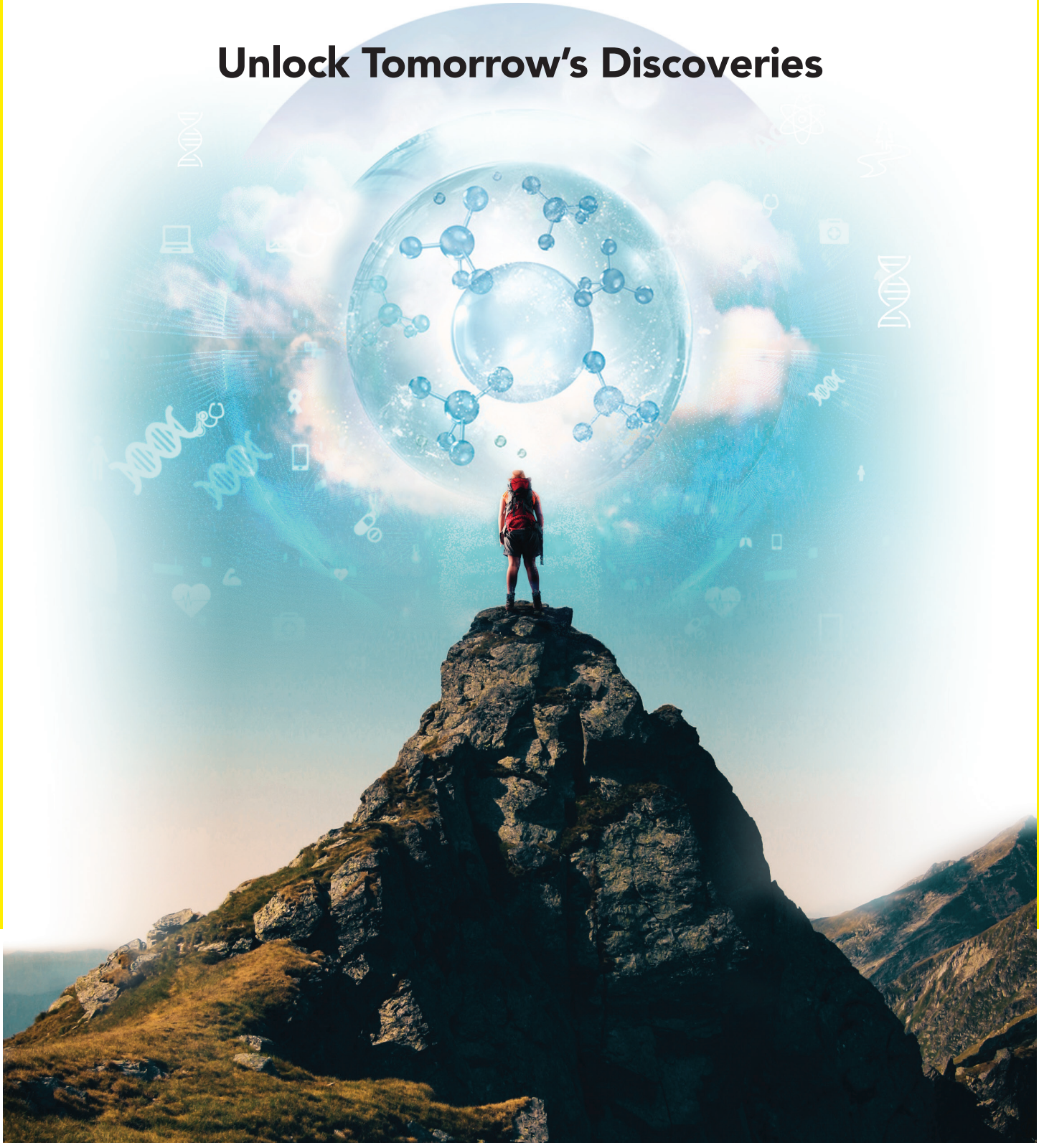
ZYMO RESEARCH

The Beauty of Science is to Make Things Simple®

Unlock Tomorrow's Discoveries



2024 - 2025 Catalog

About the Cover

This cover is dedicated to the life science community who inspire us at Zymo Research to develop the tools you need to Unlock Tomorrow's Discoveries.

A message from Zymo Research's Founder and CEO

Dear Customers and Colleagues,

As we step into this new year, we are filled with gratitude and excitement as Zymo Research marks a significant milestone—our 30th anniversary. From our humble beginnings in a small garage in Orange, CA, to becoming one of the global leaders in life science, our journey has been nothing short of truly exhilarating.

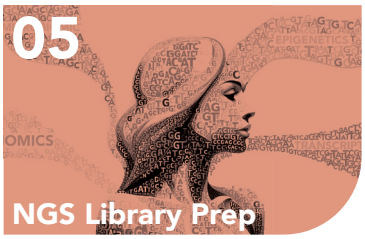
At the heart of Zymo Research is our passion for science and innovation. From our first product, the Yeast Transformation Kit, which made the frozen yeast competent cell possible, to the invention of the mini-elution volume spin column for contaminant-free DNA/RNA purification; from the invention of streamlined bisulfite DNA methylation chemistry for the epigenetic field to being the first to provide comprehensive microbiomics standards; from pioneering DNA/RNA Shield™ for challenging sample collection and stabilization of either patient samples or astronauts samples for NASA in space exploration to new methods for NGS libraries construction—all of these breakthroughs are owed to our belief that "The Beauty of Science is to Make Things Simple."

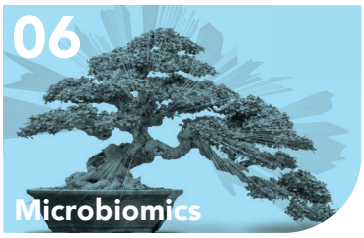
As we celebrate this milestone, we want to express our deepest gratitude to you, our valued customers, partners, colleagues, and friends. Your trust and support have been crucial in our journey. Your challenges and feedback have inspired our innovations, and your successes have been our greatest reward. Be assured, we will always treat you as we would like to be treated.

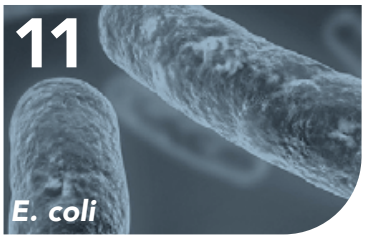
Looking ahead, we are excited to continue this journey with you. We remain committed to providing cutting-edge solutions and exceptional support, ensuring that we not only meet but exceed your expectations. The future is bright, and together, we will continue our mission: "To have a positive impact in the biomedical field and to contribute to the greater good of humanity."

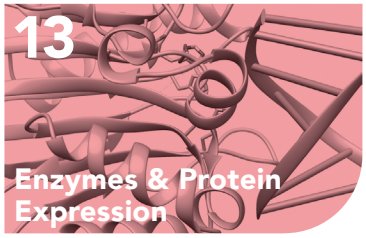
Thank you for being a part of our story.

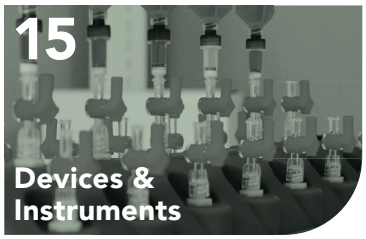
Larry Jia, M.D.
Founder and CEO, Zymo Research

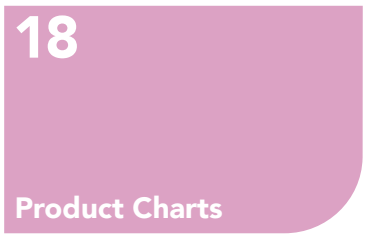












Who We Are

Since its inception in 1994, Zymo Research has been proudly serving the scientific community by providing innovative, reliable, and high quality research tools at affordable prices. Our vision "The Beauty of Science is to Make Things Simple" is now truer than ever. Whether it's epigenetics, Microbiomics, DNA, RNA, *E. coli*, or yeast based research, our philosophy remains the same: To provide the highest quality products in the industry while ensuring they are both simple to use and reliable in their performance. Zymo Research stands on three pillars which form the foundation of our company: Innovation, Quality, and Customer Service. These pillars are fundamental to our culture and ensure our products meet your needs.

Innovation

Zymo Research is historically recognized for its innovation of high quality nucleic acid purification technologies. Under the branding DNA Purification Made Simple® and RNA Purification Made Simple®, our technologies are pushing the limits of what is possible with nucleic acid isolation. As The Epigenetics Company™, Zymo Research has also received much attention for its rapidly expanding portfolio of epigenetics products and services. It is our objective to develop and provide the most comprehensive set of tools for DNA, RNA, and epigenetic research and analysis available today. Thousands of peer-reviewed scientific publications from researchers around the world feature our technologies. Through innovation, our scientists have made streamlined DNA methylation detection possible, pioneered the micro-elution column for DNA and RNA purification, developed the simplest and the most sophisticated methods for high-quality plasmid DNA purification, and patented the first RNA purification directly from Trizol® without phase separation among many other leading technologies in the industry.

Quality

We are committed to quality and guarantee that all of our products and service will meet and exceed your expectations. Our products are constantly evaluated by scientists like you to help ensure their reliability and the highest standard of quality.

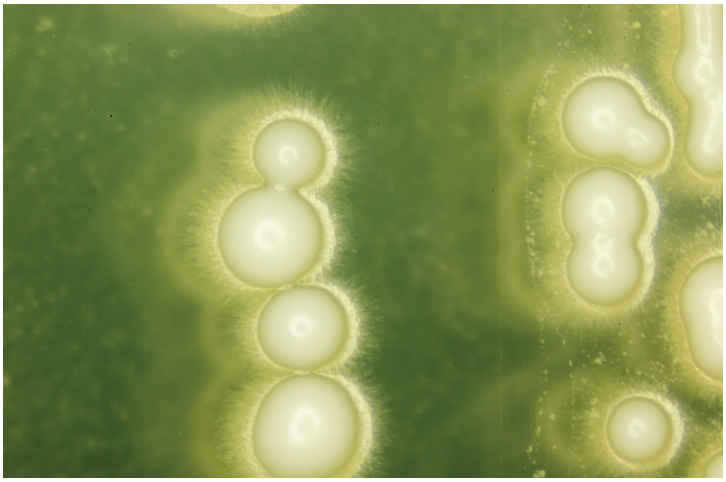
Customer Service

We strive for excellence in how we support your scientific endeavors. We pledge to be honest and responsible for everything we do with you. We will treat you as we would like to be treated. Together, we will build a brighter future.

The Sun Rises in the Yeast

Humble Beginnings from a Southern California Garage

In an ordinary garage in Orange, California, a young scientist looked down in disappointment at murky tubes of *E. coli* from a broken-down centrifuge. Realizing that his centrifuge was not fast enough to spin down *E. coli*, the virologist put off his dreams of creating gene therapy products for the only thing he could spin down – yeast.



The small pellet that emerged from the centrifuge marked the beginning of Zymo Research Corporation and the start of a revolution in yeast research technologies. Zymo Research's first product, the EZ Yeast Transformation Kit, was developed and officially launched by the company's founder in 1994. With a new vision and scarce resources, he eliminated nine of the eleven steps in yeast transformation, making the process easier and one hundred times more efficient than standard protocols. This novel transformation system enabled the preparation of yeast competent cells in just 10 minutes, followed by a one-step transformation procedure. Now, instead of taking a week to complete a yeast transformation, it takes less than one hour.

With just one part-time employee and no marketing budget, Zymo Research quickly emerged as a leader in the field of yeast research due to its versatile and cost-effective transformation technology. Today, Zymo Research's Frozen-EZ Yeast Transformation II™ Kit is widely cited and has been used by thousands of scientists for a diverse array of applications, including two-hybrid system screening, genetic manipulation, metabolic engineering, and synthetic biology.

As the company grew, it expanded its focus to include plasmid purification, DNA/RNA isolation, and Next-Gen Sequencing, while becoming an industry leader in the fields of epigenetics and microbiomics. Without the need for investors, Zymo Research was able to build on passion and the voices of customers, instead of investment dollars. This allowed the company to listen to what researchers needed and act immediately to provide highly advanced technology that made their work simpler.

The first Zymo Research products revolving around yeast technologies eventually paved the way for a plethora of innovative products offered today. While the company has evolved, the three budding yeast cells that still adorn Zymo Research's logo are a constant reminder of its roots. They represent a timeless promise that its growth will always stem from its overarching mission to provide reliable, valuable biomedical tools to the research community.

Technical & Application Support – From Scientists to Scientists

Our mission & the value we strive to bring you:

We offer easily accessible support directly from our Scientists to help ensure successful integration of our products and solutions into your unique workflows.

When you connect with our technical team, our goal is to always provide experiences that are prompt, detailed, relevant, and courteous. Please feel free to share any feedback after collaborating with our staff so that we can continue to improve our products and processes.

How Can We Support You?

Question Type	Can We Answer It?
Product Selection	✔
Protocol Clarification & Walk-Through	✔
Working with Unique Samples	✔
Product for Testing and Evaluation	✔
Troubleshooting & Optimization	✔
Workflow Building & Integration	✔
Scaling & High-Throughput Options	✔

How Your Colleagues Have Rated Our Support

What Our Customers Are Saying

I only started using Zymo recently, but now I try to use it for all my kits, specifically because the tech support is so good. I have called a couple of times, and the help has always been excellent. Thank you! It really helps my experiments.
– Katharina M., Mueller Lab at UMass Chan Medical School

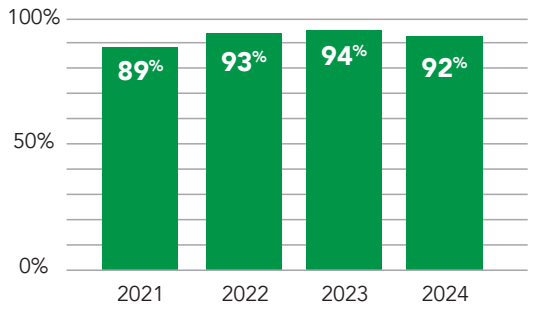
The ZYMO Tech Support Team has been more than amenable to our questions. We are grateful for the valuable suggestions they have made regarding our extraction protocol and look forward to working with ZYMO on our upcoming projects!
- Alex L., Moore Lab at The University of Arizona Arthropod Systematics

I always appreciate in-depth practical details I could get from Tech Support. Zymo is one of the rare companies that I can get great quality products with great support!
– Noriko I., Baudry Lab at The University of Alabama in Huntsville

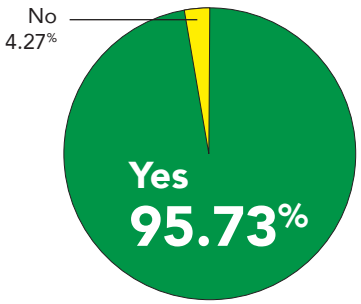
Quick, professional support and fast delivery of items is another GREAT point
– Amro H., Veterinary Diagnostic Lab at Iowa State University

Wonderful, cheery, helpful - got the answer we wanted and more!
– Alison P., Griffith University in Brisbane, Australia

Excellence Rating



Did we answer your question or resolve the issue you were experiencing?



Contact Information

Email (Response in 1-2 business days) / Phone (Available from 8-5 pm local time)

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AUTOMATION. BLISS.

Empowering our Community: Effortless, Scalable, Automated Laboratory Workflow Solutions

Our mission is to provide user-friendly, accessible automated workflow solutions, empowering our community to conduct biomedical experiments and processes efficiently and effectively. We offer turn-key solutions and custom-designed workflows to meet laboratory automation needs.

Simple as...

Zymo Research Automation

In 2018, Zymo Research's Automation Team was established with the primary goal of optimizing sample preparation, extraction, and analyte preparation (i.e. PCR, NGS, Array, etc.) utilizing laboratory automation for our customers and internal service groups.

Amidst the challenges posed by the COVID-19 pandemic, the Automation Team extended its focus to develop comprehensive systems for collecting and detecting SARS-CoV-2 across various sample types and downstream applications.

"The pandemic emphasized the need for end-to-end workflows. Customers, navigating diverse products, sought solutions for sample processing. In response, we created seamless automation-compatible workflows using Zymo Research's chemistries."

– Gregory Lee, Zymo Research's Automation Manager

Knowledge Sharing for Accelerated Automation Deployment:

These challenges provided invaluable lessons, and at Zymo Research Automation, our automation team believes in sharing knowledge gained from these experiences. We pass on this wealth of understanding to our customers, expediting the deployment of laboratory automation in their unique contexts. Our commitment goes beyond providing solutions; it extends to ensuring our customers benefit from the collective wisdom cultivated during real-world scenarios.

WHY AUTOMATE?

- **Increased Operational Efficiency:** Automating manual processes reduces experiment time and effort, compellingly enhancing operational efficiency and productivity, and enabling strategic allocation of resources.
- **Ensured Consistency in Results:** For precision and accuracy in research and clinical settings, consistent results are pivotal. Automation reagents play a crucial role in standardizing processes, ensuring reproducibility, and minimizing the potential for human error.
- **Realizing Cost-Efficiency:** By reducing manual labor and mitigating human error, laboratory automation opens a gateway to substantial cost savings covering labor, reagents, and equipment maintenance. These efficiencies directly impact your lab's financial health, providing the opportunity to allocate more resources into research and development initiatives.

Unlock the value of Zymo Research Automation:

- ✔ **Free Consultations, Free Scripts, Free Trial Kits**
- ✔ **Flexible and Personal:** Customized Solutions
- ✔ **Complete Support:** Comprehensive Assistance and Guidance

Explore the possibilities of streamlined workflows with our dedicated Automation Team. Contact Zymo Research's automation specialists at **automation@zymoresearch.com** to elevate your experimental and processing objectives.

RNA-Seq: Exploring Beyond the Commonly Studied Model Organisms

RNA sequencing (RNA-Seq) has revolutionized the study of gene expression and regulation, thus providing deep insights into the inner workings of living organisms. One common method for this technology, total RNA-Seq, profiles both coding and noncoding RNA with the depletion of the overly abundant ribosomal RNA (rRNA). With most existing rRNA depletion methods customized and established for human samples and the commonly studied mouse and rat model systems, the Zymo-Seq™ RiboFree® Total RNA Library Kit allows researchers to expand their horizons thanks to its novel rRNA depletion technology that is probe-free and species-independent. Several recently published studies have leveraged the RiboFree® depletion strategy to explore the transcriptomes of organisms outside the common models.

The Study of the Crimean-Congo Hemorrhagic Fever Virus (CCHFV)

As the scientific community transitions into a post-COVID era, there is an increased focus on epidemiological studies involving potential sources of zoonotic viruses. A recent study conducted by scientists in Uganda shed light on an insufficiently studied yet widespread tickborne pathogen called the Crimean-Congo hemorrhagic fever virus (CCHFV). Amidst their investigation, the researchers employed the Zymo-Seq™ RiboFree® Total RNA Library Kit to analyze a novel viral strain of the CCHFV.[1]

CCHFV is transmitted between livestock and humans through infected tick bites, causing severe outbreaks across Africa, Asia, the Middle East, and Eastern Europe.[2,3] Despite being the most geographically widespread tick-borne viruses, strains of CCHFV remained poorly studied, especially true for the African strains, with most knowledge derived solely from severe human disease cases.

In this study, researchers took a novel approach by collecting RNA samples directly from the infected African blue ticks, *Rhipicephalus (Boophilus) decoloratus*. The aim was to expand the understanding of the natural variation of CCHFV strains from tick vectors and animal reservoirs directly. The Zymo-Seq™ RiboFree® Total RNA Library Kit enabled the authors to successfully generate total RNA libraries from tick RNA for sequencing. From there they were able to characterize the complete coding region of this novel CCHFV strain, contributing to the growing reservoir of data essential for the development of vaccines, diagnostic tools, and control strategies for combating viral infections.[1]

The Study of the Mustard Hill Coral, *Porites astreoides*

Coral reefs harbor 25% of the world's biodiversity and unfortunately face significant challenges due to climate change-induced thermal stress.[4,5] This has led to a decline in global coral populations.[5] While some reef species are highly sensitive to these thermal changes, others demonstrate remarkable resilience and even appear to thrive under these normally unfavorable conditions. One such resilient species is the mustard hill coral *(Porites astreoides)*.[6]

To unravel the mechanisms behind the mustard hill coral's resilience, researchers from the University of Rhode Island utilized the innovative Zymo-Seq™ RiboFree® technology to generate an *ab initio* reference transcriptome of *P. astreoides*, adding a useful resource for future studies.[7]

The researchers further leveraged the RNA-Seq data from the RiboFree® libraries to characterize the mapping potential of the draft reference genome they built from DNA sequencing. Remarkably, they achieved alignment rates of around or above 80% for unique sequences. This high alignment rate underscores the suitability of the new reference genome for future transcriptomic studies. As climate change continues to impact global biodiversity, understanding how resilient species like the mustard hill coral cope with these unprecedented challenges offers crucial insights into the future of our ecosystems.

The Study of *Oenococcus oeni*

Wine production is ironically very far from soothing; in fact, it's quite a complex process. The quality and stability of the wine is dependent upon bacteria that are utilized for various biochemical reactions. One critical process in winemaking is malolactic fermentation (MLF)[8], which plays a vital role in reducing wine acidity and enhancing microbiological stability[9], both of which are highly desirable characteristics. *Oenococcus oeni*, a gram-positive heterofermentative lactic acid bacterium (LAB) species, is commonly used for controlled MLF in wine production due to its acid tolerance of high ethanol levels.[10] However, its sensitivity to sulfur dioxide (SO_2), an antiseptic compound commonly used in winemaking[9], remains poorly understood.

To shed light on the transcriptional response of *O. oeni* during MLF under the stress of SO_2 exposure, researchers from Australia conducted a comprehensive investigation.[11] They utilized the Zymo-Seq™ RiboFree® Total RNA Library Kit to prepare total RNA-Seq libraries from *O. oeni* under various experimental conditions. Through sequencing and differential gene expression analysis, they unveiled key transcriptional changes induced by SO_2 exposure, highlighting its potential as a target for the development of SO_2-tolerant strains. These advancements are pivotal in enhancing wine production and expanding the knowledge within the winemaking community.

Conclusion

The significance of an RNA-Seq kit that is compatible across all species cannot be overstated. With the Zymo-Seq™ RiboFree® Total RNA Library Kit, scientists worldwide now have a powerful tool at their disposal to delve into the transcriptomics of less commonly studied organisms. As exemplified by the peer-reviewed research presented above, the possibilities for remarkable and unprecedented discoveries are unlimited. From unraveling the secrets of resilient coral species to untangling the intricate responses of bacteria in wine production, the Zymo-Seq™ RiboFree® Total RNA Library Kit has served as a key that opens the door to a wealth of knowledge and innovation.

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Into The Dark: Exploring The Hidden World Of Bat Migration

Myth-Busting & Ecosystem Benefits

Like misunderstood superheroes of the night, bats are not the villains they are often portrayed to be. The COVID-19 pandemic disrupted not only aspects of our global economy and public health systems, but also our holistic view of bats as well, establishing them as dangerous animals.

The general view of bats shifted to disease carrying creatures, capable of causing human infections and global pandemics. Pre-existing negative perceptions of bats with darkness, vampires, and other spooky stigmas further contributed to the classification of these flying mammals as outlaws, leading to their persecution and even extermination.

Even with this fortified stigma fueled in part by the COVID-19 pandemic, ecologists studying these winged-mammals know the importance of the essential positions that bats play in the health of our ecosystem.

Mexican free-tailed bat emergence from Bracken cave. Credit Molly Simonis.

As exemplified by the declining populations of keystone species such as honeybees and reef-building corals, the repercussions of population declines can trigger severe environmental consequences. One critical and often unnoticed job that bats employ is their ability to function as pollinators. Bats aid in the dispersal of seeds seen with frugivorous species as well as help control pest populations like mosquitoes. Despite their crucial roles, bats and their behaviors remain shrouded in mystery.

Particularly, bats' migratory behavior remains largely unknown. They often go unnoticed as migratory creatures due in part to their nocturnal habits. But those living in temperate zones that are unable to hibernate must escape the dropping temperatures during winter months in search of more favorable weather.

At the forefront of bat research, Dr. Amanda Vicente-Santos and her dedicated research team have embarked on a mission to unravel the migratory world of bats and illuminate their pivotal ecological contributions. Yet, their path is riddled with challenges, including the scarcity of comprehensive research on these remarkable creatures. Dr. Vicente-Santos and her team not only aim to fill this knowledge gap but also passionately advocate for the preservation of bat populations.

Amanda Vicente-Santos taking oral swab samples from a bat.

Credit Diego Peralta

Why Do We Know So Little?

Let us first put ourselves into Dr. Vicente-Santos shoes: imagine being in Bracken Cave, Texas, during the summer. You have estimated that there are close to 20 million Mexican free-tailed bats (*Tadarida brasiliensis*) – making this the greatest mammal aggregation in the world. How do they know to aggregate here? Why are they here? Most of them are females who were pregnant and now have pups, but this is not the only place with millions of female bats that have been reported to roost together. Similar reports exist in other areas of Texas, extending all the way up to Southern Oregon and even as far south in some northern parts of Mexico.

"It takes them over four hours to leave the cave every night; that is how massive it is. They must feed their pups, so they eat tons of insects every night. And not just any insect, but agricultural pests. Farmers do not know it, but their crops are safer when these bats are around, as they help reduce pesticide use and thus make our environment safer." - Dr. Vicente-Santos

Bat researchers Diego Peralta and Javier Torres, heading inside a lava tube cave in the Sonora desert, Mexico, to survey another migratory bat species, the Tequila bat (*Leptonycteris yerbabuenae*). Credit Amanda Vicente-Santos.

Unfortunately, numerous GPS and tracking technologies employed by ornithologists for bird research prove inadequate for studying bats. Questions persist, such as their migration patterns, the survival rates during these journeys, and whether they return or venture somewhere else next summer.

Addressing these uncertainties assumes paramount importance in safeguarding these species along their migratory pathways, especially when operating on vast national and international fronts. The preservation of migratory species, including Mexican free-tailed bat, is essential for establishing crucial connections between habitats that might otherwise remain isolated.

Knowing this, bat researchers remain committed to unearthing the complexities surrounding these creatures and work on ways to adapt already existing technologies for studying bats. One promising avenue for tracking the entry and exit from a cave is by affixing PIT tags to bats and placing antennas at entrances, allowing researchers to discern and monitor individual activities. Once they have embarked from the caves, other methods utilizing radio telemetry through Motus towers enable accurate tracking of bat movements across expansive distances.

The information collected from these tracking systems, coupled with the application of molecular techniques, serves as a powerful tool for unraveling the intricate web of bat migration patterns. This reveals the hidden pathways they follow, shedding light on the migratory behavior of bats and their conservation needs.

Miratory Bats In A Changing World

The realm of conservation introduces the additional complexities of climate change and anthropogenic factors such as the increased use of agricultural pesticides which could affect their health and the ability to cope with infections. As a result, the understanding of bat health, their immune system, and their susceptibility to pathogens along their migratory route is imperative to protecting the declining populations.

Ecological fieldwork involves dealing with unpredictable natural environments where little is within our control. Every data collection effort is like taking a snapshot of a moment, so researchers aim to gather as much information as possible. Since the bats that they study often weigh only 10-15 grams (equivalent to an empty soda can), the amount of sample they can collect is extremely limited to avoid lethal collection.

"Every field site presents different and unique challenges, but for researchers, there is nothing more valuable than samples, and their integrity must be protected at all costs." - Dr. Vicente-Santos

While some samples require immediate flash freezing in liquid nitrogen, this may not be the most accessible option for field researchers. To take full advantage of these precious samples, they can be preserved at room temperature in stabilization solutions like DNA/RNA Shield™ without compromising genetic integrity. Dr. Vicente-Santos and her team often collect hundreds of samples, requiring high-throughput options for processing and extracting across several different sample types.

The *Quick*-DNA/RNA™ MagBead Kit offers a versatile and automatable solution for a wide range of biological sample types, enabling the screening of pathogens with the use of molecular techniques, to enhance our understanding of bat health and conservation needs all from a singular drop of blood.

These enigmatic creatures of the night remain a subject of fascination and importance in the world of ecology. With the ever-changing challenges of a warming planet, researchers and conservationists are working tirelessly to ensure the survival of these unsung heroes of the night. Shifting our perspective on bats allows us to truly appreciate their vital role in maintaining the delicate equilibrium of our natural world and only then can we see the continued health and vitality of our ecosystems for generations to come.

Unveiling Urban Microbial Mysteries: A MetaSUB Success Story

Picture the hidden ecosystems thriving in subway systems, parks, and public spaces, quietly shaping the microbial landscape around us. Metagenomics and Metadesign of Subways and Urban Biomes (MetaSUB) aims to uncover this unseen world and harness its insights to improve public health, city planning, and environmental sustainability.

In 2023, the MetaSUB initiative expanded internationally enlisting numerous countries, cities, and laboratories in a global research endeavor. This collaborative network aims to advance our comprehension of urban microbiomes, facilitate knowledge exchange, and standardize methodologies across participating laboratories.

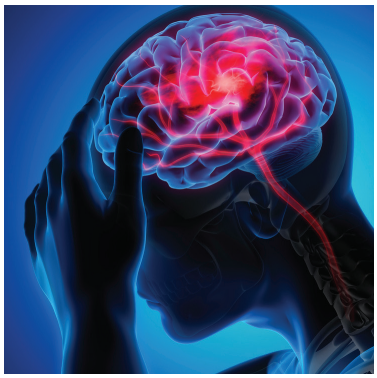
The impact of MetaSUB extends beyond the confines of laboratories. Cities worldwide are now equipped with valuable insights into their urban microbiomes, empowering them to make informed decisions regarding public health interventions, infrastructure development, and environmental sustainability.

In the quest to decode the urban microbiome, the first step is sample preparation. Zymo Research stands at the forefront of sample preparation technology, providing cutting-edge tools and expertise in both sample collection and nucleic acid extraction.

As MetaSUB delves deeper into the mysteries of urban microbiomes, Zymo Research drives this microbial revolution further by supplying thousands of collection devices and extraction kits. With over 30,000 samples processed to date, Zymo Research's ongoing participation in the MetaSUB initiative underscores the company's dedication to advancing scientific discovery.

By seamlessly integrating Zymo Research's extraction technology into the MetaSUB workflow, researchers have gained unparalleled access to the genetic information of diverse microorganisms inhabiting urban landscapes. This partnership has facilitated the development of a global database, offering a vivid depiction of the intricate microbial ecosystems that render each city unique.

Treating Ischemic Stroke using Cell Therapy



Stroke Is a Global Epidemic

Worldwide, stroke is the second most common cause of death and the third most common cause of morbidity. Patients that suffered a stroke have a range of impairments, including paralysis, vision and speech loss, and death. One stroke occurs every 40 seconds in the United States, resulting in a death rate of approximately 20%. Several factors contribute to the risk of stroke, including tobacco use, a sedentary lifestyle, diabetes, high blood pressure, and elevated levels of cholesterol and triglycerides in the blood.

No Good Treatment Options Exist

There are currently only two FDA approved treatments for ischemic stroke. However, these treatments are time sensitive and can only be used during the first 24 hours after the patient has shown symptoms of a stroke. Thus, limiting their application to less than 20% of all stroke patients. Furthermore, these are acute treatments that only aid in restoring the flow of blocked blood vessels and do not repair the tissue that was damaged by the stroke. There are several studies that have evaluated therapies promoting endogenous tissue repair using pharmacological approaches or trophic factors, but they were largely ineffective.

An Application for Cell Therapy

Cell-based therapies are a promising option for resolving stroke induced cellular deficits when implemented within days after a stroke. Progenitor-based vascular cell therapies have been demonstrated to improve neurological recovery by exploiting neurogenic and vasculogenic processes that occur during nerve tissue repair and/or development. Unfortunately, current approaches face significant obstacles due to reliance on scarce or impaired progenitor cell populations, especially in patients with multiple diseases. These therapies also carry additional risks such as uncontrolled differentiation, tumorigenesis, genetic abnormalities, and immunogenicity.

New breakthroughs in direct cell reprogramming have unlocked the likelihood for patient-specific cell therapies that overcome the obstacles mentioned above by using abundant and readily available cell sources such as skin fibroblasts. However, current gene delivery methods used to directly reprogram cells are not ideal. Viral transduction has biosafety concerns and capsid size constraints on gene payload. Chemical transfection methods, such as lipo/polyplex-based nanocarriers, rely significantly on endocytosis to deliver genetic information, making them less effective if endosomal escape of the cargo is not efficient. Physical delivery methods, such as biolistic transfection, can cause extensive cell damage and negatively affect cell function. Bulk electroporation (BEP) is a quick and easy method for gene delivery, but it also relies on endocytosis and endosomal escape. Also, the high-magnitude and nonuniform voltage used during BEP often results in poor cell health.

Nanotransfection-Based Vasculogenic Cell Reprogramming

An article published in Science Advances in 2021 set-out to resolve the major challenges associated with current gene delivery technologies and direct cell reprogramming by utilizing a novel and simple nanotransfection based method for nonviral cell reprogramming.[1] The study by Lemmerman et al. used the ZymoPURE™ II Plasmid Midiprep Kit to purify endotoxin-free plasmids containing the developmental transcription factor genes Etv2, Foxc2, and Fli1. Mouse fibroblasts were then transfected with the plasmid cocktail using a nanochannel-driven delivery system, which overcomes many of the issues associated with current transfection methods. The transfected fibroblasts were successfully transformed into vascular cells.

In addition, intracranial delivery of the reprogrammed fibroblasts into a mouse model of ischemic stroke resulted in dose-dependent increases in perfusion, reduced stroke volume, and significant improvement of locomotive skills in stroke-affected mice. Further analysis also confirmed that the treatment increased vascularity and neuronal cellularity and reduced glial scar formation. Their results suggest that vasculogenic cell reprogramming using a nonviral nanotransfection gene delivery system is a promising approach for the treatment of ischemic stroke.

References:

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Decoding the Genetic Secrets of Honey: A Buzzworthy Exploration

From being revered as a divine offering in ancient Egypt to gracing our tables as a sweet addition to tea, honey has been a beloved companion for humans for centuries. Beyond its culinary allure, honey contains a wealth of DNA, paving the way for research avenues that span from honeybee well-being to exploring the origins of the nectar that gives honey its unique flavors.

Sweet Insights

Honey's genetic content, primarily from pollen, offers insights into the specific floral sources of the honey and highlights the varied diet of bees.[1] Honey also contains cell-free DNA and microbes that provide a distinct genetic profile, further deepening our understanding of the health and well-being of bees.

Addressing Colony Collapse Disorder

The global bee population has experienced alarming declines in recent years, evident in phenomena known as Colony Collapse Disorder (CCD). In response to this crisis, the USDA formed a CCD Steering Committee in 2007, bringing together representatives from various government agencies and academia. Their primary objective is to understand and combat CCD effectively. Central to the CCD Action Plan is conducting surveys and gathering data to evaluate the scope of CCD and pinpoint factors contributing to bee mortality.

Researchers are focusing on DNA extracted from honey to explore the dietary patterns and overall health of honeybees. These investigations aim to uncover the root causes of colony collapse, offering potential strategies to preserve and protect future bee populations.

Navigating a Sticky Situation

While extracting DNA from honey holds significant promise for insights, it comes with a unique set of challenges. The high viscosity and low water content of honey make the extraction process intricate. One solution is to dilute the honey prior to extraction, ensuring a smoother workflow. The subsequent steps detail the process for extracting both cellular and cell-free DNA from honey, offering a comprehensive guide for researchers navigating this sticky situation:

Cellular DNA Extraction from Honey

1. Dilute DNA with water in a 1:3 dilution (for instance 100 ml of honey with 300 ml water)
2. Incubate at 55°C for 30 minutes to homogenize
3. Separate into smaller volumes and centrifuge at 10,000 x *g* for 10 minutes in a microcentrifuge, or in a large centrifuge at 3,000 x *g* for 15 minutes
4. Remove supernatant
5. Resuspend in PBS
6. Continue with the extraction by using the *Quick*-DNA™ Plus Kit

Cell-free DNA Extraction from Honey

- Dilute DNA with water in a 1:3 dilution (for instance 100 ml of honey with 300 ml water)
- Incubate at 55°C for 30 minutes to homogenize
- Add 70 µl of Urine Conditioning Buffer™ to every 1 ml of honey solution
- Centrifuge at 10,000 x *g* for 10 minutes in a microcentrifuge, or in a large centrifuge at 3,000 x *g* for 15 minutes
- Remove supernatant
- Resuspend in PBS
- Continue with the extraction by using the *Quick*-DNA™ Plus Kit

As we navigate the challenges presented by honey's viscosity, we uncover opportunities that could be pivotal in ensuring the future of these vital pollinators and preserving the intricate fabric of our global agricultural ecosystem.

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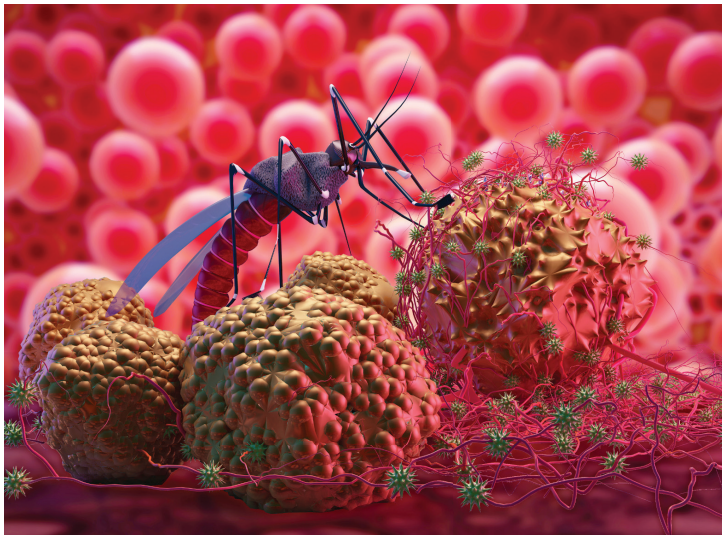
Advancing Malaria Vaccine Development

Characterization of Antibodies Against the Parasite *Plasmodium falciparum*



Malaria remains a pervasive threat, accounting for 247 million cases worldwide in 2021 and claiming an estimated 619,000 lives. *Plasmodium falciparum* is the deadliest malaria-causing parasite and is prevalent throughout Africa, necessitating the development of effective antimalarial vaccines.[1] However, for years scientists struggled to develop a vaccine with sufficient clinical efficacy, as human antibody responses were not of sufficient magnitude or endurance.[2]

An important aspect of the vaccine development project was the characterization of human antibodies capable of eliciting an effective response and conferring functional immunity. One such study published in 2019 by researchers with the University of Oxford investigated the functionality of human monoclonal antibodies against the *P. falciparum* reticulocyte-binding protein homolog 5 (PfRH5), which is a critical vaccine target due to its role in binding host red blood cells during infection.[3] The University of Oxford group first recovered peripheral blood B cells from vaccine recipients in the first clinical trial of a PfRH5-based vaccine, and subsequently isolated a panel of antibodies against PfRH5.

In this study, Zymo Research's *Mix & Go!™ Competent Cells - DH5 Alpha* were used for cloning antibody variable genes prior to transfection. After subsequent protein expression and functional studies, the researchers were able to identify four unique classes of antibodies against PfRH5: neutralizing antibodies, inert antibodies, antagonistic antibodies, and non-neutralizing synergistic antibodies.[3] This thorough characterization of antibody function and the unexpected discovery of non-neutralizing antibodies that can still work against malaria infection by potentiating the effects of neutralizing antibodies provided a foundation for structure-guided PfRH5-based antimalarial vaccine development.

Today, there are two malaria vaccines that target *P. falciparum* recommended by the World Health Organization, which will be distributed to at least 28 countries in Africa.[4] The vaccines are expected to substantially reduce malaria-related hospitalizations and deaths in vulnerable regions. While the journey to malaria vaccine development and roll-out was a challenging one, important biotechnical tools such as Zymo Research's *Mix & Go!™* Competent Cells enabled scientists to overcome these hurdles for the greater good of humanity.

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2 Draper, S. J., Sack, B. K., King, C. R., Nielsen, C. M., Rayner, J. C., Higgins, M. K., Long, C. A., and Seder, R. A. (2018). Malaria vaccines: recent advances and new horizons. Cell Host & Microbe, 24(1), 43–56. https://doi.org/10.1016/j.chom.2018.06.008.
3 Alanine, D. G. W., Quinkert, D., Kumarasingha, R., Mehmood, S., Donnellan, F. R., Minkah, N. K., Dadonaite, B., Diouf, A., Galaway, F., Silk, S. E., Jamwal, A., Marshall, J. M., Miura, K., Foquet, L., Elias, S. C., Labbé, G. M., Douglas, A. D., Jin, J., Payne, R. O., Illingworth, J. J., Pattinson, D. J., Pulido, D., Williams, B. G., de Jongh, W. A., Wright, G. J., Kappe, S. H. I., Robinson, C. V., Long, C. A., Brabb, B. S., Gilson, P. R., Higgins, M. K., and Draper, S. J. (2019). Human Antibodies that Slow Erythrocyte Invasion Potentiate Malaria-Neutralizing Antibodies. Cell, 178(1), 216–228.e21. https://doi.org/10.1016/j.cell.2019.05.025.
4 WHO recommends R21/Matrix-M vaccine for malaria prevention in updated advice on immunization. World Health Organization (2023).

Mind in Motion

How Running Boosts Brain Health and Performance

"We compared several kits for small-amount-RNA purification, the TRIzol™ based RNA purification (Direct-zol™ RNA Microprep) yielded the highest quality of RNA. This is also the best way to protect the small amount of RNA from degradation. Besides, the smaller diameter of membrane in the elution column allows to elute RNA in a small volume of elutes therefore there is no need to add an extra step to concentrate the purified RNA." - Dr. Yu Gao, University of Wisconsin- Madison

Neuronal Regeneration Boost

Recent research has shed light on a fascinating phenomenon: the relationship between running, the enhanced generation of hippocampal neurons, and its impact on learning ability and mood regulation. A study conducted by Dr. Yu Gao and colleagues starts to unravel the intricate mechanisms underlying this connection, revealing the potential for a healthier brain through the power of running. While the correlation between running and neurogenesis is widely known, the exact mechanism behind this connection remains unclear. The study's findings highlight the critical role of G protein signaling 6 (RGS6) in neuronal maturation and hippocampal neurogenesis dependent learning and mood regulation. Knockdown of RGS6 in mice was shown to negate the positive effects of running on neuronal maturation and subsequent learning and anxiolytic (anxiety reducing) effects. The study proposed that RGS6 might contribute to neuronal maturation by influencing calcium influx through voltage-activated calcium channels. RGS6 may be a potential target for therapeutic interventions aimed at neurogenerative diseases and age-related cognitive decline.

Tackling Low Input

Due to the heterogeneity and composition of brain tissue, the extraction of viable regenerated or newborn neurons presented a large challenge for Dr. Yu Gao and his team. With a limited number of viable neurons, extensive RNA extraction was necessary to conduct a genome wide assessment. In order to identify the newborn neurons, conditional ribosomal tagging was used, and the RNA was immunoprecipitated.

The research conducted by Dr. Yu Gao and his team has uncovered that voluntary running initiates profound alterations in the translation of adult-born neurons. Highlighting the role of RGS6 in the maturation of these neurons, and the resulting boost in behavior. This exploration not only illuminates the molecular pathways that govern our response to external stimuli and life experiences but could also aid our understanding of diseases and developing therapeutics, all through the lens of the impact of exercise on our cognitive and emotional well-being.

Tips for Low Input RNA Extraction

1. Simplify your Workflow: Reduce the amount of protocol steps to minimize user error and bias introduced from every additional step, such as phenol-chloroform separation where the user's skill level can influence results.

2. Optimize Collection & Processing: Consider using a DNA/RNA stabilization reagent like DNA/RNA Shield™ or employ rapid flash freezing techniques using liquid nitrogen to preserve samples for future extraction. Opt for a chaotropic-based lysis solution such as TRI Reagent® or TRIzol™, ideal for difficult, fatty samples high in DNases. Ensuring samples are collected and homogenized properly will result in high RNA integrity.

3. Tailor your RNA extraction: Choose RNA extraction kits designed for low-input samples. These kits incorporate specialized columns and reagents to enhance RNA recovery and minimize loss from as small as 17 nt and as little as single cell inputs (Direct-zol™ Microprep RNA Kit).

References:
1. Yu Gao, et al., RGS6 Mediates Effects of Voluntary Running on Adult Hippocampal Neurogenesis, Cell Reports, Volume 32, Issue 5, 2020

Transforming Agriculture and Therapeutics: The Roots of Plant Synthetic Biology

Plant synthetic biology stands at the forefront of innovation, promising breakthroughs from advanced biofuels to resilient crops. This burgeoning field not only holds the potential to revolutionize agriculture but also offers solutions for pressing environmental and economic challenges. Plant synthetic biology can be harnessed to engineer crops with greater nutrition, fewer harmful ingredients, and sustainable agricultural practices.[1] On the pharmaceutical side, synthetic biology can exploit unique plant metabolic pathways to synthesize low-cost therapeutic compounds.[2] However, the advancement of this promising field has been hindered by the scarcity of comprehensive DNA part libraries and efficient assembly strategies.[3]

Scientists from Berkeley National Laboratory tackled this challenge in 2016 by developing a method to assemble DNA into plant transformation vectors through yeast homologous recombination.[3] Digested plant DNA fragments were extracted from agarose gels using Zymo Research's Zymoclean™ Gel DNA Recovery Kit. These fragments were then pieced together into yeast-compatible binary vectors, leveraging overlapping homologous sequences. The yeast-compatible binary vectors were linearized to release a URA3 dropout-cassette and were subsequently transformed into yeast using Zymo Research's Frozen-EZ Yeast Transformation II™ Kit. The transformed yeast cultures were cultivated with Zymo Research's 5-Fluoroorotic Acid (5-FOA) for effective negative selection of uncut vectors. DNA assemblies within these vectors were recovered employing Zymo Research's Zymoprep™ Yeast Plasmid Miniprep II Kit and were verified with sequencing.

The researchers successfully applied their DNA stacking method to synthesize bisabolene, an alternative to D2 diesel fuel, and violacein, a therapeutic compound possessing anticancer and antimicrobial properties, in tobacco leaves. This innovative strategy for plant gene stacking, made feasible by Zymo Research's yeast research tools, paves the way for reconstructing pivotal metabolic pathways. Such pathways hold the potential for generating therapeutic compounds, sustainable biofuels, and crops resilient to pathogens.[3]

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2 Barnum, C. R., Endelman, B. J., and Shih, P. M. (2021). Utilizing Plant Synthetic Biology to Improve Human Health and Wellness. *Frontiers in Plant Science*, 12, 691462. https://doi.org/10.3389/fpls.2021.691462.

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Sample Collection & Stabilization

01

The scientists at Zymo Research have developed sample collection/preservation solutions to ensure robustness of DNA and/or RNA analysis for both clinical and research applications. The methods used for collection and storage can significantly impact downstream analyses depending on the integrity of the sample. Most conventional methods often rely on costly, unreliable cold-chain logistics. Additionally, microbial growth and other factors can alter sample composition if not properly stabilized.

Zymo Research's DNA/RNA Shield™ collection devices preserve nucleic acids at ambient temperature for prolonged periods. These technologies inactivate pathogens making collected samples safe for shipping from remote regions having no access to cold chain. Nucleic acids from samples collected with these devices can be readily purified or stored (preserved) safely for the long-term.

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Stabilization
Made Simple™

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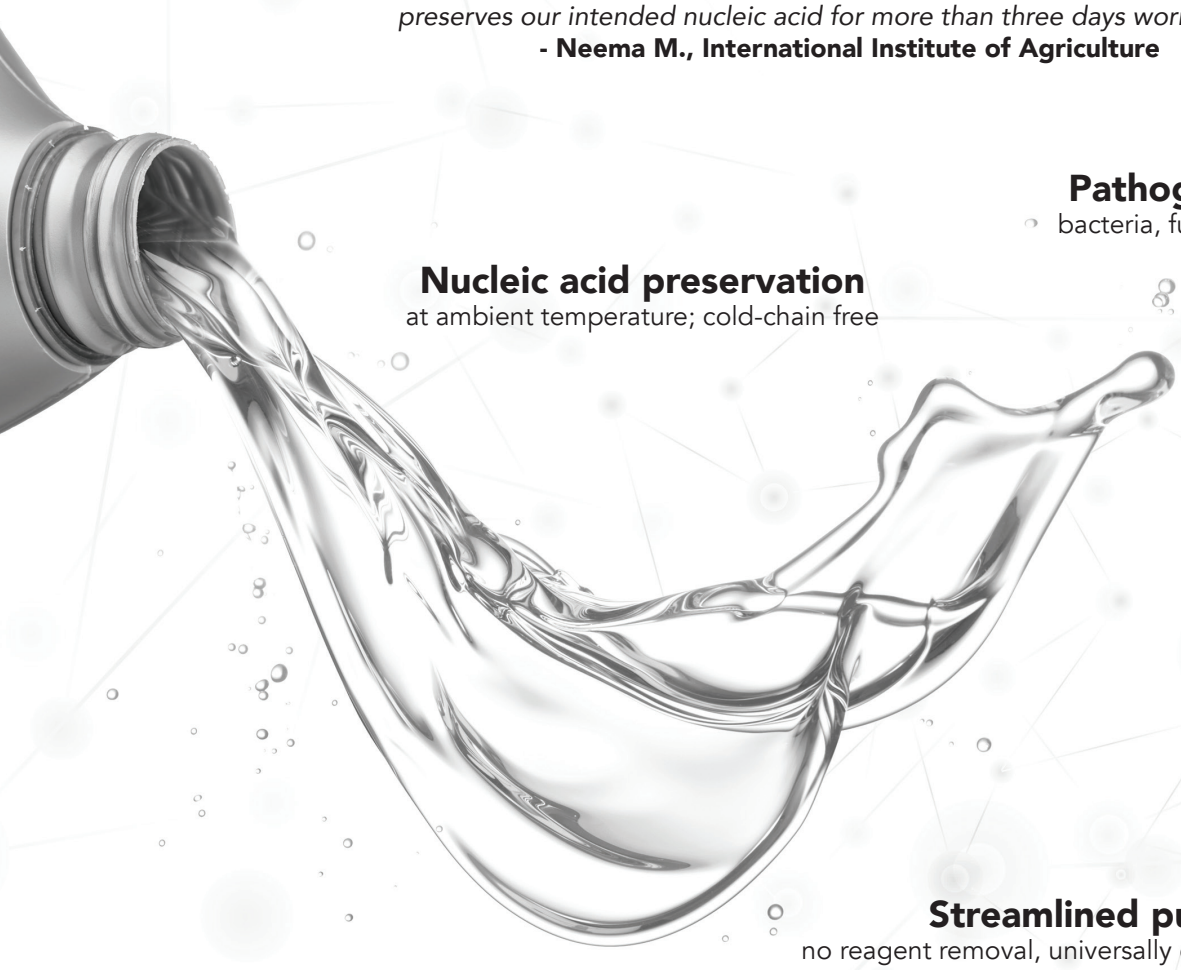
- Neema M., International Institute of Agriculture



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L. fermentum	Ebola Virus	*P. malariae*
L. monocytogenes	Herpes Simplex Virus-1	
M. tuberculosis	Herpes Simplex Virus-2	
P. aeruginosa	Influenza A	
S. enterica	Rhinovirus	
S. aureus	MERS-coronavirus	
S. pneumoniae	West Nile Virus	
X. fastidiosa		

1. Dr. Thraenhart and Dr. Jursch. Virucidal activity of the nucleic acid preservation product "DNA/RNA Shield™" against the murine parvovirus (MVM) at 20 °C.
2. Guidance on the inactivation or removal of select agents and toxins for future use. Centers for Disease Control (CDC)

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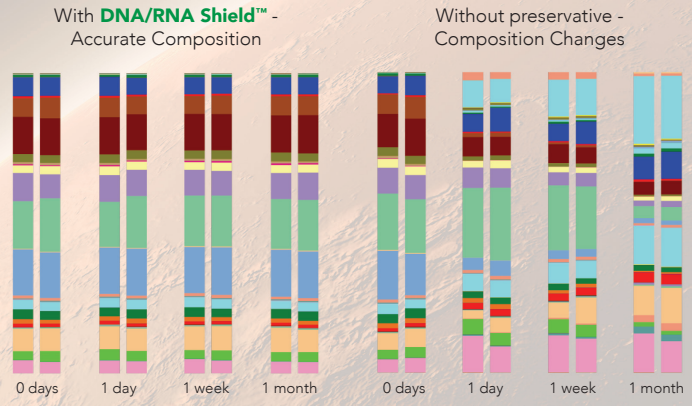

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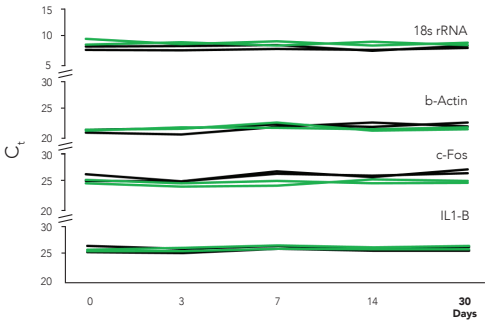
Accommodates Any Sample

including cells, tissues, fecal samples, tough-to-lyse samples, soil samples, plants, microorganisms, and bodily fluids

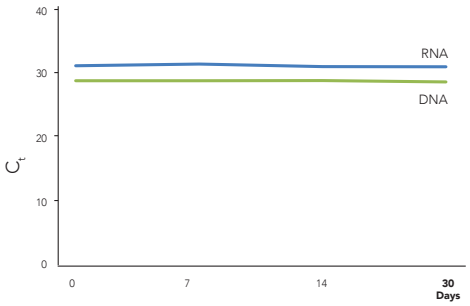
Nucleic Acid Stabilization at Ambient Temperature

Blood



RNA in blood is effectively stabilized in DNA/RNA Shield™ at ambient temperature.

Stool



RNA in stool is effectively stabilized in DNA/RNA Shield™ at ambient temperature.

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From Inception to Innovation:
The Story of DNA/RNA Shield™

Prompted by scorching temperatures and lack of access to freezers in remote sampling locations, the Walter Reed Army Institute of Research set out to compare nucleic acid preservation methods to find the most reliable solution for collecting specimens for surveillance.

Inspired by the idea of a soldier in the Middle East having nothing more than a small tube and a backpack, Zymo Research submitted formulations that could preserve nucleic acids at any temperature and protect users from harmful pathogens.

These formulations evolved into what is now known as DNA/RNA Shield™. Zymo Research's formulations surpassed other preservation methods, notably for their capability to inactivate pathogens and stabilize RNA even under extreme heat. This success piqued the interest of US Army Medical Detachments stationed in Kuwait.

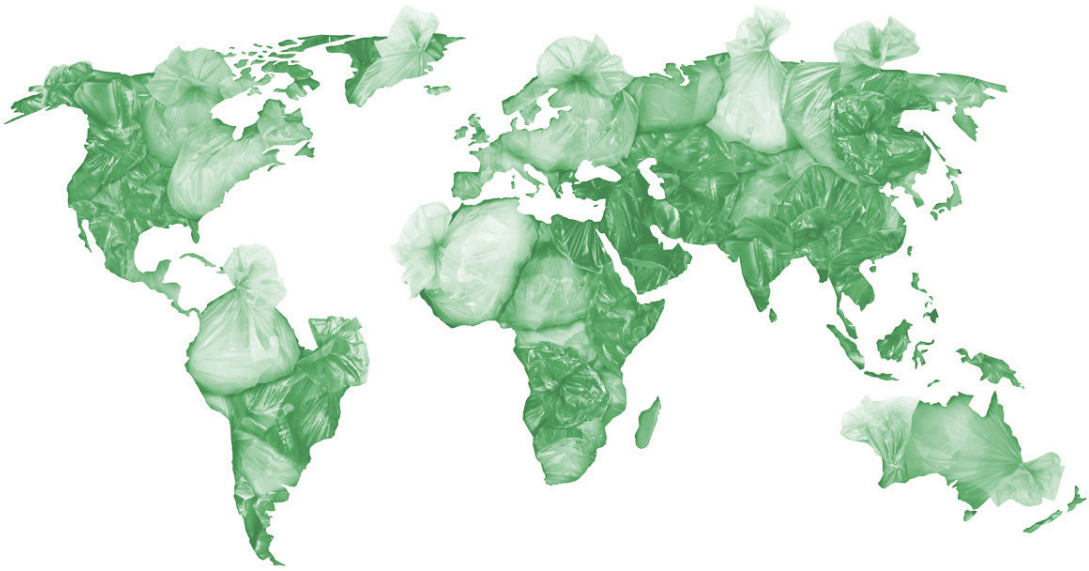
Following the validation of DNA/RNA Shield™ for preserving viral nucleic acids, demand surged. The reagent was subsequently distributed across the region, proving invaluable in supporting field responses to disease outbreaks and enabling sample collection in areas with scarce medical resources.

Building on its success in extreme environments, Zymo Research's DNA/RNA Shield™ Swab Collection Device garnered recognition from NASA's Human Research Program for its pivotal role in preserving DNA and RNA samples aboard the International Space Station. This technology, which had safeguarded genetic materials in the harshest terrestrial conditions, further demonstrated its versatility by ensuring sample integrity in the challenging environment of outer space.

Tech Tip

Protect the Planet and Your Samples!

Cold-chain logistics have long been the convention for sending biological samples from lab to lab and service providers, and now the planet is paying the price as unprecedented amounts of Styrofoam fill landfills. DNA/RNA Shield™ can help labs, service providers and organizations transition away from Styrofoam and dry ice in sample transportation, in addition to saving shipping and electricity costs.



- By reducing the need for Styrofoam and dry ice, DNA/RNA Shield™ can save an average of $50,000 a year or per 500 projects.
- Per 500 projects, about 500 Styrofoam boxes can be saved. Stacked together, this measures about 354.167 feet tall - approximately the height of the Statue of Liberty.
- Without the need for short-term refrigeration, DNA/RNA Shield™ is able to save over 3.83MWh per freezer per year. This equals approximately $425 in savings per freezer each year.
- 99,657 gallons of water per freezer per year can be saved by using DNA/RNA Shield™, without the need of cold storage. This does not include the hundreds of thousands of gallons needed to manufacture Styrofoam and dry ice.
- Just one freezer can emit 3.6 metric tons of CO each year. DNA/RNA Shield™ can significantly help labs and service providers reduce their carbon footprint.

Dr. Jia, CEO & Founder of Zymo Research, shares our vision:

> "Zymo Research is engineering sustainable solutions in the biomedical and biotechnology world. We are committed to making fundamental changes to eliminate cold-chain logistics for biological sample transportations globally, one of the most environmentally contaminating practices in the industry.
>
> Through scientific innovation, we aim to reduce environmental waste and create a more sustainable future."

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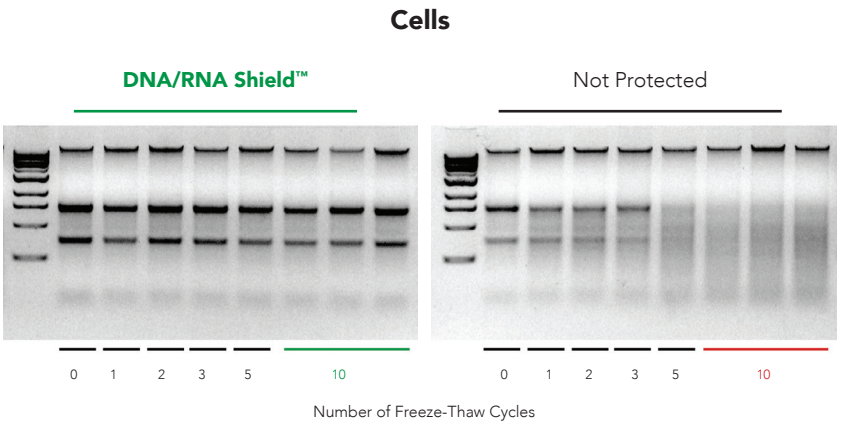
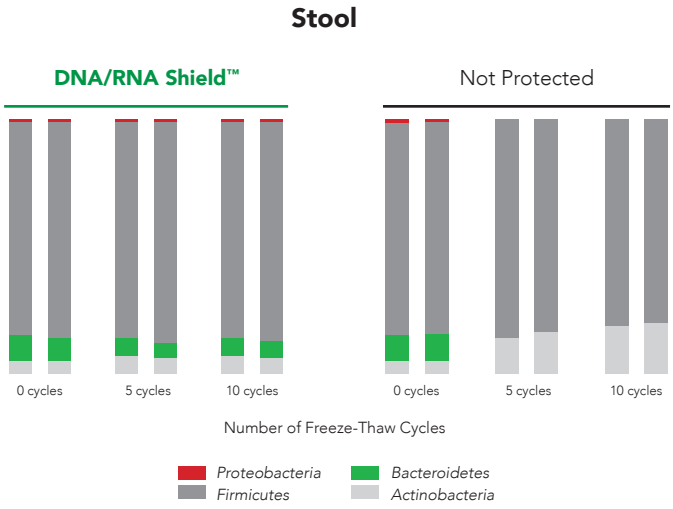
Tech Tip

Protect Samples from Freeze-Thaw Degradation

Today's most common practice for storing biological specimen, whether it be short or long-term, is the use of freezers. Unfortunately, freezers are not impervious to failing for a number of reasons - more notably mechanical failure and power outages. DNA/RNA Shield™ provides peace of mind to scientists, as it preserves the genetic integrity even under stressful freeze-thaw cycles, ensuring that precious samples will not be lost due to such events.



High quality RNA from cells stored in DNA/RNA Shield™ after up to 10 freeze-thaw cycles. In unprotected samples, RNA integrity begins to decline after just one freeze-thaw cycle.



High-quality DNA from stool stored in DNA/RNA Shield™ after up to 10 freeze-thaw cycles. Microbial composition profiling via 16S rRNA gene targeted sequencing.

DID YOU KNOW?

One of the world's largest repositories of autism brain samples suffered a freezer failure in its tissue bank, losing a third of its samples. Researchers reported at the time that the priceless collection took over 14 years to collect and could set autism research back by a decade.

DNA/RNA Shield™ Fecal Collection Tube

Highlights:
- Protect DNA and RNA in stool samples without cold chain.
- Pathogen inactivation (bacteria, virus, eukaryotic).
- Compatible with Next-Gen Sequencing - metagenomic and metatranscriptomic analysis.

Description:
Store and inactivate fecal samples with the DNA/RNA Shield™ Fecal Collection Tube, which includes a scoop attached to its screwcap for easy collection of fecal samples.

Applications:
- Microbiomic analysis
- Gene expression analysis
- miRNA analysis
- Pathogen detection

DNA/RNA Shield™ Fecal Collection Kit

Highlights:
- Preservation of samples with DNA/RNA Shield™.
- Complete solution that is conveniently pouched.
- Designed for at-home sample collection.

Biohazard Bag


Gloves


DNA/RNA Shield Fecal Collection Tube


Feces Catcher

Description:
The Individual Fecal Collection Kit is a conveniently pouched kit that includes all the components needed for collecting and stabilizing fecal samples.

Applications:
- Microbiomic analysis
- Gene expression analysis
- miRNA analysis
- Pathogen detection

Product	Cat. No.	Size	Specifications	Uses
DNA/RNA Shield™ Fecal Collection Tube (SK)	R1101 R1101-E* R1137 R1137-E*	10 pack 10 pack (with beads)	• The tube is equipped with a spoon attached to its screwcap for convenient sample collection • The tube can collect up to 1 g or 1 ml of fecal specimen	Spoon based fecal sample collection
DNA/RNA Shield™ Fecal Collection Kit (SK)	R1180	1 collection kit	• This kit includes a fecal collection tube, a feces catcher, a biohazard bag, gloves, and multi-language instructions.	Scoop based fecal sample collection

SK - Sample Kit Available *CE IVD

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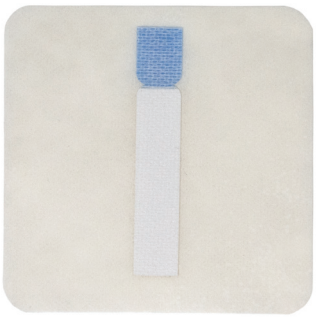
Bunny Wipe™ Fecal Sample Collector

Highlights:

- Convenient, simple method for at-home fecal sample collection.
- Completely water soluble. Simply flush the wipe along with standard toilet paper.
- Coupled with DNA/RNA Shield™ technology, the nucleic acid in samples collected with the Bunny Wipe™ are stable during transport and pathogens are inactivated.



Description:

A mess-free method for the convenient collection of fecal material for downstream nucleic acid analysis. The Bunny Wipe™ mimics toilet-paper for a more familiar and comfortable collection process, replacing the need for some of the traditional, more cumbersome methods of fecal collection (collection buckets, cups, scoops, etc.). By eliminating some of the mess and discomfort of traditional fecal collection, the Bunny Wipe™ is perfect for applications where the user experience is especially important.

Applications:

- Microbiomic analysis
- Gene expression analysis
- miRNA analysis
- Pathogen detection

DNA/RNA Shield™ Collection Tube with Swab

Description:

A general swab collection system that allows for the collection of samples including mouth, nose, throat, etc. The swab is collected into a tube prefilled with DNA/RNA Shield™, which effectively inactivates viral, bacterial, and other pathogens. Samples stored in DNA/RNA Shield™ are ready for downstream purification and any nucleic acid-based analysis.

Applications:

- Environmental sample collection
- Pathogen inactivation and detection

Product	Cat. No.	Size	Specifications	Uses
Bunny Wipe™ Fecal Sample Collector SK	R1133-1 R1133-10 R1138	1 wipe 10 wipes 10 wipes + 10 tubes	• 102 x 102 mm flushable wipe • DNA/RNA Shield™ tube to stabilize and inactivate the sample	Wipe based fecal sample collection
DNA/RNA Shield™ - Collection Tube w/ Swab SK	R1106 R1107 R1107-E* R1108 R1109 R1109-E*	10 pack (1 ml fill) 50 pack (1 ml fill) 50 pack (1 ml fill) 10 pack (2 ml fill) 50 pack (2 ml fill) 50 pack (2 ml fill)	• Contains a sterile nylon swab with 80 mm breakpoint • Prefilled with DNA/RNA Shield™ (1 or 2 ml) • Ideal for the general collection of swab samples (i.e., nose, mouth, throat) • 12x80mm screw cap tube	General swab collection of samples (mouth, nose, throat, surfaces, etc.)

SK - Sample Kit Available *CE IVD

DNA/RNA Shield™ SafeCollect™ Collection Kits

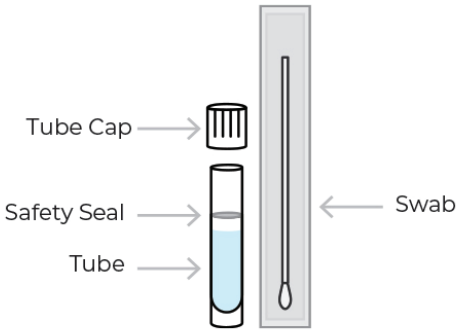
Highlights:

- User-friendly, spill-free design allows for safe, convenient collection of samples. Ideal for at-home self-collection applications.
- DNA/RNA Shield™ completely inactivates harmful pathogens at the point of collection, for worry-free transport and downstream analysis.
- Automation-ready for high-throughput sample processing.

Description:

The patented SafeCollect™ tube features a safety seal that prevents users from spilling, ingesting, or being exposed to the stabilization solution. The unique safety seal is punctured with the Safe Puncture Cap or swab after adding a sample to the tube to release the stabilization solution.

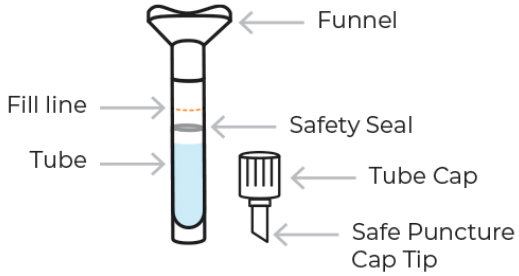
DNA/RNA Shield™ SafeCollect™ Swab Collection Kit



Applications:

- Microbiomic analysis
- Gene expression analysis
- miRNA analysis
- Pathogen detection

DNA/RNA Shield™ SafeCollect™ Saliva Collection Kit



Applications:

- Microbiomic analysis
- Gene expression analysis
- miRNA analysis
- Pathogen detection

Product	Cat. No.	Size	Specifications	Uses
DNA/RNA Shield™ SafeCollect™ Swab Collection Kit, 1 mL (SK)	R1160 R1160-E*	1 collection kit	• Prefilled 15 x 92mm collection tube with DNA/RNA Shield™ (1 or 2ml) • Contains an 80mm breakpoint flocked swab.	General swab collection of samples (mouth, nose, throat, surfaces, etc.)
DNA/RNA Shield™ SafeCollect™ Swab Collection Kit, 2 mL (SK)	R1161 R1161-E*	1 collection kit		
DNA/RNA Shield™ SafeCollect™ Saliva Collection Kit (SK)	R1211 R1211-E*	1 collection kit	• Prefilled 15 x 92mm collection tube, equipped with funnel • Contains 19 x 15mm Safe Puncture Cap to pierce the safety foil to release DNA/RNA Shield™ • Prefilled with 2 ml of 2X concentrate of DNA/ RNA Shield™	Saliva/sputum samples

SK - Sample Kit Available *CE IVD

DNA/RNA Shield™ Blood Collection Tube

Description:

Conveniently collect whole blood directly into DNA/RNA Shield™ blood vacuum tubes. Each evacuated tube instantly inactivates any harmful/ pathogenic organisms and stabilizes the nucleic acid for prolonged periods at ambient temperature. Blood tubes are compatible with most blood collection sets designed for venipuncture (i.e., winged/butterfly needle).

Applications:

- Gene expression analysis
- miRNA analysis
- Bloodbourne pathogen detection

Product	Cat No.	Size	Specifications	Uses
DNA/RNA Shield™ Blood Collection Tube SK	R1150	50 pack	• A sterile evacuated blood collection tube ((16 x 100 mm) that is prefilled with 6 ml DNA/RNA Shield™ • The blood draw volume of the tube is 3 ml	Whole blood collection

SK - Sample Kit Available

DNA/RNA Shield™ Lysis Tube (Microbe)

Description:
Collect and inactivate samples in lysis tubes prefilled with DNA/RNA Shield™. Each tube is also filled with ultra-high density BashingBeads™, specifically designed for optimal microbial lysis. Samples collected are ready for any sensitive downstream analysis.

Applications:
- Microbiomic analysis
- Gene expression analysis
- miRNA analysis
- Pathogen detection

DNA/RNA Shield™ - Lysis Tube (Tissue)

Description:
Collect and inactivate samples in lysis tubes prefilled with DNA/RNA Shield™. Each tube is also filled with ultra-high density BashingBeads™, specifically designed for optimal tissue lysis. Samples collected are ready for any sensitive downstream analysis.

Product	Cat. No.	Size	Specifications	Uses
DNA/RNA Shield™ Lysis Tube (Microbe) SK	R1103 R1103-E* R1104 R1104-E*	50 pack	• A 2 ml tube prefilled with 1 ml of DNA/RNA Shield™ • Contains 0.5 mm & 0.1 mm ultra-high density BashingBeads™ for homogenization • Each lysis tube can be paired with a sterile swab for initial sample handling.	Collection and storage of tough-to-lyse microbes from feces, saliva, soil, etc.
DNA/RNA Shield™ Lysis Tube (Tissue) SK	R1105 R1105-E*	50 pack	• A 2 ml tube prefilled with 1 ml of DNA/RNA Shield™ • Contains 2.0 mm ultra-high density BashingBeads™ for homogenization	Collection of tissue, whole insects, and tough-to-lyse pathogens
DNA/RNA Shield™ Collection Tube SK	R1102 R1102-E*	50 pack	• A 2 ml tube prefilled with 1 ml of DNA/RNA Shield™	Collection of solid tissues, and biological liquids

SK - Sample Kit Available *CE IVD

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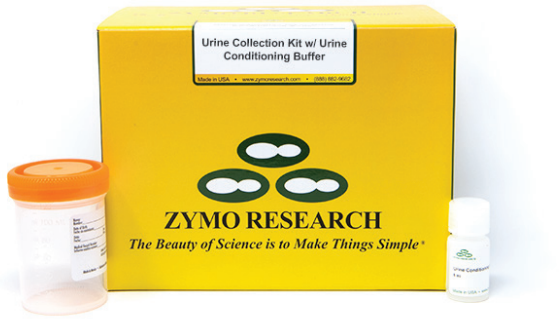
Urine Collection Kit

Highlights:

- Effectively preserves DNA and RNA in urine at ambient temperatures
- Facilitates pelleting of urine nucleic acids from large volume urine samples for nucleic acids purification
- Microbial inactivation



Description:
Urine Collection Kit w/ Urine Conditioning Buffer (UCB™) ensures nucleic acid stability in urine during sample storage/transport at ambient temperatures.

DNA/RNA Shield™ DirectDetect™ Swab Collection Tube

Highlights:

- Eliminates the need for RNA (or DNA) extraction, allowing or rapid, direct, cost-effective analysis of samples
- No inhibition of real-time PCR
- Reduces sample viscosity to minimize pipetting errors with automated liquid handlers

Description:
DNA/RNA Shield™ DirectDetect™ Swab Collection Tube is a kit that allows users to go from sample collection directly to PCR. The kit includes a sterile collection swab and a prefilled tube with DNA/RNA Shield™ DirectDetect™, which safeguards viral genomes (nucleic acids) from degradation and provides ambient temperature collection and transportation of samples without the need for nucleic acid extraction.

Applications:

- RT-PCR
- Covid-19 Testing
- Pathogen Detection

Product	Cat No.	Size	Specifications	Uses
Urine Collection Kit	D3062	10 pack	• Kit contains Urine Collection Cup and a vial of Urine Conditioning Buffer	Urine collection
DNA/RNA Shield Direct Detect™ Swab Collection Tube	R1401-1 R1401-1-E*	1 collection kit	• Contains a sterile nylon swab with 80mm breakpoint • 12 x 80 mm screwcap tube prefilled with DNA/RNA Shield™ DirectDetect™ reagent	Saliva, oral, and nasal samples

*CE IVD

Feces Catcher

Description:

Feces Catcher is a strip of paper that fits onto any toilet seat. It allows for an easy method to collect fecal samples for further testing. The Feces Catcher is a great addition to DNA/RNA Shield™ Fecal Collection Tubes, Swab tubes, and Lysis tubes.

Applications:

- Easy and hygienic collection of human fecal samples
- Small, light-weight, and flushable
- Lower cost compared to standard methods

ColOff® (Stool Collection Device)

Description:

The ColOff® device, a stool collection facilitator device, is a plastic sleeve for the toilet seat used for diagnostic tests which use stool as the sample source. ColOff® is a disposable device that facilitates the stool collection in a physiological position (sitting on the toilet seat).

Applications:

- Microbiomic analysis
- Gene expression analysis
- miRNA analysis
- Pathogen detection

Product	Cat. No.	Size	Specifications	Uses
Feces Catcher	R1101-1-10	10 pack	• Adhesive is pressure sensitive and has good staying-power but is easy to remove after sample collection. • After flushing, paper will dissolve completely. • Biodegradable.	Accessories for fecal sample collection
ColOff® (Stool Collection Device)	R1101-2-5	5 pack	• Oxo-Biodegradable Plastic Film (HDPE). Inert and Non-toxic. • Gamma irradiation. Sterile unless opened or damaged	

Sterile Collection Swab

Description:
Our sterile fiber swabs are individually packaged and can be used in the field where appropriate per application for specimen collection.

Applications:
- Used in a variety of environments and specimen collection applications such as medical, forensics, genetics, microbiology, preanalytical, diagnostics.

Urine Collection Cup

Description:
Plastic urine collection cup for use in research labs.

Applications:
- Suited for the collection of bodily fluids for everyday clinical, industrial, and research sample handling and transportation.

Product	Cat No.	Size	Specifications	Uses
Sterile Collection Swab	C1052-50 C1053-50	50 pack (20 mm) 50 pack (80 mm)	• Fiber swabs are especially popular for specimen collection in the field and available in 20 mm and 80 mm break points. • Sold in 50 packs, sterile and individually wrapped. For swabs with transportation reagent, see DNA/RNA Shield™ Collection Tube w/ Swab.	General swab collection of samples (mouth, nose, throat, surfaces, etc.)
Urine Collection Cup	D3062-1	10 pack	• Features wide mouth design for ease of sample collection and management	For collecting urine specimens

DNA/RNA Shield™ Reagent

Highlights:

- Nucleic acid preservation (at ambient temperature; cold-free)
- Pathogen inactivation (bacteria, fungi, parasites & viruses)
- Streamlined purification (no reagent removal, universally compatible, automatable)

Description:

DNA/RNA Shield™ ensures nucleic acid stability during sample storage/transport at ambient temperatures. There is no need for refrigeration or specialized equipment. DNA/RNA Shield™ effectively lyses cells, inactivates nucleases and infectious agents (bacteria, fungi, parasites, and viruses), and is compatible with various collection and storage devices (vacutainers, swabs, nasal, buccal, fecal, etc.).

Applications:

- Microbiomic analysis
- Gene expression analysis
- miRNA analysis
- Pathogen detection

DNA/RNA Shield™ DirectDetect™

Description:

DNA/RNA Shield™ DirectDetect™ is a reagent that allows users to go from sample collection directly to PCR. DNA/RNA Shield™ DirectDetect™ safeguards viral genomes (nucleic acids) from degradation and provides ambient temperature collection and transportation of samples without the need for nucleic acid extraction.

Applications:

- RT-PCR
- COVID-19 Testing

Product	Cat No.	Size	Specifications	Uses
DNA/RNA Shield™ SK	R1100-50 R1100-250	50 ml 250 ml	Bottle pre-filled with bulk reagent	Collection and preservation for any biological sample
DNA/RNA Shield™ (2X concentrate)	R1200-25 R1200-125	25 ml 125 ml	Bottle pre-filled with bulk reagent	
DNA/RNA Shield™ DirectDetect™	R1400 R1400-E*	bulk	Bottle pre-filled with bulk reagent	Collection and preservation for direct to PCR analysis

SK - Sample Kit Available *CE IVD

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Wastewater Stabilization Buffer™

Highlights:

- Stabilizes DNA and RNA in water samples, including raw wastewater, at ambient temperatures.
- Enables the pelleting of both cellular and cell-free nucleic acids to concentrate high-volume water samples.
- Pathogen inactivation for safe handling and transport.

Description:

Wastewater Stabilization Buffer facilitates pelleting of viruses, microbes, and free nucleic acid for concentration eliminating the need for vacuum filtration. This buffer also enables pathogen inactivation when added to water samples and preserves DNA/RNA integrity.

Urine Conditioning Buffer™ (UCB™)

Highlights:

- Effectively preserves DNA and RNA in urine at ambient temperatures.
- Inhibits microbial growth during long term storage of urine samples.
- Facilitates pelleting of both cellular and cell-free nucleic acids from large volume urine sample.

Description:

Urine Conditioning Buffer™ (UCB™) ensures nucleic acid stability in urine during sample storage/transport at ambient temperatures. There is no need for refrigeration or specialized equipment. UCB™ can be added to any urine collection device.

Urine Conditioning Buffer™ Plus (UCB+™)

Highlights:

- Effectively preserves DNA and RNA in urine at ambient temperatures.
- Concentration of both cellular and cell-free nucleic acids of large urine volumes through pelleting.
- Inhibits growth of pathogenic bacteria and fungi.

Description:

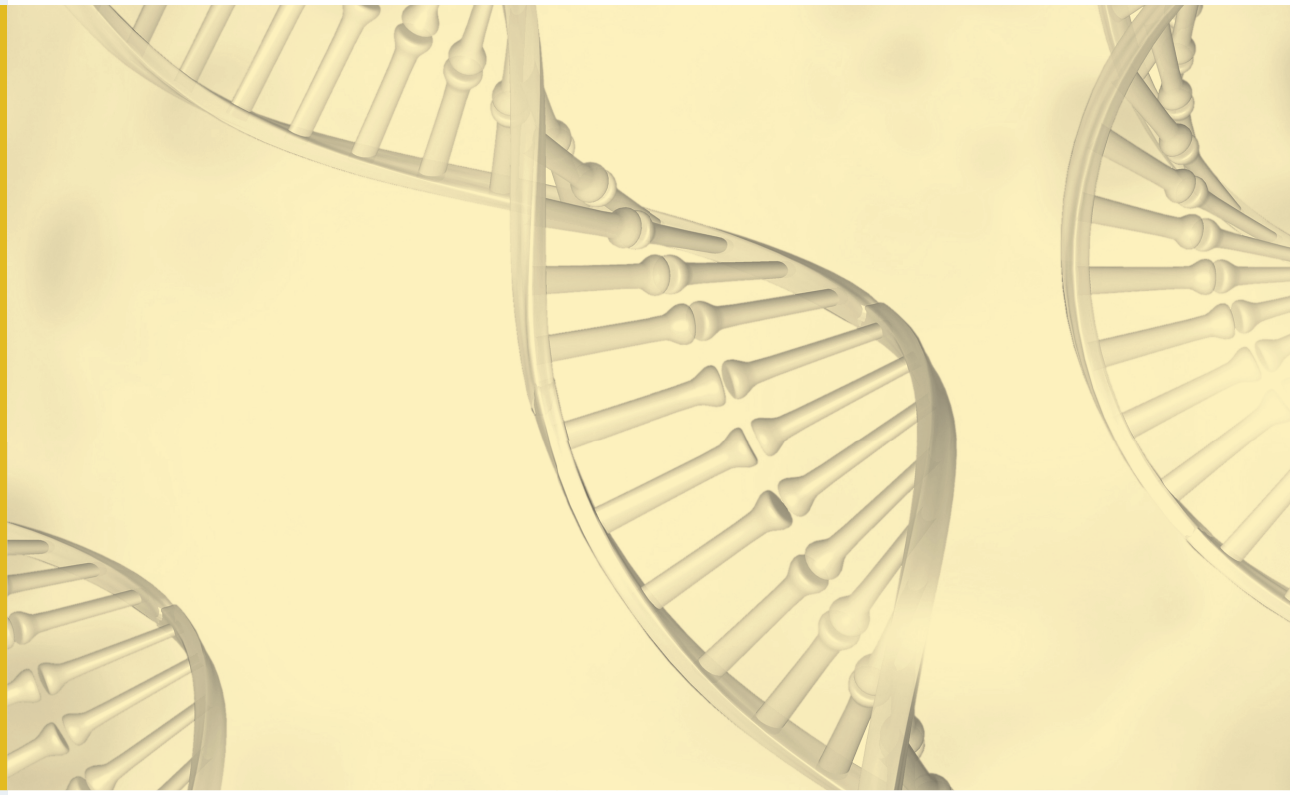
Urine Conditioning Buffer Plus™ (UCB+™) ensures DNA and RNA stability in urine at time of collection, storage, and transport at ambient temperatures. Refrigeration is not needed nor is special equipment required. UCB+™ can be filled into any urine collection device.

Product	Cat. No.	Size	Specifications	Uses
Wastewater Stabilization Buffer™	R1501-140	140 ml	Bottles prefilled with bulk reagent	Water collection and preservation
Urine Conditioning Buffer™ (UCB™) SK	D3061-1-8 D3061-1-140	8 ml 140 ml	Bottles prefilled with bulk reagent	Urine collection and preservation
Urine Conditioning Buffer™ Plus (UCB+™) SK	R1502-8 R1502-140	8 ml 140 ml	Bottles prefilled with bulk reagent	

SK - Sample Kit Available

DNA Purification

02



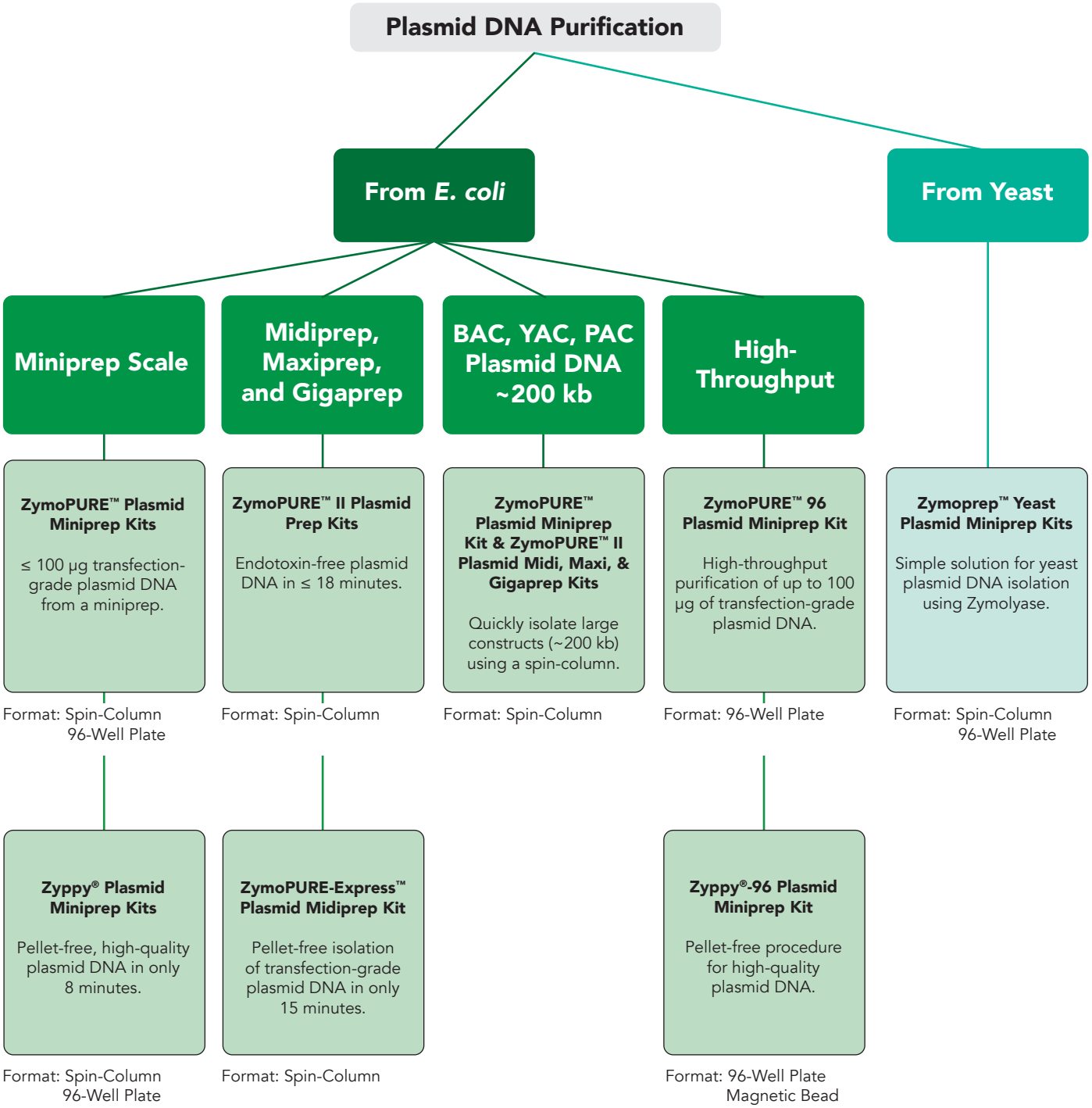
The fidelity of the method used for the purification of DNA from biological samples and from reaction mixtures is of critical importance when considering the success of subsequent downstream molecular applications. Though sometimes overlooked, DNA purification is of critical importance when considering the success of downstream molecular applications.

Samples can be challenging to process, due to a variety of factors: small sample size, contaminants, degradation, and sample source (i.e. tough-to-lyse or Gram-positive). Extraction methods must also protect DNA from degradation, especially when storing/transporting precious samples. Inadequate preservation can lead to suboptimal analysis. Contaminants require removal to prevent interference with downstream applications. These can include proteins, RNA, chemicals and compounds from the source material which can convolute procedures through nonspecific interactions with the DNA substrate and/or method used for analysis.

High-quality DNA is crucial for most molecular-based applications including: PCR, DNA sequencing, microarrays, cloning, southern blotting, etc. The scientists at Zymo Research have developed a range of DNA purification kits designed for the simple and rapid recovery of high-yield, inhibitor-free DNA from diverse sample sources

DNA Purification Made Simple®

Quick Product Guide



Plasmid DNA Isolation

Innovation. Pure & Simple.™

Plasmid DNA purification has existed for nearly a half-century. Yet, it has remained unwieldy, requiring time-consuming gravity filtration, centrifugation steps, and isopropanol precipitation.

Zymo Research is making history with our plasmid DNA isolation technologies. The rapid, streamlined purification results in ultrapure plasmid at superior speeds and the unique colored buffers allow for visualization of complete bacterial lysis and neutralization.

The ZymoPURE™ plasmid kits feature state-of-the-art technology for simple and robust purification. Streamlined methodology avoids time-consuming steps and enables highly concentrated transfection-grade plasmid DNA to be eluted directly from a microcentrifuge column in minutes.

Imagine recovering plasmid DNA without the need for cell pelleting using large-scale centrifugation. The ZymoPURE-Express™ Midiprep Kit allows for direct lysis and the omission of pelleting and re-suspension steps that are common to all other conventional procedures. Plasmid DNA can then be isolated in minutes with our unique Zymo-Spin™ columns.

Does your workflow involve highly sensitive applications, which requires ultra-pure plasmid DNA? The ZymoPURE™ II Plasmid Kits enable you to easily isolate plasmid DNA with endotoxin levels ≤ 0.025 EU/µg in less than 18 minutes. The kits incorporate the novel EndoZero™ Spin Column to reduce endotoxin levels of plasmid DNA without lengthy incubations, gravity flow anion-exchange columns, expensive chromatography columns, or time-consuming centrifugation steps. The result is plasmid DNA ideal for transfection, recombinant virus production, genome editing, *in vivo* studies, sequencing, restriction endonuclease digestion, *in vitro* transcription/translation, PCR, transformation, and other sensitive applications.

Simplify your workflow with Zyppy® technology, which drives the fastest molecular biology grade miniprep kits available. It features a pellet-free alkaline lysis procedure which bypasses bacterial culture centrifugation. The Zyppy® 96 Miniprep Kits enable culturing, lysis, and neutralization using the same plate. These kits feature the fastest and simplest high-throughput and automated procedures for purifying high-quality plasmid DNA.

Growing *E. coli* for Plasmid Purification

The amount of plasmid DNA that you obtain from your plasmid prep is highly dependent on the number of plasmid containing *E. coli* cells that you process. Therefore, optimal culture growth is critical in maximizing the quantity of plasmid DNA that is achieved from the prep. Below are several important recommendations to keep in mind when growing *E. coli* cultures for plasmid purification.

First, always inoculate your growth medium with a single colony on a plate. This ensures that your culture is derived from the same genotype and is not a mix of different colonies which may not have the same characteristics. If you are using a bacterial stock, such as a glycerol stock or bacterial stab, streak the bacteria onto a Luria Broth (LB) Agar plate containing the appropriate antibiotic and let it grow overnight at 37 °C to isolate single colonies.

Second, it is imperative that the correct amount of antibiotic is present in your culture (Table 1), otherwise the lack of selective pressure will cause your culture to start to dilute out the plasmid during cell division. Also, add the antibiotic to the growth medium immediately before inoculating with *E. coli* to ensure the antibiotic is performing optimally when growing the cells.

Antibiotic	Stock Concentration	Working Concentration for *E. coli*
Ampicillin	100 mg/ml	20-100 µg/ml
Chloramphenicol	10 mg/ml	20 µg/ml
Kanamycin	35 mg/ml	30 µg/ml
Tetracycline	10 mg/ml	10-20 µg/ml

Table 1. Recommended stock and working concentrations for several commonly used antibiotics.

Tech Tip (continued)

Growing *E. coli* for Plasmid Purification

Third, although *E. coli* is a facultative anaerobic organism, they grow much faster if oxygen is present. Therefore, choosing a flask that allows for proper aeration of the culture is key for optimal growth. Ideally, a flask with a maximum volume that is at least 5 times larger than the culture volume (Example: Use a 250 ml flask for 50 ml of culture) should be used to grow the *E. coli*. In addition, for the best aeration, use baffled culture flasks and a vented or gas-permeable seal on the culture vessel and shake at 200 – 300 rpm.

Fourth, the *E. coli* cells should be harvested after they have reached the stationary phase. Bacterial growth in liquid culture occurs in three phases, the lag phase, the log phase and the stationary phase.

The lag phase is a short period in which the bacteria acclimate to the media and begin dividing. Next, during the logarithmic or log phase, the bacteria grow exponentially. Finally, during stationary phase growth plateaus due to a lack of nutrients. However, plasmids will typically still be replicating during the early part of the stationary phase. Therefore, you want to collect the cells after about 12–16 hours of growth so you can maximize the number of *E. coli* cells and the amount of plasmid DNA that each cell contains.

Next, for overnight culture volumes greater than 10 ml, it's recommended to use a starter culture for optimal growth. This is accomplished by inoculating 10 ml or less of LB with the appropriate antibiotic using a colony on a plate and shaking at 37°C for 8 hours. After 8 hours, prepare the larger overnight culture by diluting the starter culture 1:500 to 1:1000 with LB containing the appropriate antibiotic.

Lastly, different culture medias have different effects on bacterial growth. For example, rich media, such as Terrific Broth or YT Broth have additional nutrients that promote higher levels of cell growth, which can be used to increase plasmid yield. However, it is important to consider the maximum number of cells your particular plasmid purification process can handle because exceeding the protocol's limits can result in decreased yields and low-quality plasmid DNA.

Making Plasmid Purification Pretty and Practical

Have you ever noticed that many plasmid purification kits come with buffers that look remarkably similar? While working in the lab, the daughter of Zymo Research's founder faced a challenge: distinguishing between multiple bottles of clear, identical-looking liquids in these kits. This similarity posed a risk of mistakenly identifying buffer bottles, potentially resulting in errors in purification protocols.

Such errors not only consumed valuable time and samples but also created tense moments in the lab and at home, requiring the repetition of extraction procedures. Recognizing this issue, she envisioned a solution to distinctly differentiate these buffers.

Following creative brainstorming and dedicated efforts from Zymo Research scientists, the patented colored buffer system was born. This innovative color system not only simplifies the identification of buffers but also has important scientific applications.

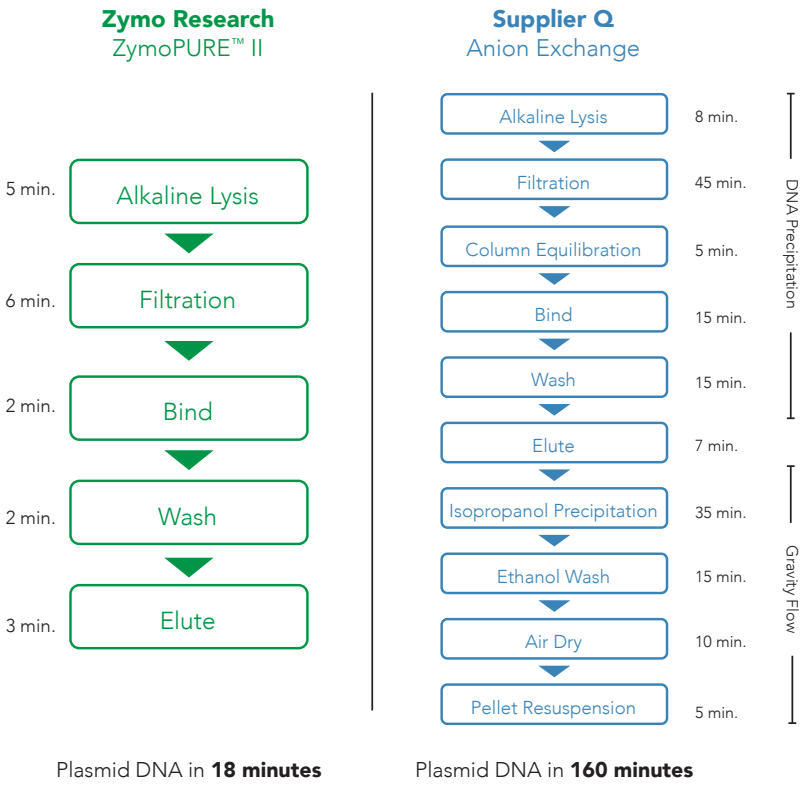
The distinct colored buffer technology facilitates clear visualization during lysis and neutralization processes. Its integration into Zymo Research's plasmid purification kits ensures superior recovery and increased purity of the isolated plasmid DNA. This high-quality DNA is essential for various sensitive downstream applications, including sequencing, transfections, genome editing, gene therapy research, vaccine development, microinjections, *in vitro* transcription, and PCR.

Without addressing the challenge of similar-looking buffer bottles, researchers might have continued mixing them up, resulting in obtaining low-quality or even no plasmid DNA. Fortunately, the Zymo Research colored buffer system presents a colorful improvement to traditional plasmid purification techniques.

Technology Overview: ZymoPURE™

Empower your research with ZymoPURE™ plasmid DNA purification kits. Streamlined methodology and superior technology enables unrivaled speed and performance. At the core of the ZymoPURE™ technology is a novel binding chemistry and membrane that redefines plasmid purity, reduces processing time by 9-fold, and enables > 3 mg of transfection-grade plasmid DNA to be eluted directly from a microcentrifuge column.

Endotoxin-Free Plasmid DNA in 5 Easy Steps



Plasmid DNA in **18 minutes**

Plasmid DNA in **160 minutes**

Highly Rated

95% of researchers consider ZymoPURE™ easy to use

88% of researchers were satisfied with the overall performance

85% of researchers would recommend ZymoPURE™ to a colleague

based on feedback from 687 researchers

ZymoPURE™ II Plasmid Purification Kits

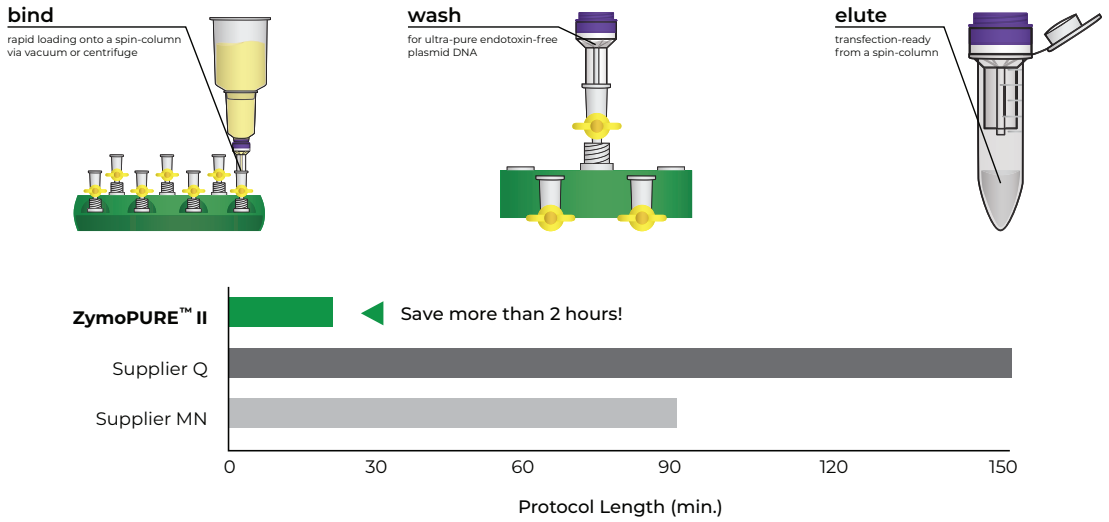
Highlights:

- **Fastest:** Simple 16 minute Midi/Maxi preps.
- **Highest Yield:** Up to 25 mg from a spin-column.
- **Ultra-Pure:** Endotoxin-Free and Transfection-Ready.

Description:

The ZymoPURE™ II Plasmid purification kits provide the fastest and simplest method available to efficiently isolate up to 25 mg of transfection-grade plasmid DNA from *E. coli*. Utilizing a modified alkaline lysis in conjunction with our patented binding chemistry, the ZymoPURE™ II Midi and Maxiprep kit protocols can be carried out in less than 18 minutes. These remarkable kits result in significantly more plasmid DNA while providing drastically reduced processing times. The plasmid DNA is rapidly bound onto a column with either a vacuum or a centrifuge instead of a lengthy gravity flow column. Additionally, there is no ethanol precipitation step required and the elution is performed using a microcentrifuge. The recovered plasmid DNA is highly concentrated (up to 6 mg/ml) and endotoxin-free. As an added convenience, the ZymoPURE™ II Plasmid purification kits contain colored buffers that permit error-free visualization and identification of complete bacterial cell lysis and neutralization.

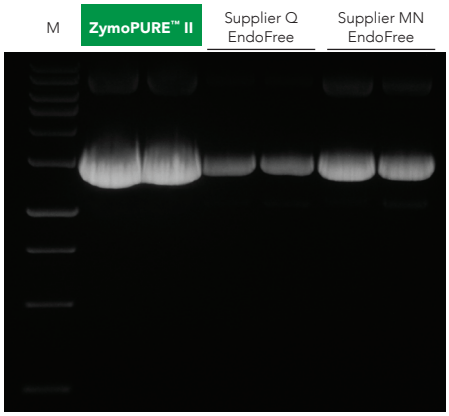
Perform Transfection-Ready Midi & Maxi Preps in Only 16 Minutes

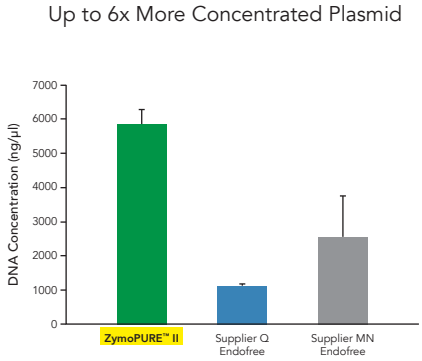


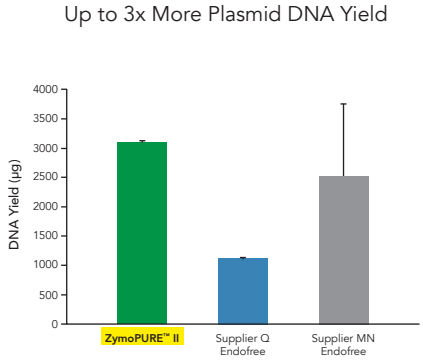
www.zymoresearch.com | info@zymoresearch.com | tel: 1-(949) 679-1190 | toll-free: 1-(888) 882-9682 | fax: 1-(949) 266-9452

ZymoPURE™ II Plasmid Purification Kits

Consistent Highly Concentrated Transfection-Grade Plasmid

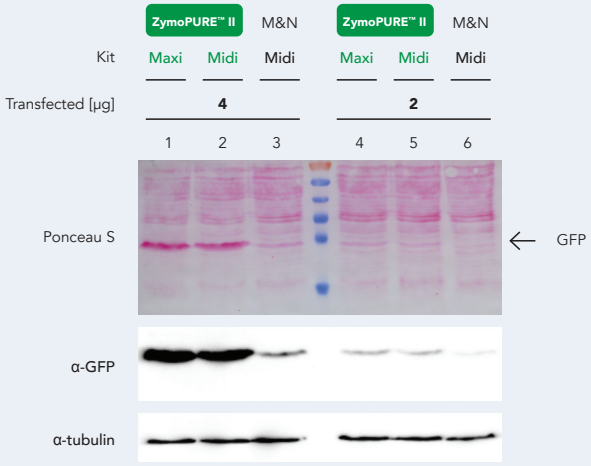






Yield and concentration for plasmid DNA isolated using the ZymoPURE™ II Maxiprep kit compared to two endotoxin-free kits from Supplier Q and Supplier MN. Plasmid DNA (pGL3®) was isolated from 150 ml of JM109 *E. coli* culture grown overnight following the manufacturer's suggested protocol (in duplicate). One (1) µl of eluted plasmid DNA was visualized post agarose gel electrophoresis. M, ZR 1 kb DNA Marker (Zymo Research).

Dependable Purification of Transfection-Grade Plasmid



Plasmid DNA prepared with ZymoPURE™ Kits exhibit superior transfection efficiency. HeLa Cells seeded in a 6-well plate were transfected with either 2 or 4 µg of pCI-neo®+GFP plasmid isolated from 100 ml of bacteria culture using the ZymoPURE™ Midiprep Kit, ZymoPURE™ Maxiprep Kit, or MN Midiprep Kit. GFP expression was assessed 48 hours later in cell lysates using western blot and Ponceau S staining. The blot was also probed with an antibody against alpha-Tubulin in order to verify equal loading samples. Data generated by V.B. at University of Cologne.

Product	Cat. No.	Size	Processing Time	Culture Input	Minimum Elution Volume	Maximum Plasmid Yield	Endotoxins
ZymoPURE™ II Plasmid Midiprep Kit SK	D4200 D4201	25 preps 50 preps	≤ 18 minutes	50 ml	≥ 150 µl	1.2 mg	≤ 0.025 EU/µg
ZymoPURE™ II Plasmid Maxiprep Kit SK	D4202 D4203	10 preps 20 preps	≤ 18 minutes	150 ml	≥ 300 µl	3.0 mg	≤ 0.025 EU/µg
ZymoPURE™ II Plasmid Gigaprep Kit	D4204	5 preps	≤ 45 minutes	2.5 L	≥ 3 ml	25 mg	≤ 0.025 EU/µg

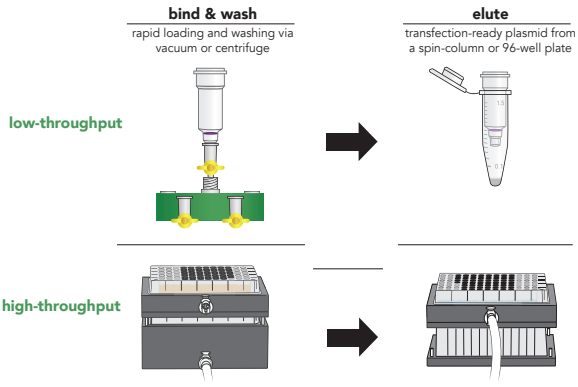
SK - Sample Kit Available

ZymoPURE™ Plasmid Miniprep Kit

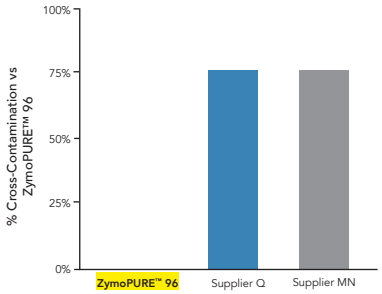
Highlights:

- **Convenient Formats:** Available in Spin-Column or 96-Well Plate
- **Highest Yield:** Up to 100 µg of Highly Concentrated Plasmid DNA
- **Transfection-Ready:** Low Endotoxins and Ultra-Pure

Conveniently Available in Spin-Column and 96-Well Plate Formats

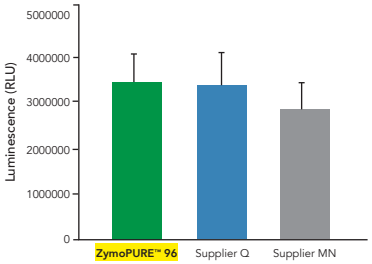


The ZymoPURE™ Miniprep is conveniently available in a spin-column or 96-well plate format that allows for the purification of transfection-ready plasmid DNA using a vacuum manifold or centrifuge.



Novel 96-Well Wash Plate Significantly Reduces Cross-Contamination

Percent cross-contamination of two popular 96 vacuum plate kits from Supplier Q and Supplier MN compared to ZymoPURE™ 96 Plasmid Miniprep kit. Plasmid DNA (pGL3®) was isolated from 1 ml of JM109 *E. coli* culture grown overnight following the manufacturer's suggested protocol (in replicates). Unused wells adjacent to sample processed wells were eluted and quantified for the presence of pGL3® plasmid DNA through qPCR. The number of cross-contaminated unused wells was compared between kits.

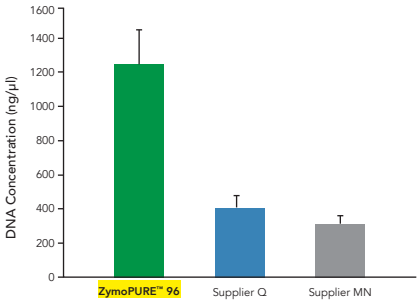


Eluted Plasmid DNA is Transfection-Ready

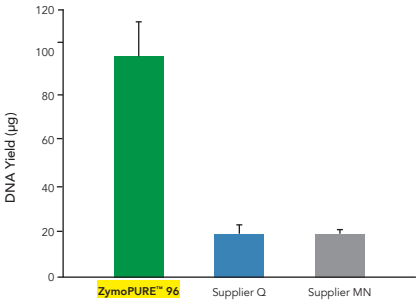
Transfection efficiency of plasmid prepared using ZymoPURE™ chemistry compared to two popular endotoxin-free kits from Supplier Q and Supplier MN. HeLa cells seeded in a 96-well plate were transfected with 0.2 µg of pGL3® plasmid isolated from an overnight *E. coli* culture. Luciferase activity was measured after 48 hours.

Achieve the Highest Yield of Plasmid DNA from a Miniprep

Up to 3x More Concentrated Plasmid



Up to 5x More Plasmid DNA Yield



Concentration and yield for plasmid DNA using the ZymoPURE™ 96 Plasmid Miniprep kit compared to two popular 96 vacuum plate kits from Supplier Q and Supplier MN. Plasmid DNA (pGL3®) was isolated from 5 ml of JM109 *E. coli* culture grown overnight following the manufacturer's suggested protocol (in duplicate). One (1) µl of eluted plasmid DNA was visualized post agarose gel electrophoresis. M, ZR 1 kb DNA Marker (Zymo Research).

Product	Cat. No.	Size	Processing Time	Culture Input	Elution Volume	Plasmid Yield	Endotoxins
ZymoPURE™ Plasmid Miniprep Kit (SK)	D4208T D4209 D4210 D4211 D4212	10 preps 50 preps 100 preps 400 preps 800 preps	≤ 15 min	5 ml	≥ 25 µl	≤ 100 µg	≤ 1 EU/µg DNA
ZymoPURE™ 96 Plasmid Miniprep Kit	D4214 D4215	2 x 96 preps 4 x 96 preps	≤ 60 min	5 ml	≥ 125 µl	≤ 100 µg	≤ 1 EU/µg DNA

SK - Sample Kit Available

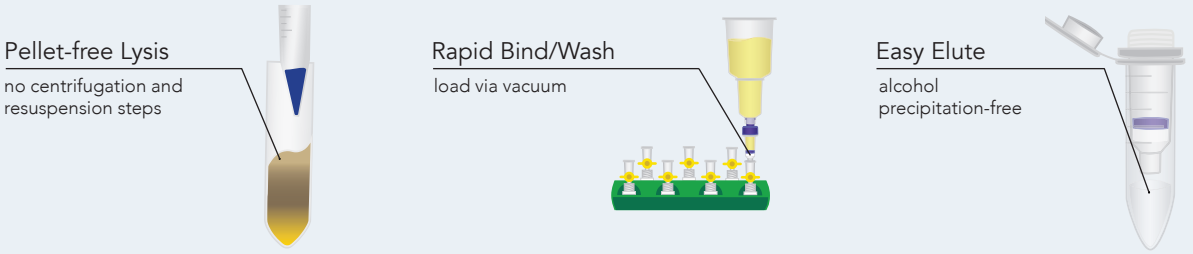
ZymoPURE-Express™ Plasmid Midiprep Kit

Highlights:

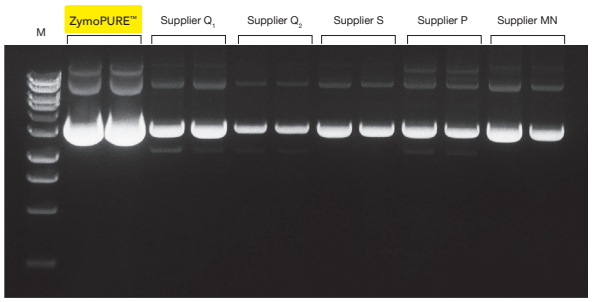
- **Pellet-Free:** Direct lysis procedure omits cell-pelleting, resuspension steps, and large centrifuges.
- **Quick & Pure:** 15 minutes from culture flask to transfection-grade plasmid DNA.
- **Highest Yield:** Purify up to 1.2 mg of plasmid DNA using a spin-column.

15 Minutes from Culture to Plasmid DNA

(No large-scale centrifugation)

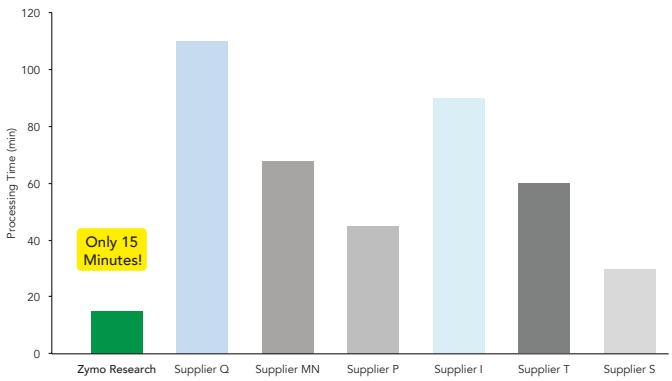


Superior Yield



Plasmid DNA yield and concentration from the ZymoPURE-Express™ Midiprep Kit compared to other major suppliers. Plasmid DNA (pGL3®) was isolated from 25 ml of JM109 *E. coli* culture grown overnight following the manufacturer's suggested protocol in duplicate. The eluted plasmid DNA was visualized post agarose gel electrophoresis. The size marker "M" is a 1 kb ladder.

Fastest Plasmid Midiprep



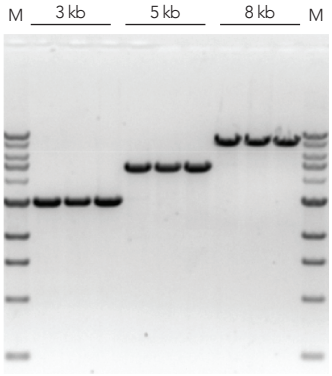
Save up to 100 minutes with the ZymoPURE-Express™ Midiprep Kit.

Product	Cat. No.	Size	Processing Time	Culture Input	Elution Volume	Plasmid Yield	Endotoxins
ZymoPURE-Express™ Plasmid Midiprep Kit	D4213	25 preps	15 minutes	25 ml	≥ 150 µl	≤ 1.2 mg	≤ 1 EU/µg DNA

ZR Plasmid Miniprep™ – Classic

Highlights:

- **High-Purity:** Eluted plasmid DNA is ready for PCR, sequencing, cloning and transfection.
- **Error-Free Processing:** P1, P2, and P3 buffers are colored for easy visualization of complete lysis and neutralization.
- **Zymo-Spin Technology:** Unique column design provides zero buffer retention and low (30 µl) elution volume.



Restriction endonuclease digestion of three different plasmids prepared using the ZR Plasmid Miniprep™-Classic, performed in triplicate. M: ZR 1 kb DNA marker (Zymo Research).

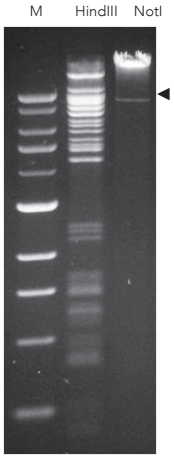
Description:

The ZR Plasmid Miniprep™ – Classic is designed for efficient isolation of plasmid DNA from *E. coli* using a traditional 3-buffer procedure that is simple, rapid, user-friendly, and reliable. It features a modified alkaline lysis protocol together with a unique Zymo-Spin™ Column to yield high-quality plasmid DNA in minutes. The buffers are color-coded (red, green, yellow) for easy determination of complete cell lysis and neutralization. Plasmid DNA purified from this kit is well suited for use in restriction endonuclease digestion, sequencing, DNA ligation, cloning, PCR, bacterial transformation, transfection, etc.

ZR BAC DNA Miniprep Kit

Highlights:

- **BAC/PAC Compatible:** Purify ultra-pure high molecular constructs (up to ~200 kb) that are suitable for sequencing, PCR, restriction endonuclease digestion, etc.
- **High-Purity:** Eluted plasmid DNA is ready for PCR, sequencing, cloning and transformation.
- **Error-Free Processing:** P1, P2, and P3 buffers are colored for easy visualization of complete lysis and neutralization.



HindIII and NotI digestion of BAC DNA. A BAC (~160 kb) from a RPCI-11 human BAC library (CHORI) was purified from DH10B cells (Invitrogen) using the ZR BAC DNA Miniprep Kit. Digestion with NotI removed the ~148 kb insert from the 11.6 kb pBACe3.6 cloning vector 1 (◀). M: 1 kb DNA ladder (Zymo Research).

Description:

The ZR BAC DNA Miniprep Kit is for the efficient isolation of BAC plasmid DNA or other large plasmids (e.g., PAC) from *E. coli* using a procedure that is simple, rapid, user-friendly, and reliable. It features a modified alkaline lysis protocol with color-coded reagents that allow easy visualization and assessment of complete bacterial cell lysis and neutralization. The innovative Zymo-Spin™ IC-XL columns are optimized for high yield recovery of ultra-pure BAC DNA. BAC DNA purified using the ZR BAC DNA Miniprep Kit is ideal for sequencing, PCR, endonuclease digestion, etc.

Product	Cat. No.	Size	Specifications	Uses
ZR Plasmid Miniprep™ – Classic	D4015 D4016 D4054	100 preps 400 preps 800 preps	Format: Spin-Column Culture Input: 0.5 - 5.0 ml Processing Time: 15 minutes Elution Volume: ≥ 30 µl DNA Yield: ≤ 25 µg DNA Size Limits: ≤ 25 kb	Plasmid recovery from *E. coli* culture
ZR BAC DNA Miniprep Kit™	D4048 D4049	25 preps 100 preps	Format: Spin-Column Culture Input: 0.5 - 5.0 ml Processing Time: 15 minutes Elution Volume: ≥ 10 µl DNA Yield: ≤ 10 µg DNA Size Limits: 50 bp to ≥ 200 kb	Large plasmid recovery from *E. coli* culture

Zyppy®-96 Plasmid MagBead Miniprep Kit

Highlights:

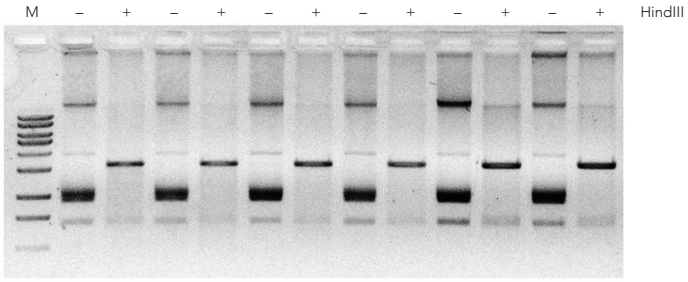
- **Pellet-Free:** Rapid direct lysis procedure omits cell-pelleting and resuspension steps.
- **High Quality:** Ready for PCR, sequencing, cloning, and transfection.
- **Ideal for Synthetic Biology:** Fastest, high-throughput automated method for preparing high-quality plasmid DNA.

Pellet-Free Workflow

1. Add lysis buffer directly to bacterial culture
2. Neutralize
3. Beads remove debris without centrifugation

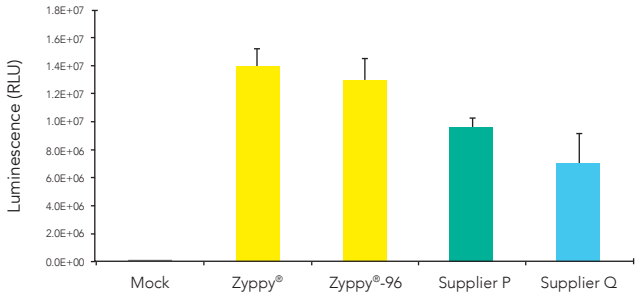
Workflow exemplary of automated procedure: Lysis buffer is added directly to *E. coli* culture with no centrifugation or pelleting necessary. MagClearing Beads are added following neutralization to remove cell debris resulting in a cleared supernatant.

High-Quality Plasmid DNA



Plasmid DNA (pGEM-3Zf(+)) was purified then digested with HindIII for one hour at 37°C. Both undigested (– lanes) and digested (+ lanes) samples were separated in a 1.0% agarose gel. The undigested samples show supercoiled plasmid, while the digested samples show the expected single linearized 3,197 bp fragment. The size marker "M" is a 1 kb ladder.

High Transfection Efficiency



Plasmid DNA isolated with Zyppy® show the highest transfection efficiencies. Luciferase activity was measured in lysates from cells transfected with plasmid DNA extracted using the Zyppy® Plasmid Miniprep Kit or products from Suppliers P and Q. The luciferase activity is indicated as relative light units (RLU).

Product	Cat. No.	Size	Processing Time	Culture Input	Elution Volume	Plasmid Yield	Endotoxins
Zyppy®-96 Plasmid MagBead Miniprep Kit	D4100 D4101 D4102	2 x 96 preps 4 x 96 preps 8 x 96 preps	60 minutes	750 µl	≥ 30 µl	≤ 5 µg	≤ 50 EU/µg DNA

Pellet-free, High-Quality Plasmid DNA in 8 Minutes

1. Add lysis buffer directly to bacterial culture

2. Neutralize

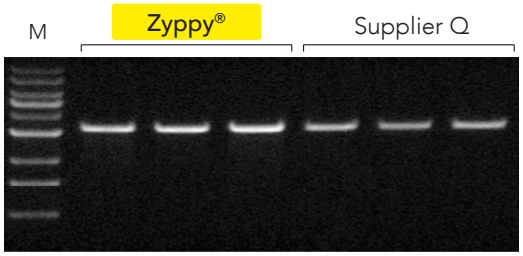
3. Bind, Wash, Elute

No Pelleting. No Resuspension.

Highlights:

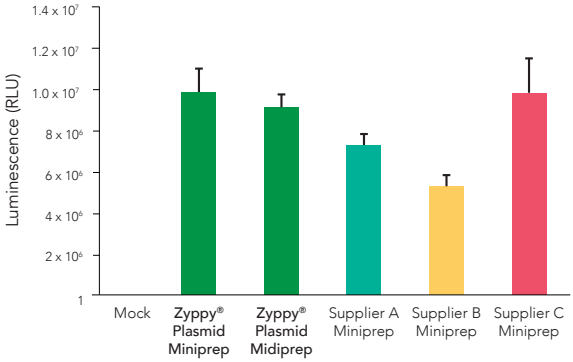
- **Fastest:** 8 minutes from culture flask to high-quality plasmid DNA.
- **Pellet-Free:** Direct lysis procedure omits cell-pelleting and resuspension steps.
- **High Quality:** Plasmid DNA is ready for PCR, sequencing, cloning, and transfection.

Superior Yield



EcoRI digestion of plasmid DNA (pGEM®) isolated from *E. coli* culture using the Zyppy® Plasmid Miniprep Kit or the similar kit from Supplier Q. The amount of DNA loaded was standardized based on culture volume input. Performed in triplicate. The size marker "M" is a 1 kb ladder.

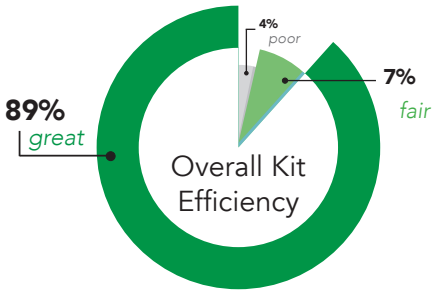
Transfection Ready



Luciferase activity was measured in lysates from cells transfected with DNA that was extracted using the pellet-free (Zyppy® system) or non-pellet-free (suppliers A, B, and C) formats. The luciferase activity is indicated as relative light units (RLU).

Proven Performance

would recommend
this kit to another researcher



Product	Cat. No.	Size	Processing Time	Culture Input	Elution Volume	Plasmid Yield	Endotoxins
Zyppy® Plasmid Miniprep Kit SK	D4036 D4019 D4020 D4037	50 preps 100 preps 400 preps 800 preps	8 minutes	600 µl	≥ 30 µl	≤ 25 µg	≤ 50 EU/µg DNA
Zyppy®-96 Plasmid Miniprep Kit	D4041 D4042 D4043	2 x 96 preps 4 x 96 preps 8 x 96 preps	45 minutes	750 µl	≥ 30 µl	≤ 5 µg	≤ 50 EU/µg DNA

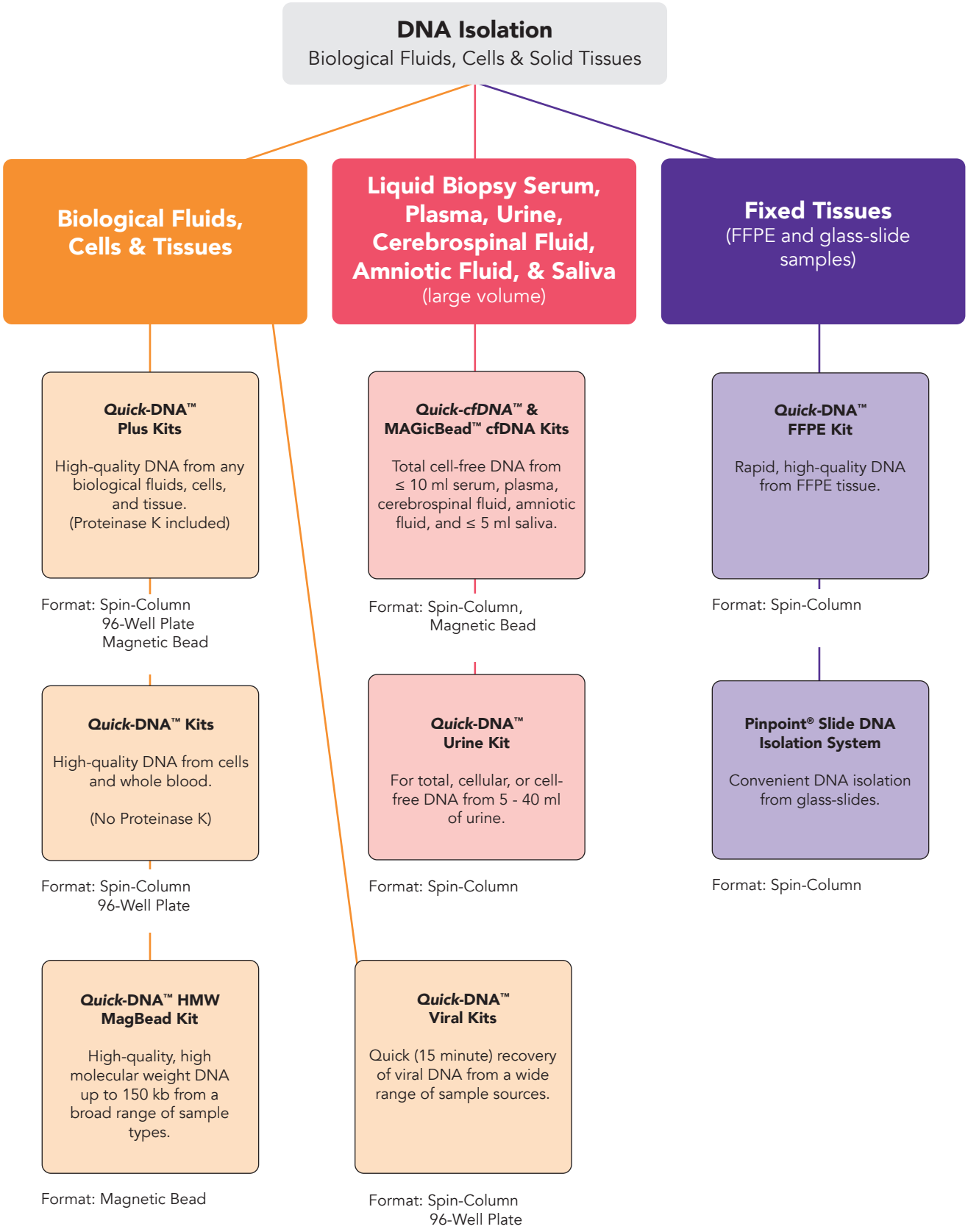
SK - Sample Kit Available

Genomic DNA Purification

Innovation. Pure & Simple.™

Zymo Research offers a range of genomic DNA isolation kits that are suitable for extracting high molecular weight DNA from a wide variety of sample types including tissue, fresh and paraffin-embedded tissue sections, cultured cells, saliva, buccal cells, whole blood, plasma, serum, urine, bacteria, fungi, yeast, algae, viruses, and mitochondria. Our genomic DNA isolation kits yield high-quality DNA that is ideal for use in any sensitive downstream applications such as PCR, DNA sequencing, endonuclease digestion, and methylation detection.

Quick Product Guide



Tech Tip

Tips for Successful Genomic DNA Extraction

Genomic DNA extraction is a fundamental procedure in life sciences designed to isolate an organism's genetic material for various downstream applications, such as gene analysis and genome sequencing. The primary goal is to efficiently separate genomic DNA from other cellular components like proteins, RNA, and cell membranes. The success of subsequent applications, including in-depth gene studies, full genome sequencing, and DNA modifications, critically depends on the precision and efficiency of the initial genomic DNA extraction.

To ensure the extraction of high-quality DNA, it is essential to pay attention to the following:

- **Sample Quantity:** Tailor the amount of the sample based on its DNA content. Overloading the sample can compromise lysis efficiency and potentially obstruct the extraction kit's performance.

- **Sample Lysis:** Customize the lysis procedure according to the nature of the sample. For instance, tissues benefit from being finely chopped to increase surface area, expediting the digestion process. In the case of bacteria and fungi, with their tough cell walls, physical methods like using ceramic beads become crucial for complete lysis.

- **Handling:** The pace at which various steps are performed, such as transferring spin columns and buffer washing, significantly influences DNA extraction performance. Operating at a comfortable pace is crucial.

- **Reducing Salt Contamination:**
  - Use proper centrifugation speeds to ensure complete removal of salts.
  - Thoroughly wash columns with ethanol, paying attention to prevent splash back.
  - Invert closed columns during wash steps to eliminate trace salts.
  - Avoid contact between the column tip and binding buffers.
  - Prevent any part of the column, except the matrix, from coming into contact with the elution buffer to avoid salt pickup.

- **Elution Strategies:** During elution, consider the trade-off between yield and concentration. Heating the elution buffer to 55°C can enhance efficiency. A lesser known tip involves reloading the eluate for a second elution, potentially increasing the yield by up to 5%.

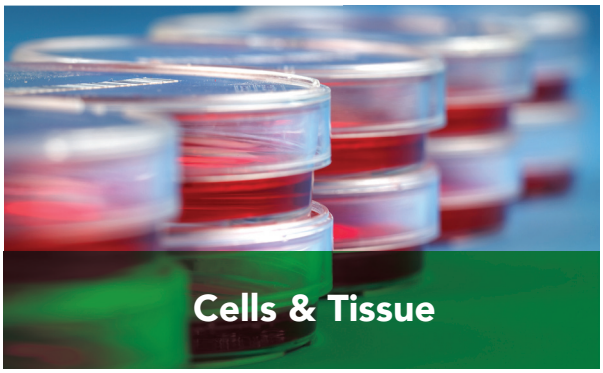
Successful genomic DNA extraction involves optimizing sample quantity, ensuring complete lysis, fine-tuning elution conditions, and meticulously addressing procedural errors. Despite the inherent challenges, these tips aim to empower scientists to maximize the efficacy of their genomic DNA preps.

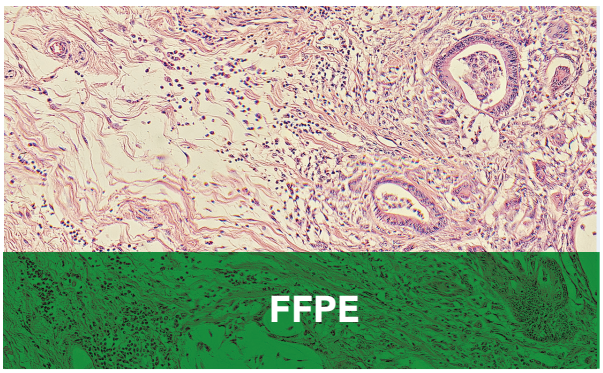
www.zymoresearch.com | info@zymoresearch.com | tel: 1-(949) 679-1190 | toll-free: 1-(888) 882-9682 | fax: 1-(949) 266-9452

Technology Overview: *Quick*-DNA™ Kits

DNA From Any Sample

The *Quick*-DNA™ Kits are a simple solution for high-yield, ultra-pure total DNA extraction (e.g., genomic, plasmid, mitochondrial, viral) from any biological fluid, cell culture, or solid tissue sample. *Quick*-DNA™ technology ensures the fastest isolation of high-quality DNA by using a streamlined workflow optimized for nearly any sample type. These products feature a novel Zymo-Spin™ Column capable of effectively eluting high molecular weight DNA in as little as 10 µl. DNA is ultra-pure, highly concentrated, and immediately ready for any sensitive downstream application such as qPCR, Next-Gen Sequencing and arrays.





Quick-DNA™ and *Quick*-DNA™ Plus Kits

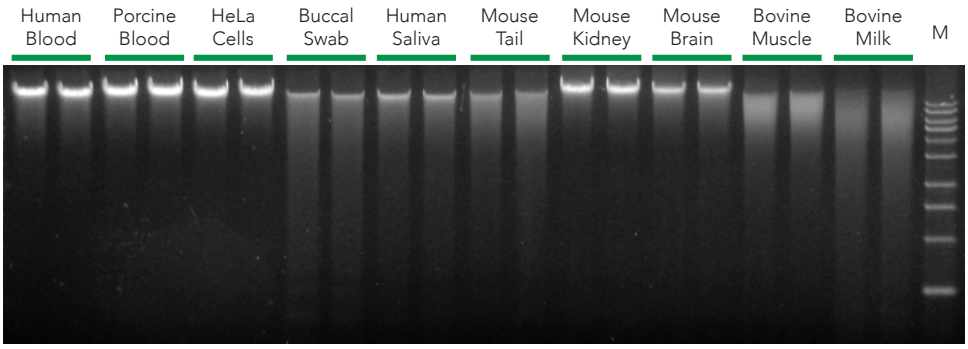
Highlights:

- **Quick & Easy:** Simple 20 minute procedure.
- **Highest Yield:** Recover 3x more DNA.
- **Ultra-Pure:** Isolated DNA is ready for qPCR, Next-Gen Sequencing, arrays, etc.

Description:

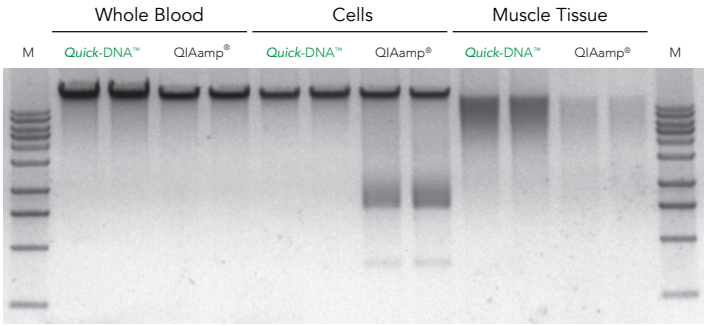
The *Quick*-DNA™ Plus Kits are the easiest method for high-yield total DNA extraction (e.g., genomic, plasmid, mitochondrial, viral) from any biological fluid, cell culture, or solid tissue sample. Innovative reagents and Zymo-Spin™ Column technologies allow for ultra-pure and concentrated genomic DNA > 50 kb to be eluted in as little as 10 µl. Zymo-Spin™ Columns ensure no buffer retention. Purified DNA is RNA-free, bypassing the need for RNase A treatment and enables accurate quantification. Isolated DNA is ideal for immediate use in sensitive downstream applications including qPCR, DNA-seq, arrays, and methylation analysis.

Universal Sample Compatibility



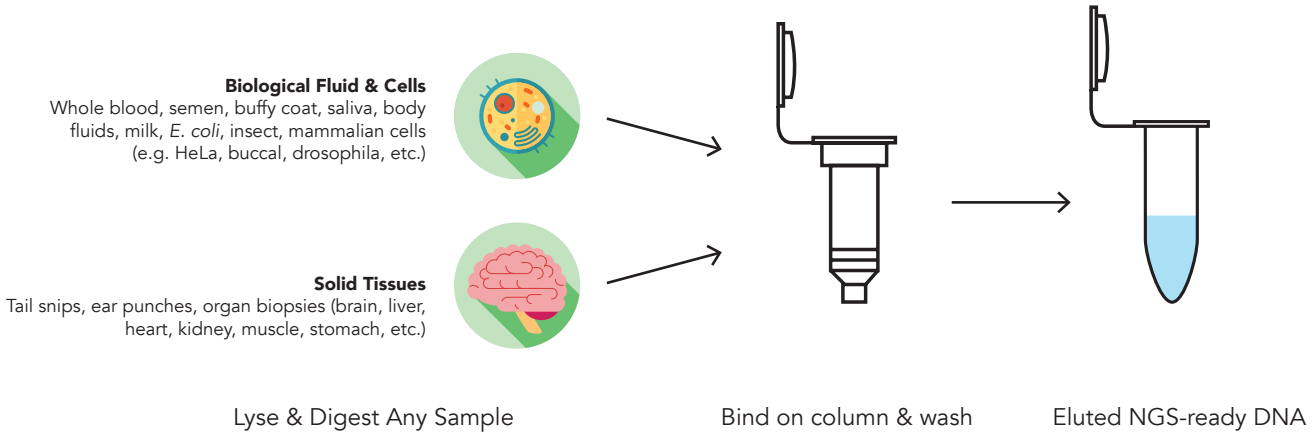
The *Quick*-DNA™ Miniprep Plus Kit is universal and accommodates any sample input including cultured cells, any type of tissue, whole blood, tough-to-lyse samples, milk, etc.

Superior Yields



The *Quick*-DNA™ Miniprep Plus kit isolates highly concentrated genomic DNA without any RNA contamination. *Quick*-DNA™ Miniprep Plus and QIAamp (Qiagen) were compared by processing porcine whole blood, HeLa cells, and bovine muscle tissue. The resultant DNA was analyzed on 1% (w/v) agarose gel.

Quick-DNA™ Plus Workflow



Quick-DNA™ Plus (Proteinase K Included)

Any Sample Type - Tissue, Cells, Whole Blood, etc.

Product	Cat. No.	Size	DNA Recovery	Minimum Elution	(Animal) Cells/ Tissue
Quick-DNA™ Microprep Plus Kit	D4074	50 preps	5 µg	10 µl	≤ 10^6 cells ≤ 5 mg tissue
Quick-DNA™ Miniprep Plus Kit SK	D4068T D4068 D4069	10 preps 50 preps 200 preps	25 µg	35 µl	≤ 5 x 10^6 cells ≤ 25 mg tissue
Quick-DNA™ Midiprep Plus Kit	D4075	25 preps	125 µg	200 µl	≤ 3 x 10^7 cells ≤ 125 mg tissue
Quick-DNA™ 96 Plus Kit	D4070 D4071	2 x 96 preps 4 x 96 preps	5 µg	15 µl	≤ 10^6 cells ≤ 5 mg tissue
Quick-DNA™ MagBead Plus Kit	D4081 D4082	96 preps 4 x 96 preps	10 µg	50 µl	≤ 3 x 10^6 cells ≤ 25 mg tissue

SK - Sample Kit Available

Quick-DNA™ (No Proteinase K)

Whole Blood, Swabs, Cells

Product	Cat. No.	Size	DNA Recovery	Minimum Elution	(Animal) Cells
Quick-DNA™ Microprep Kit	D3020 D3021	50 preps 200 preps	5 µg	10 µl	≤ 10^6 cells
Quick-DNA™ Miniprep Kit	D3024 D3025	50 preps 200 preps	25 µg	30 µl	≤ 5 x 10^6 cells
Quick-DNA™ 96 Kit	D3010 D3011 D3012	2 x 96 preps 4 x 96 preps 10 x 96 preps	5 µg	30 µl	≤ 10^6 cells

Quick-DNA™ HMW MagBead Kit

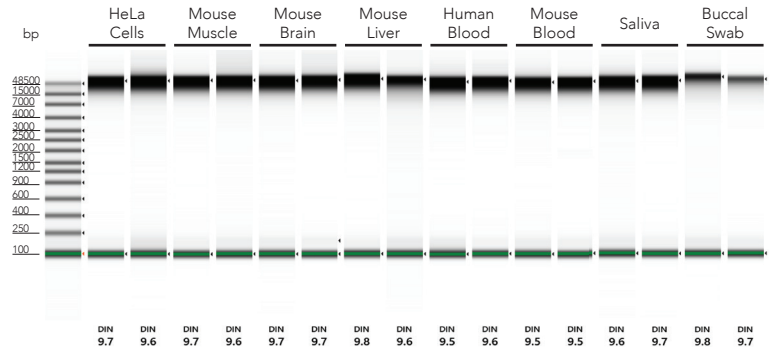
Highlights:

- **High Molecular Weight DNA:** Extract high molecular weight DNA up to 150 kb from any sample.
- **Ultra-Pure:** Recover the highest DNA yield and purity with no RNA contamination.
- **Third-Generation Sequencing Ready:** Optimized for long read sequencing (including PacBio® and Oxford Nanopore™ sequencing).

Description:

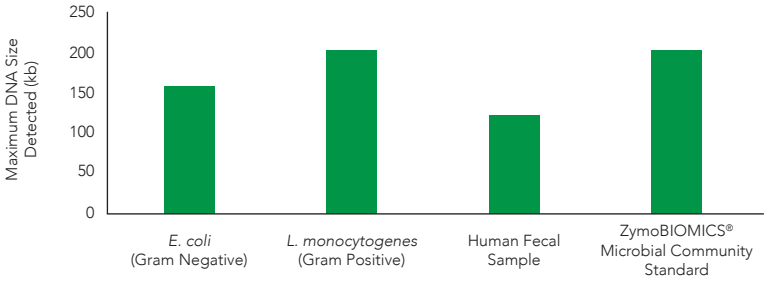
The *Quick*-DNA™ HMW MagBead Kit is the easiest method to purify high molecular weight DNA from any sample (including biological fluids, cells, solid tissue, and cultured cells). The purified HMW DNA is ideal for long read sequencing and immediately ready for third-generation sequencing platforms such as Nanopore™ and PacBio® Sequencing. With a unique binding system, the *Quick*-DNA™ HMW MagBead kit delivers ultra-pure and concentrated genomic DNA up to 150 kb.

High Molecular Weight DNA from Any Sample



High Molecular Weight DNA From Any Sample Type. 10^6 Mammalian HeLa cells, 25 mg mouse muscle, brain, and liver, 200 µl human blood, 200 µl mouse blood, 200 µl human saliva, and buccal swabs stored in DNA/RNA Shield™ (R1100) were extracted using the *Quick*-DNA™ HMW Magbead Kit (n=2). DNA is of high molecular weight size (>60 kb). Quality was assessed using Agilent 2200 TapeStation®.

Longer DNA for Longer Read Lengths



High Molecular Weight DNA. Cultured *E. coli* (~10^8 cells), cultured *L. monocytogenes* (~10^8 cells), 50 mg feces, and 75 µl ZymoBIOMICS® Microbial Community Standard (D6300) were input into the *Quick*-DNA™ HMW MagBead kit (n=2). Length of the highest detected peak were recorded and averaged for each sample. DNA size was analyzed using Aligent's Femto Pulse system.

Product	Cat. No.	Size
Quick-DNA™ HMW MagBead Kit	D6060	96 preps

Quick-DNA™ FFPE Kit

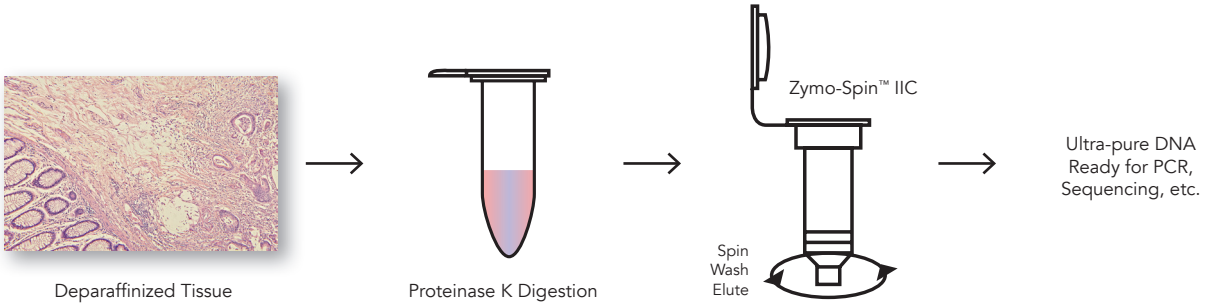
Highlights:

- **Fast & Simple:** Rapid deparaffinization procedure without xylene.
- **Ultra-Pure:** Isolated DNA is ready for qPCR, Next-Gen Sequencing, arrays, etc.
- **Highest Yield:** Recover 6x more DNA.

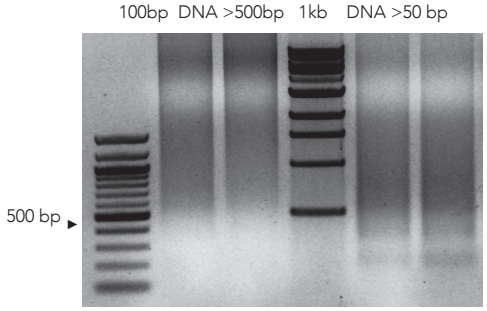
Description:

The *Quick*-DNA™ FFPE Kit provides a simple and reliable method for high yield/quality DNA isolation from formalin-fixed, paraffin embedded (FFPE) tissue samples and sections. The unique chemistries of the product have been optimized for maximum recovery of non-crosslinked, ultra-pure DNA without RNA contamination. Simply digest deparaffinized tissues using the provided Proteinase K, heat, and then purify the DNA with the Zymo-Spin™ columns in the kit. DNA >50 bp or >500 bp can be selectively isolated by altering the lysis buffer conditions as described in the protocol. PCR inhibitors are effectively removed during the isolation procedure and eluted DNA is ideal for PCR, Next-Gen library prep, enzymatic manipulation, etc.

Simplest Workflow

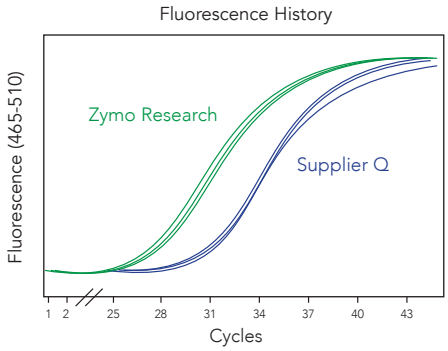


Size Selection Built In



The *Quick*-DNA™ FFPE Kit selectively isolates DNA > 50 bp or > 500 bp. Equivalent amounts of DNA resolved on a 1% agarose gel. 100 bp DNA ladder and 1 kb DNA ladder from Zymo Research

The Highest Recovery



DNA isolated using the *Quick*-DNA™ FFPE Kit consistently yielded lower Ct values as depicted by the amplification curves above. Equivalent amounts of DNA isolated using Zymo and Supplier Q procedures were used for real time PCR analysis.

Product	Cat. No.	Size	Specifications	Uses
Quick-DNA™ FFPE Kit	D3067	50 preps	Format: Spin-Column Sample Size: up to 25 mg tissue Binding Capacity: 25 µg Elution Volume: ≥ 25 µl	DNA isolation from: FFPE blocks; FFPE tissue sections

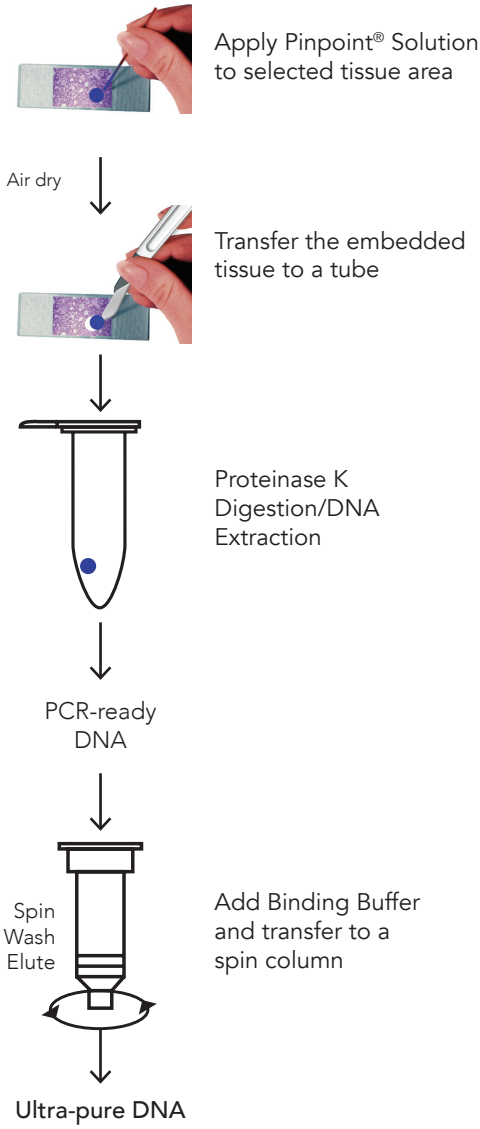
Pinpoint® Slide DNA Isolation System

Highlights:

- **Quick & Easy:** Convenient and streamlined method for the isolation of genomic DNA from targeted areas of fresh and FFPE tissue sections (slides).
- **Simple Workflow:** Features Pinpoint® tissue sampling technology and one-step DNA extraction method.

Description:

The Pinpoint® Slide DNA Isolation System is an innovative product for the isolation of total DNA from targeted areas of fresh, frozen, and FFPE tissue sections. This eliminates the need for expensive specialized equipment or computer software. Instead, the system combines innovative Pinpoint® tissue sampling technology, Proteinase K digestion, and a one-step DNA extraction method for the isolation of DNA that is ideal for PCR, sequencing, etc.



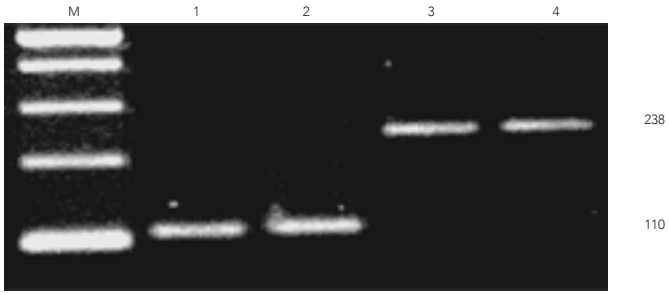


Figure 1. PCR amplified DNA fragments from different samples of paraffin embedded tissue. Lane M: 100 bp marker; Lane 1 and 2: β-Globin; Lane 3 and 4: An uncharacterized gene on chromosome 3.

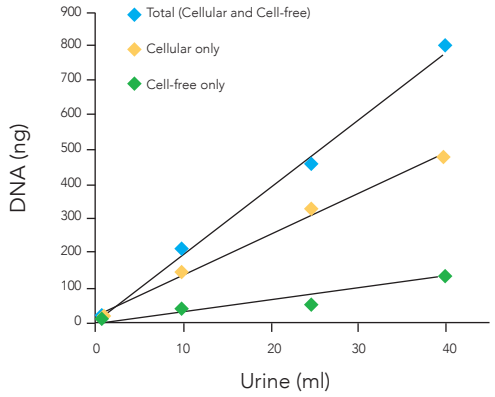
Product	Cat. No.	Size	Specifications	Uses
Pinpoint® Slide DNA Isolation System	D3001	50 preps	Format: Spin-Column Binding Capacity: 5 µg Elution Volume: ≥ 10 µl	DNA isolation from targeted areas of: tissue sections; FFPE tissue sections; glass slides

Quick-DNA™ Urine Kit

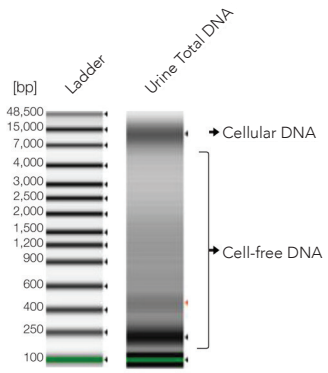
Highlights:

- **Total DNA Recovery:** Recover cellular and/or cell-free DNA easily from ≤ 40 ml of urine.
- **Preservation Reagent Included:** Nucleic acid stabilized at room temperature for 30 days.
- **Ultra-Pure DNA:** Isolated DNA is ready for qPCR, Next-Gen Sequencing, arrays, etc.

Cellular DNA. Cell-free DNA. Or both!

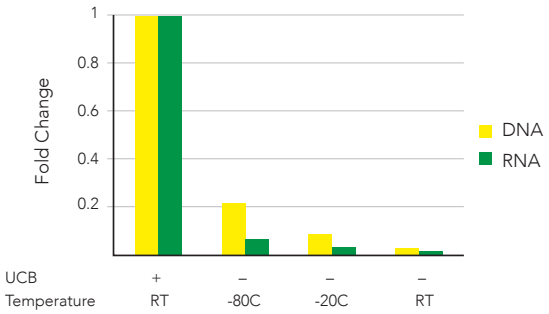


DNA yields increase linearly with increasing urine from healthy subjects extracted with the *Quick*-DNA™ Urine Kit. DNA was isolated from 1 ml, 10 ml, 25 ml, and 40 ml urine. DNA concentration was quantified by qPCR using the Femto™ Human DNA Quantification Kit (Zymo Research).



Both cellular and cell-free DNA was effectively purified from urine. 5 ml of urine from a healthy female donor was processed and DNA was eluted in 20 µl final volume. Purified DNA was analyzed using the Agilent 2200 TapeStation® system.

Superior Preservation



Urine Conditioning Buffer™ (UCB) provides more preservation compared to conventional methods. Urine (with or without UCB) was preserved using different storage conditions: Room temperature (RT), -20 °C, and -80 °C. After 2 weeks of storage, total DNA (yellow) and total RNA (green) were purified using the *Quick*-DNA™ Urine Kit and a custom RNA extraction protocol by Zymo Research, respectively. Corresponding fold change of preserved nucleic acids obtained from qPCR analysis.

Streamlined Workflow

Achieve ultra-pure total DNA from urine in three easy steps.

Product	Cat. No.	Size	Specifications	Uses
Quick-DNA™ Urine Kit	D3061	50 preps	Sample Volume: ≤ 40 ml Column Binding Capacity: 5 µg DNA Size: 100 bp to 23 kb	Cellular and cellular-free DNA isolation from urine

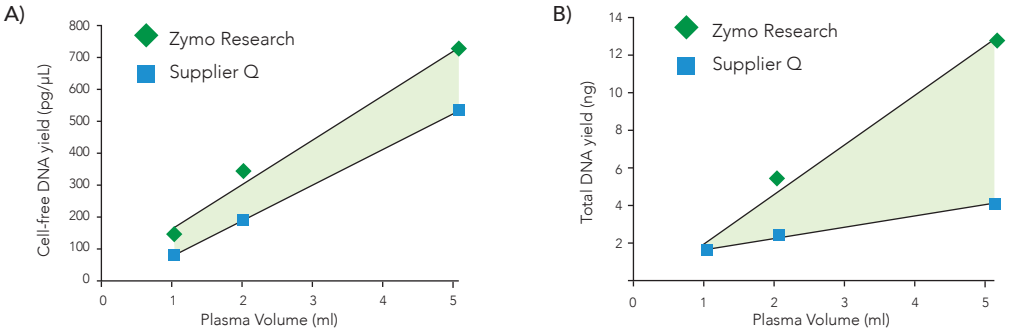
Learn more about Urine Conditioning Buffer™ (UCB™) on page 39.

Quick-cfDNA™ & MAGicBead™ cfDNA Kits

Highlights:

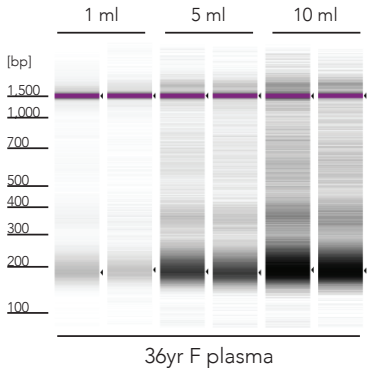
- **High Processing Volume:** Purify ≤ 10 ml of serum or plasma and elute with 35 µl.
- **Highest Yields:** Consistently purify > 30% more cfDNA.
- **Ultra-Pure:** Isolated DNA is ready for qPCR, Next-Gen Sequencing, etc.

Highest Yields



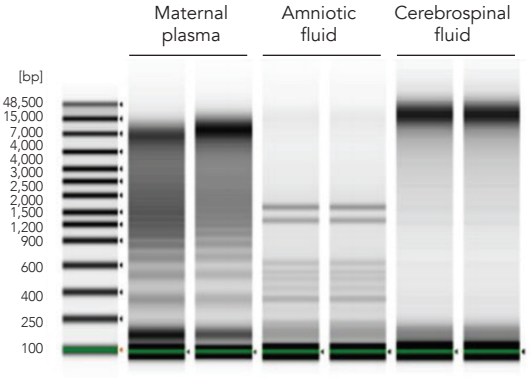
The *Quick*-cfDNA™ Serum & Plasma Kit recovers more cell-free DNA than a comparable Supplier Q kit. The DNA recovered is linearly proportional to the sample input volume when compared with Supplier Q. (A) Concentration of the smallest nucleosomal fragment DNA (N1, ~180 bp) was determined using the Agilent 2100 Bioanalyzer® system. (B) Total DNA recovery was quantified using the Zymo Research Femto™ Human DNA Quantification Kit on an Applied Biosystems® 7500 Real-Time PCR System.

Linear and Efficient Recovery of Cell-Free DNA



Cell-free DNA recovery scales proportionally with sample input using the *Quick*-cfDNA™ Serum & Plasma Kit. Cell-free DNA was isolated in duplicate from three healthy female donors, and visualized using the Agilent 2200 Tapestation® system.

Versatile Sample Compatibility



Total DNA, including both high and low molecular weight species, was purified in duplicate from human maternal plasma, amniotic fluid, and cerebrospinal fluid. DNA was visualized using the Agilent 2200 Tapestation® system.

Product	Cat No.	Size	Specifications	Uses
Quick-cfDNA™ Serum & Plasma Kit	D4076 D4076-Custom	50 preps Custom Input Size	Compatible with vacuum and centrifuge Processing Volume: ≤10 ml DNA Recovery: ≥ 100bp Elution Volume: ≥ 35 µl	DNA isolation from: Serum; Plasma; Amniotic fluid; Cerebrospinal fluid; Saliva; Ideal for isolating cell-free DNA
Quick-cfDNA™ Serum & Plasma Buffer Set	D4076-A	1 set		
MAGicBead™ cfDNA Isolation Kit SK	D4086 D4086-Custom	2 ml x 50 preps Custom Input Size	Format: Magnetic BeadProcessing Volume: ≤10 ml DNA Recovery: ≥ 50 bp Elution Volume: ≥ 15 µl	

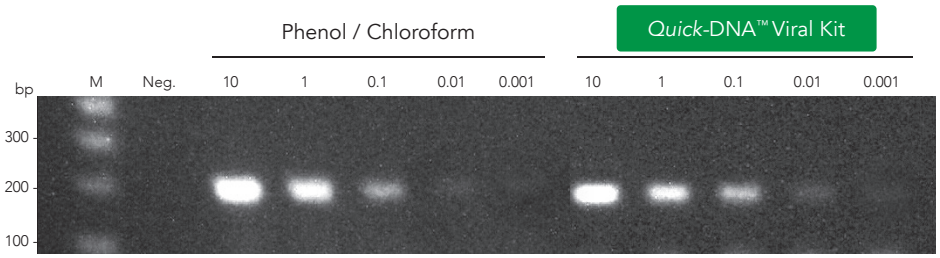
SK - Sample Kit Available

Quick-DNA™ Viral Kits

Highlights:

- **Rapid Protocol:** Elute DNA in 6 µl within 10 minutes.
- **Ultra-Pure:** Isolated DNA is ready for qPCR, Next-Gen Sequencing, arrays, etc.
- **High Efficiency:** Yields increase linearly with sample input.

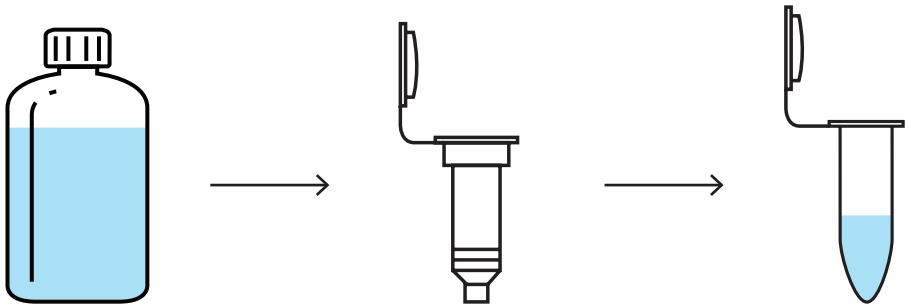
Viral DNA in 10 minutes



Viral DNA is quickly and easily purified with the *Quick*-DNA™ Viral Kit. Human HBV DNA was isolated from 10 to 0.001 µl of human serum using phenol/chloroform or *Quick*-DNA™ Viral Kit. The presence of HBV DNA is evidenced by a ~200 bp PCR amplicon. The size marker M is a 100 bp DNA Ladder (Zymo Research) and "Neg." is the negative PCR control.

The Simplest Workflow

Achieve ultra-pure viral DNA in three easy steps.



Lyse any Sample Input | Bind onto Column | Elute Ultra-Pure DNA

Product	Cat. No.	Size	Specifications	Uses
Quick-DNA™ Viral Kit	D3015 D3016	50 preps 200 preps	Format: Spin-Column Elution Volume: ≥ 6 µl Processing Time: 15 minutes Binding Capacity: 5 µg DNA Size Limits: 100 bp - 50 kb	Viral DNA isolation from: Fresh/frozen soft tissue; Cultured cells; Whole blood
Quick-DNA™ Viral 96 Kit	D3017 D3018	2 x 96 preps 4 x 96 preps	Format: 96-Well Plate Elution Volume: ≥ 10 µl Processing Time: 25 minutes Binding Capacity: 5 µg DNA Size Limits: 100 bp - 50 kb	

Environmental DNA Purification using *Quick*-DNA™ Kits

Innovation. Pure & Simple.™

Many techniques exist to extract DNA and RNA from challenging samples. However, mechanical lysis using bead bashing is often required to efficiently process tough-to-lyse organisms and environmental samples. The Zymo Research line of environmental purification kits feature unique BashingBead™ technology, which allows isolation of DNA from samples resistant to conventional lysis procedures. DNA from samples including tough-to-lyse tissues, soil samples, feces, plants, seeds, food, arthropods, Gram-positive and Gram-negative bacteria, yeast, filamentous fungi, unicellular and filamentous algae, and protozoa is efficiently and rapidly extracted. These products produce high-yield and high-quality DNA suitable for downstream applications such as PCR, sequencing, hybridization, restriction digestion, and other enzymatic processes.

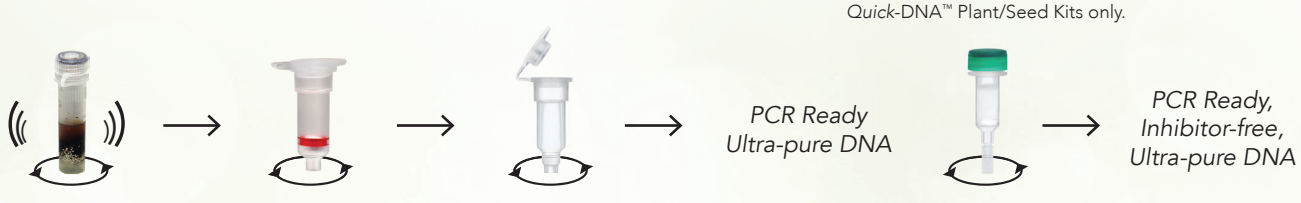
Environmental samples provide a unique challenge not present in other types of sample processing and analyses. Due to the inhibitors typically found in feces and soil, there is a need for inhibitor removal during DNA purification. These inhibitors – including humic acid, tannic acid, fulvic acid, heme, and polyphenolic compounds – can significantly affect downstream applications. For example, humic acid contamination in DNA samples can inhibit PCR. Our Zymo-Spin™ III-HRC Inhibitor Removal technology contains all the components needed for efficient removal of contaminants that can inhibit downstream enzymatic reactions (e.g. PCR and RT-PCR) from DNA and RNA preparations.

Technology Overview: BashingBead™ Lysis & Environmental DNA Purification

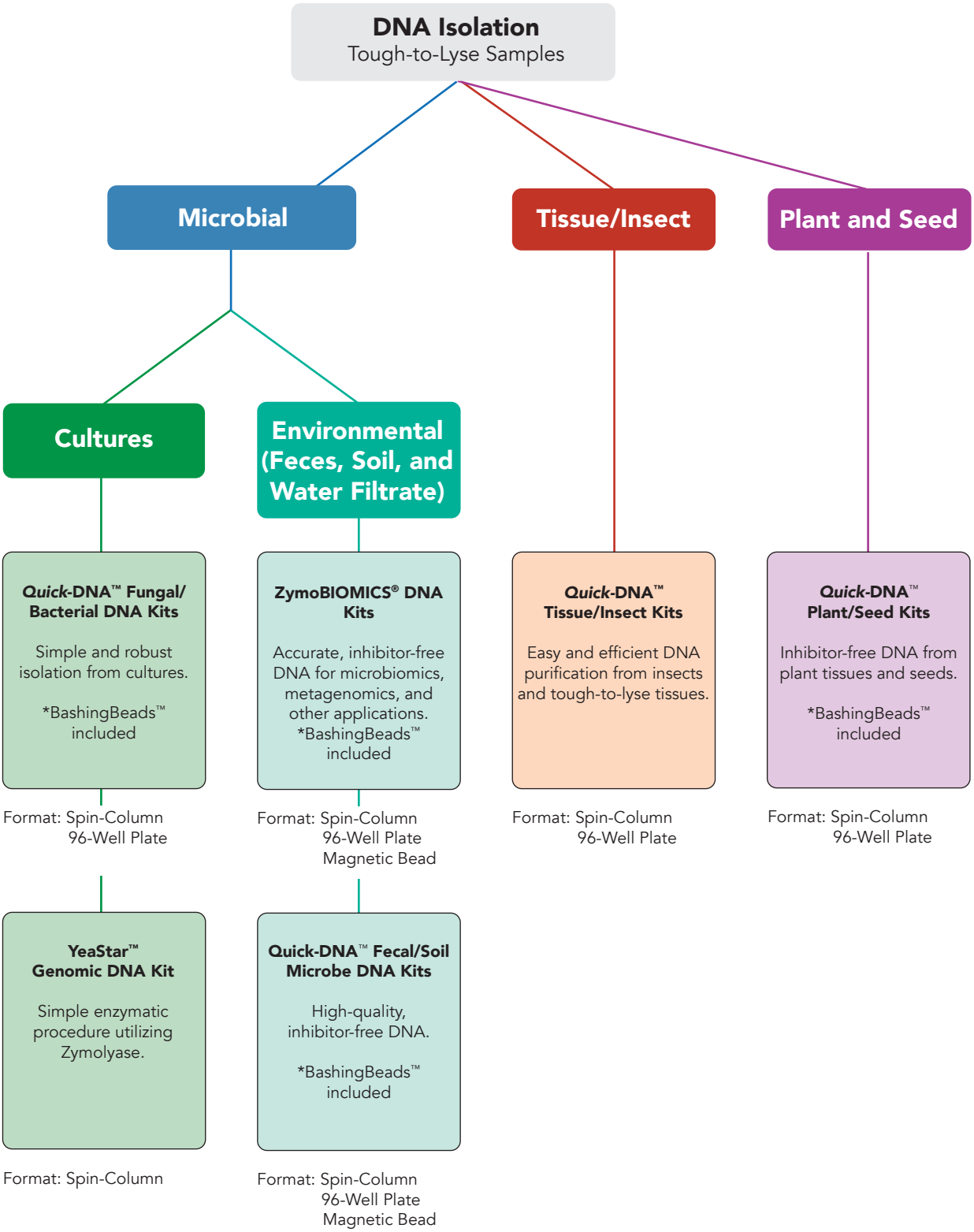
The BashingBead™ DNA purification kits from Zymo Research are for rapid recovery of PCR-ready DNA from a broad range of tough-to-lyse organisms and environmental samples. Kits have been specifically designed for the efficient recovery of inhibitor-free DNA from plants, seeds, tissues, insects, and microorganisms that inhabit soil, sludge, sediment, or fecal samples. Products are available in spin-column Micro- (5 µg/prep), Mini- (25 µg/prep), Midi- (125 µg/prep) and 96-well (5 µg/well) formats – these formats are diagrammed below and on the following pages.

For processing, samples are simply transferred to the provided ZR BashingBead™ Lysis Tubes where they are rapidly and efficiently lysed by bead beating in novel lysis buffers. Processing the samples can be performed using any bead mill, pulverizer, or vortex that can accommodate standard 2.0 ml, 50 ml tubes, or 96-well blocks, depending on the format of the kit. Following lysis, DNA is isolated using innovative Zymo-Spin™ Column and Plate technologies, and in cases where plant, feces, or soil samples are processed, the DNA is subsequently filtered to remove humic/fulvic acids or polyphenols that can inhibit PCR. The isolation of inhibitor-free DNA is accomplished in as little as 15 minutes.

Microprep & Miniprep Formats



Quick Product Guide



A Guide for Optimizing Plant DNA Extraction

Extracting DNA from plant leaves or seeds is crucial for advancing future plant-based technologies. Plant DNA serves as the input for various molecular biology techniques, such as PCR and NGS, forming the foundation for academic and commercial research programs. In agrobiotechnology and agrigenomics, obtaining accurate data for agricultural research, spanning from opioid alternatives to global food security and climate change mitigation, relies on high-quality plant DNA.[1-3] Plant DNA extraction entails a few key steps, addressing unique challenges in plant materials and requiring diverse methods tailored to specific applications.

Different Methods for Plant DNA Extraction

While the conventional CTAB extraction method has dominated the field since 1987, advancements have led to modifications and the emergence of alternative techniques.[4,5] Bead beating steps enhance DNA extraction for plant species with robust cell walls, while column-based procedures and magnetic beads offer efficient washing and purification of DNA.[6]

Several factors influence the choice of extraction method:

1. **Lysis Efficiency:** CTAB may face challenges with robust cell walls, while bead beating methods ensure homogeneous tissue disruption.
2. **Removal of Downstream Inhibitors:** CTAB protocols may struggle with complete contaminant removal, while membrane or magnetic bead methods enhance washing efficiency.
3. **DNA Quality:** Column or magnetic bead-based protocols enable more efficient washing, ensuring high-quality DNA for downstream applications.
4. **DNA Loss:** CTAB may result in DNA loss, while column-based and magnetic bead procedures may reduce overall yield due to low binding capacity, but minimize DNA loss.
5. **Use of Hazardous Reagents:** CTAB involves hazardous phenol and chloroform, while column and magnetic bead-based procedures eliminate such risks.

Tech Tip (continued)

A Guide for Optimizing Plant DNA Extraction

Tips for Successful CTAB DNA Extraction:

1. **Timing Your DNA Extractions:** Plan carefully, as the full CTAB protocol can take approximately two hours for a small number of samples.
2. **Working With Hazardous Materials:** Exercise caution with liquid nitrogen, phenol, and chloroform. Adhere to safety protocols for handling toxic chemicals and disposal procedures.
3. **Processing the Plant Tissue:** Use a blender for more consistent tissue disruption, although this step remains time-consuming.
4. **Phase Separation:** Meticulously execute phase separation to avoid DNA loss or contamination.
5. **PCR Inhibitors:** Consider potential coprecipitation of biochemicals from plant tissues and optimize the protocol for variations in compounds between plant species.

Achieving mastery in plant DNA extraction is vital for researchers at the forefront of plant biology. While the CTAB method is a staple, recognizing its intricacies and exploring alternative methods can enhance efficiency, yield, and overall success in downstream applications.

References:

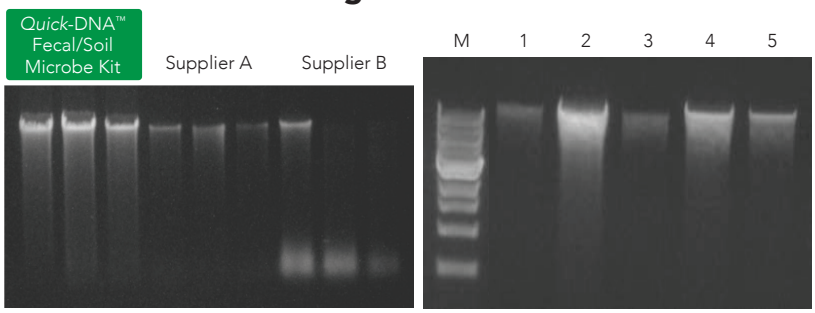
1. Todd DA, Kellogg JJ, Wallace ED, et al. Chemical composition and biological effects of kratom (Mitragyna speciosa): In vitro studies with implications for efficacy and drug interactions. Sci Rep. 2020;10(1). doi:10.1038/S41598-020-76119-W
2. Sedeek KEM, Mahas A, Mahfouz M. Plant Genome Engineering for Targeted Improvement of Crop Traits. Front Plant Sci. 2019;0:114. doi:10.3389/FPLS.2019.00114
3. Varshney RK, Bansal KC, Aggarwal PK, Datta SK, Craufurd PQ. Agricultural biotechnology for crop improvement in a variable climate: hope or hype? Trends Plant Sci. 2011;16(7):363-371. doi:10.1016/j.tplants.2011.03.004
4. Abdel-Latif A, Osman G. Comparison of three genomic DNA extraction methods to obtain high DNA quality from maize. Plant Methods. 2017;13(1):1-9. doi:10.1186/S13007-016-0152-4
5. Doyle J, Doyle J. A Rapid DNA Isolation Procedure for Small Quantities of Fresh Leaf Tissue. Phytochem Bull. 1987;19(1):11-15.
6. Aboul-Maaty NAF, Oraby HAS. Extraction of high-quality genomic DNA from different plant orders applying a modified CTAB-based method. Bull Natl Res Cent. 2019;43(25). doi.org/10.1186/s42269-019-0066-1

Quick-DNA™ Fecal/Soil Microbe Kits

Highlights:

- **Boost Detection:** Included BashingBeads™ ensure complete lysis of tough-to-lyse samples.
- **Inhibitor-Free:** Isolated DNA is ready for qPCR, Next-Gen Sequencing, arrays, etc.
- **Simple Workflow:** Lyse, purify on column, and filter to remove PCR inhibitors.

Higher Yields

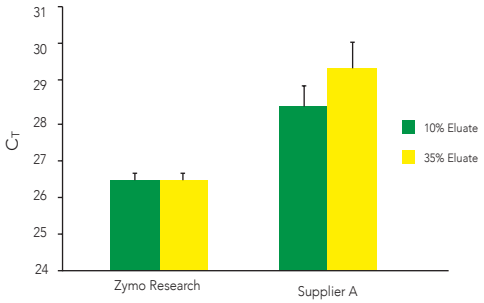


High-quality total DNA was isolated from different environmental sample sources using the *Quick*-DNA™ Fecal/Soil Microbe Kit and compared against other suppliers. (A) Equivalent amounts of feces were processed using each kit, then equal volumes of eluted DNA were analyzed on a 0.8% (w/v) agarose gel stained with EtBr. (B) Metagenomic DNA isolated from 5 soil samples. M: 1 kb marker (NEB); 1-5: soil samples (sand, sandy clay loam, hydrophobic sandy loam course, sandy loam, fine gravel).

Complete Homogenization

State-of-the-art BashingBeads™ are ideal for disrupting tough-to-lyse organisms when paired with bead mills or high speed cell disrupters.

Ultra-Pure & Inhibitor-Free DNA



Real-time PCR was used to evaluate 10% or 35% of eluates recovered using the *Quick*-DNA™ Fecal/Soil Microbe Kit or Supplier A Kit to detect PCR inhibitors. Delayed amplification indicates PCR inhibition from inefficient inhibitor removal (n=8).

Product	Cat. No.	Size	Specifications	Uses
Quick-DNA™ Fecal/Soil Microbe Microprep Kit	D6012	50 preps	Format: Spin-Column Binding Capacity: 5 µg Elution Volume: ≥ 20 µl Processing Time: 20 min	Total DNA isolation from: Feces; Gram (+) bacteria; Gram (-) bacteria; yeast; filamentous fungi; unicelluar algae; filamentous algae; protist; soil, sludge, clay
Quick-DNA™ Fecal/Soil Microbe Miniprep Kit SK	D6010	50 preps	Format: Spin-Column Binding Capacity: 25 µg Elution Volume: ≥ 50 µl Processing Time: 20 min	
Quick-DNA™ Fecal/Soil Microbe Midiprep Kit	D6110	25 preps	Format: Spin-Column Binding Capacity: 125 µg Elution Volume: ≥ 150 µl Processing Time: 25 min	
Quick-DNA™ Fecal/Soil Microbe 96 Kit	D6011	2 x 96 preps	Format: 96-Well Plate Binding Capacity: 5 µg Elution Volume: ≥ 50 µl Processing Time: 50 min	
Quick-DNA™ Fecal/Soil Microbe 96 Magbead Kit (includes ZR BashingBead™ Lysis Rack)	D6010-FM	2 x 96 preps	Format: Magnetic Bead Binding Capacity: 25 µg Elution Volume: 37.5 µl Processing Time: 2 hours	
Quick-DNA™ Fecal/Soil Microbe 96 Magbead Kit (Lysis Matrix Not Included)	D6011-FM	2 x 96 preps		
Quick-DNA™ Fecal/Soil Microbe 96 Magbead Kit (includes ZR BashingBead™ Lysis Tubes)	D6012-FM	2 x 96 preps		

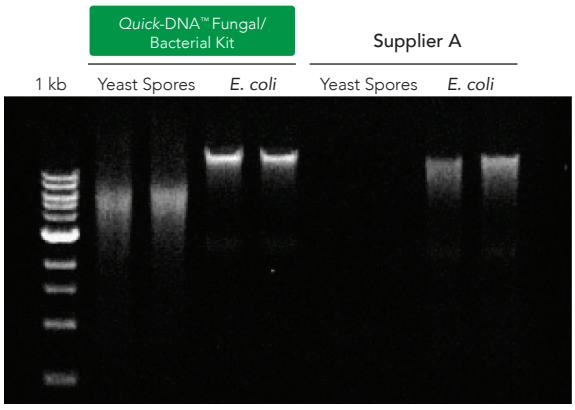
SK - Sample Kit Available

Quick-DNA™ Fungal/Bacterial Kits

Highlights:

- **Boost Detection:** Included BashingBeads™ ensure complete lysis of tough-to-lyse samples.
- **Ultra-Pure:** Isolated DNA is ready for qPCR, Next-Gen Sequencing, arrays, etc.
- **Simple & Quick Workflow:** Extract total microbial DNA in less than 20 minutes.

Highest Yields



DNA isolated from *Saccharomyces cerevisiae* (spores) and *E. coli* using the *Quick*-DNA™ Fungal/Bacteria Kit was high-quality and structurally intact. Equivalent amounts of yeast and bacteria were processed using the *Quick*-DNA™ Fungal/Bacterial Kit or the Supplier A kit. Equal volumes of eluted DNA were analyzed on a 0.8% (w/v) agarose gel stained with EtBr.

Simple Workflow

Homogenize sample with ZR BashingBead™ Lysis Tube

Filter Lysate with Zymo-Spin™ III-F

Bind, Wash, Elute DNA with Zymo-Spin™ IC or IIC

PCR Ready, Ultra-Pure DNA

Product	Cat. No.	Size	Specifications	Uses
Quick-DNA™ Fungal/Bacterial Microprep Kit	D6007	50 preps	Format: Spin-Column Binding Capacity: 5 µg Elution Volume: ≥ 10 µl Processing Time: 15 minutes	Total DNA isolation from: Gram (+) bacteria; Gram (-) bacteria; Yeast; Filamentous fungi; Unicellular algae; Filamentous algae; Protist; Either fungi or bacteria grown in media
Quick-DNA™ Fungal/Bacterial Miniprep Kit SK	D6005	50 preps	Format: Spin-Column Binding Capacity: 25 µg Elution Volume: ≥ 35 µl Processing Time: 15 minutes	
Quick-DNA™ Fungal/Bacterial Midiprep Kit	D6105	25 preps	Format: Spin-Column Binding Capacity: 125 µg Elution Volume: ≥ 150 µl Processing Time: 20 minutes	
Quick-DNA™ Fungal/Bacterial 96 Kit	D6006	2 x 96 preps	Format: 96-Well Plate Binding Capacity: 5 µg Elution Volume: ≥ 25 µl Processing Time: 40 minutes	

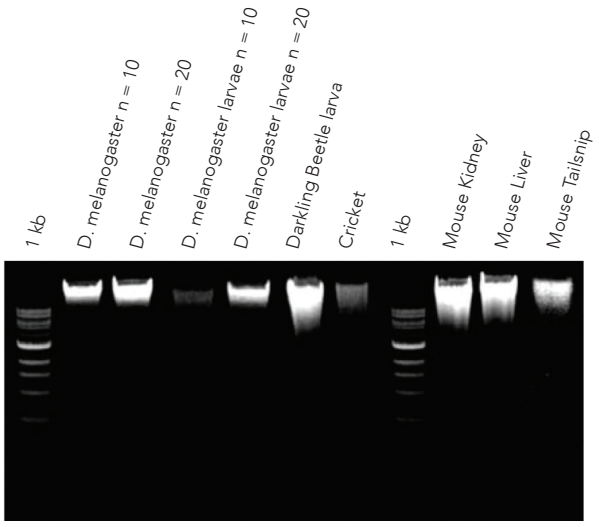
SK - Sample Kit Available

Quick-DNA™ Tissue/Insect Kits

Highlights:

- **Streamlined Workflow:** Lyse & purify using a simple spin-column protocol.
- **Highest Yield:** Included BashingBeads™ ensure complete lysis of tough-to-lyse samples & recovery of total DNA.
- **Ultra-Pure:** Isolated DNA is ready for qPCR, Next-Gen Sequencing, arrays, etc.

High Recovery



Yields of DNA isolated from various insect and mouse samples using the *Quick*-DNA™ Tissue/Insect Kit. Various amounts of sample were processed then equal volumes of eluted DNA were analyzed on a 0.8% (w/v) agarose gel stained with EtBr.

Simple Workflow

Homogenize sample with ZR BashingBead™ Lysis Tube

Filter Lysate with Zymo-Spin™ III-F

Bind, Wash, Elute DNA with Zymo-Spin™ IC or IIC

PCR Ready Ultra-Pure DNA

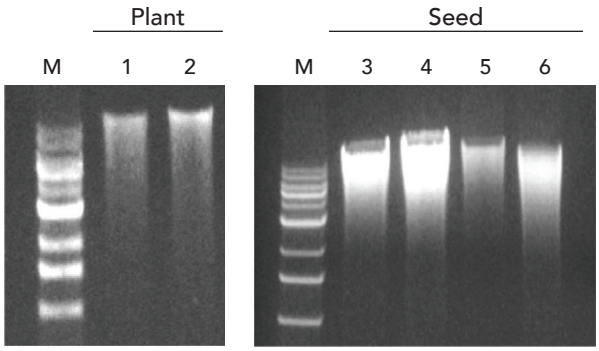
Product	Cat. No.	Size	Specifications	Uses
Quick-DNA™ Tissue/Insect Microprep Kit	D6015	50 preps	Format: Spin-Column Binding Capacity: 5 µg Elution Volume: ≥ 10 µl Processing Time: 15 minutes	DNA isolation from: Insects/arthropods; tough-to-lyse tissues; tough-to-lyse organisms; soft & solid tissues (food)
Quick-DNA™ Tissue/Insect Miniprep Kit	D6016	50 preps	Format: Spin-Column Binding Capacity: 25 µg Elution Volume: ≥ 35 µl Processing Time: 15 minutes	
Quick-DNA™ Tissue/Insect 96 Kit	D6017	2 x 96 preps	Format: 96-Well Plate Binding Capacity: 5 µg Elution Volume: ≥ 25 µl Processing Time: 40 minutes	

Quick-DNA™ Plant/Seed Kits

Highlights:

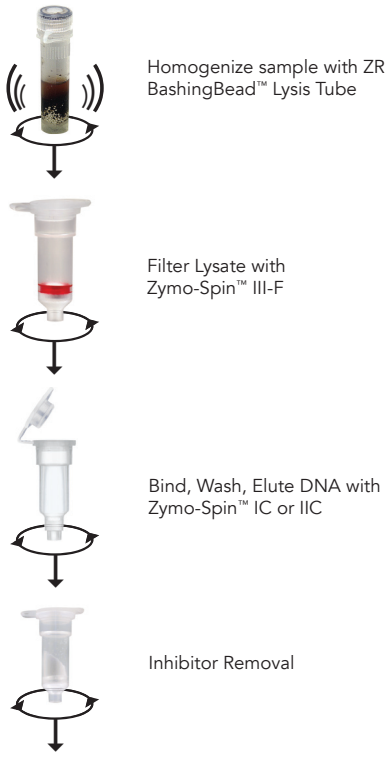
- **Boost Detection:** Included BashingBeads™ ensure complete lysis of tough-to-lyse samples.
- **Inhibitor-Free:** Isolated DNA is ready for qPCR, Next-Gen Sequencing, arrays, etc.
- **Simple & Quick Workflow:** Lyse, purify on column, and filter to remove PCR inhibitors.

High Recovery



Comparison of DNA yields from various plant and seed samples using the *Quick*-DNA™ Plant/Seed Kit. Equivalent amounts of plant materials were processed with equal volumes of eluted DNA analyzed in a 0.8% (w/v) agarose gel stained with EtBr. Arabidopsis thaliana (1), juniper (2), corn kernel (3, 4), sunflower seed (5, 6).

Simple Workflow



Product	Cat. No.	Size	Specifications	Uses
Quick-DNA™ Plant/Seed Miniprep Kit (SK)	D6020	50 preps	Format: Spin-Column Binding Capacity: 25 µg Elution Volume: ≥ 50 µl Processing Time: 20 minutes	DNA isolation from: leaves; other plant material; seeds; fruit
Quick-DNA™ Plant/Seed 96 Kit	D6021	2 x 96 preps	Format: 96-Well Plate Binding Capacity: 5 µg Elution Volume: ≥ 50 µl Processing Time: 50 minutes	

(SK) - Sample Kit Available

Unveiling the Secrets of Halophile DNA

Extracting Genetic Gold from High Salinity Samples

In the seemingly desolate landscapes of the Dead Sea and other salt-rich soils, a hidden world thrives beneath the surface. Salt-loving microorganisms, known as halophiles, populate these extreme environments in abundance, captivating scientists with their unique adaptations. Delving into the genetic makeup of these resilient organisms has become a focal point for researchers eager to unlock the potential within.

The Hidden Life of Halophiles

Halophiles tend to be easily spotted from the vibrant pinks and purple pigments they produce. Along with these vivid colors, several species have been shown to produce compounds capable of being used as biofuels or within pharmacology. Additionally, members of the archaea genus Methanohalophilus have been found to break down toxic and environmentally detrimental sulfur compounds, such as Hydrogen sulfide and Dimethyl sulfide, as well as some greenhouse gasses like methane.[1] Members of another archaea genus, Haloferax, can produce poly-ß-hydroxyalkanoate polymers which can be used to create biodegradable plastics.[2] As the world moves towards more sustainable and environmentally friendly technologies, studies into halophiles have seen an exponential increase, despite all the challenges associated with researching them.

Unraveling Genetic Mysteries

At the heart of the investigation lies the genetic code of halophiles, holding the key to their remarkable survival strategies. Scientists are eager to unravel the mysteries encoded in their DNA, exploring potential applications in fields ranging from biotechnology to environmental science. Extracting and studying halophile DNA opens doors to discovering novel genes and biochemical pathways that may revolutionize our understanding of life's adaptability.

Extracting DNA from high salinity samples comes with its own set of challenges, given the harsh conditions in which halophiles thrive. The high salinity in collected samples interferes with many standard methods of extracting nucleic acids. The process involves careful steps to ensure the preservation of genetic material for subsequent analysis. The following steps outline a general approach for extracting halophile DNA, providing a foundation for researchers venturing into this realm.

Many high salinity soil samples can be processed by adapting the *Quick*-DNA™ Fecal/Soil Microbe Kit with these added steps:

For cellular DNA from high salinity soil samples:

1. Add enough water to cover the soil and sonicate or mix to extract the microbes from the soil.
2. Centrifuge sample at 16,000 *x g* for 3 minutes to pellet microbes.
3. Remove supernatant and process the pellet using the *Quick*-DNA™ Fecal/Soil Microbe Kit.
    i. Note: Replacing the initial Lysis Solution with DNA/RNA Shield™ will help overcome effects of salt.
4. After filtering large particulates from the lysate in step 4 of the protocol, add Genomic Lysis Buffer and then ethanol (400 µl supernatant + 1,200 µl of Binding Buffer + 800 µl of 95% ethanol). The additional ethanol increases the binding efficiency which may have been reduced by the high salt levels.
    i. Note: The amount of ethanol required may need to be titrated to find the optimal level relative to the salinity of the sample.
5. Bind the mixture to the IIC column (included in the kits) by adding 800 µl of the mixture to the column. Centrifuge at 10,000 *x g* for 1 minute. Then discard supernatant and repeat two more times.
6. Proceed with the remainder of the protocol.

For cell-free DNA, the soil sample should be processed in the beadbeater using the DNA/RNA Shield™ Lysis Tubes (microbe). After a centrifugation at 16,000 x *g* for 1 minute, the supernatant can be processed with the *Quick*-cfDNA™ Serum and Plasma kit.

Further Explorations

As scientists continue to explore the hidden world of halophiles and unlock the secrets embedded in their DNA, the potential applications are vast. From biotechnological innovations to gaining insights into extremophile adaptations, the extraction of halophile DNA from high salinity samples marks a crucial step in expanding our understanding of life's diversity and resilience. The seemingly barren landscapes of salt-rich soils are not void of life; they are teeming with organisms that challenge our perceptions and inspire groundbreaking discoveries. In the pursuit of extracting genetic gold from these extreme environments, we embark on a journey of scientific exploration that may pave the way for transformative advancements in various fields.

References:

1. Kiene, R. P., R. S. Oremland, A. Catena, L. G. Miller, and D. G. Capone. 1986. Metabolism of reduced methylated sulfur compounds in anaerobic sediments by a pure culture of an estuarine methanogen. Appl. Environ. Microbiol. 52:1037-1045.
2. Quillaguaman, J.; Guzman, H.; Van-thuoc, D.; Hatti-Kaul, R. 2012. Synthesis and production of polyhydroxyalkanoates by halophiles: current potential and future prospects. Appl. Environ. Microbiol. 85:1687-96.

A Spin Down Memory Lane: The Origin of the Micro-Elution Spin Column

While researching unidentified pathogens, a young virologist grew frustrated with conventional methods of nucleic acid cleanup. Obtaining low concentrations of DNA from large elution volumes was hindering his research and consuming valuable time. Fed up with inefficient protocols and products, he decided to pioneer his own method.

Using a glass microfiber filter, a micro-Eppendorf tube, and a hot needle for perforation, the founder of Zymo Research created the first-ever micro-elution spin-column. This homemade solution offered significantly higher concentrations of DNA from small elution volumes. This level of purity and concentration enabled him to sequence DNA directly from PCR without the once-required cloning step, a breakthrough that had long eluded researchers.

As nearby researchers observed the efficiency of his method, spin-columns began disappearing from his work-station. It was clear that this technology fulfilled a widespread need in the industry, so he decided to make it available to the world. This marked the beginning of the Zymo-Spin™ Micro-Elution Spin Column.

This pioneering technology sparked the first wave of Zymo Research's DNA purification products and quickly made its mark on scientific discovery. Notably, it played a pivotal role in landmark research, including the identification of the West Nile Virus in North America. Today, the Zymo-Spin™ technology continues to streamline laboratory workflows and empower researchers worldwide, facilitating cutting-edge discoveries across diverse fields.

DNA Clean-Up

DNA Clean-Up from Any Enzymatic Reaction

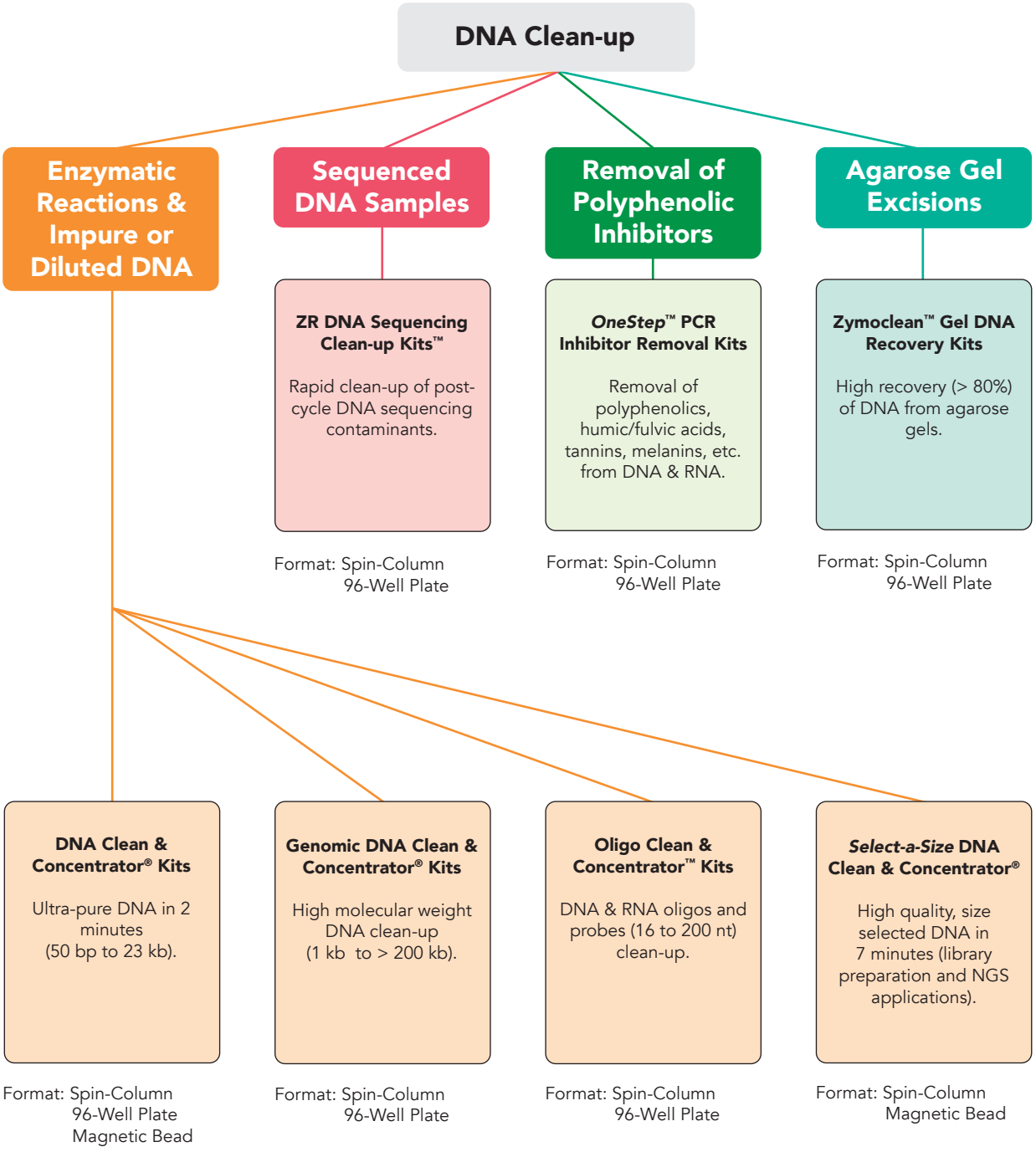
High-quality, inhibitor-free DNA is crucial for successful qPCR, DNA ligation/cloning, sequencing, arrays, and all sensitive downstream applications. Our scientists have developed the most comprehensive technologies for nucleic acid clean-up and concentration from any preparation. Central to the innovation of these is the total removal of salts and alcohols from samples by using uniquely designed spin-columns and plates that ensure complete elution with no buffer carryover. ZymoSpin™ Technology has revolutionized the microcentrifuge column to ensure the purification of high-quality, ultra-pure DNA ready for use in any downstream application.

Zymo-Spin™ Technology Ensures High-quality DNA

Technology Overview: DNA Clean & Concentrator®

Zymo Research pioneered rapid, efficient DNA clean-up and concentration with the introduction of its DNA Clean & Concentrator® (DCC®) product line. Since its inception, the DCC® family of products has evolved into one of the most efficient and versatile methods for cleaning and concentrating DNA from a range of sample sources into minimal elution volumes (i.e., ≥ 6 µl). DNA is effectively desalted and concentrated from PCR, endonuclease digestions, DNA modification reactions, isotope/fluorescence labeling reactions, etc. DNA recovered with the DCC® kits is ideal for use in subsequent sequencing, cloning, ligation, microarray, and endonuclease digestion procedures. The DCC® kits are available as DCC®-5, DCC®-25, DCC®-100, and DCC®-500 formats that are based on the maximal DNA binding capacities (in micrograms) per column treatment as well as a magnetic bead format for automation. Also, the Genomic DNA Clean & Concentrator® is available for rapid clean-up of large-sized DNA (up to and ≥ 200 kb) making it ideal for genomic DNA clean-up. The Oligo Clean & Concentrator™ provides a streamlined method for efficient recovery and clean-up of DNA fragments and oligonucleotides ≥ 16 nt. *Select-a-Size* DCC® is an innovative technology with size selection capabilities that are commonly used for Next-Gen Sequencing cleanups.

Quick Product Guide



Tech Tip

How to Design Primers for Polymerase Chain Reaction (PCR)

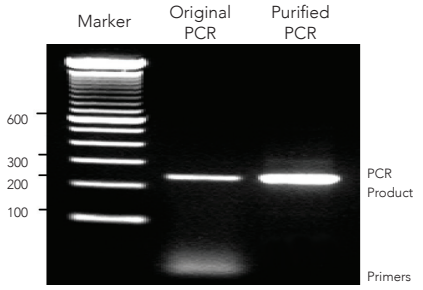
Polymerase chain reaction (PCR) is incredibly useful for amplifying and precisely quantifying a DNA sequence of interest. However, primer design is a critical step in determining the success of a PCR reaction. To optimize this process and minimize future troubleshooting, it's important to adhere to specific recommendations for creating specific and effective primers for PCR.

Tips for Primer Design:

- **Keep the melting temperatures (T_m) of each primer pair within 2°C of one another.** The T_m can be approximately calculated by the formula T_m = (A+T) x 2 + (G+C) x 4, however, more precise, and elaborate T_m calculation tools are available online. Having a similar T_m between primers ensures that the forward and reverse primers will be bound to their complementary DNA strands at the same time, reducing the chance that the primer with the highest T_m will bind to nonspecific DNA sequences.
- **Use an annealing temperature (Ta) 3-5°C below the melting temperature.** The annealing temperature is the temperature at which the primers will bind to a new template strand. This needs to be lower than the T_m so that the primers can efficiently bind to the target, but not too low that the primers bind to nonspecific targets.
- **Keep primers between 18-22 base pairs long.** This primer length is long enough to ensure binding specificity while also short enough to keep the T_m within an appropriate range.
- **Design primers with a GC content of 35-65%.** A GC content between 35% and 65% without long stretches (> 4 bases) of the same nucleotide will ensure enough sequence complexity for optimal primer specificity.
- **Minimize G/C repeats, especially at the 3' end of the primer.** Cytosine and guanine have stronger binding affinity than adenine and thymine and repeats of more than 4 G or C can bind to many places in the genome with high affinity. If these repeats are at the 3' end of the primer, DNA polymerase can extend amplicons in off-target locations, which can ultimately decrease the PCR efficiency.
- **Limit amplicon length to 140 base pairs.** Amplicons between 70-140 base pairs are generally long enough to allow the design of two efficient primers and a probe (if a TaqMan-based assay is desired) for qPCR assays. Longer amplicons are possible, although it may be necessary to adjust the thermal cycler protocol to allow for complete elongation of the new strand. Additionally, if the sample contains heavily fragmented DNA, it is best to keep amplicons smaller to increase the likelihood of having intact target sequences for primer binding.

DNA Clean & Concentrator® – 5 Kits

DNA Clean-Up



Clean & Concentrated DNA. DNA samples, such as the PCR products shown here, can be efficiently purified and concentrated using the DNA Clean & Concentrator®-5.

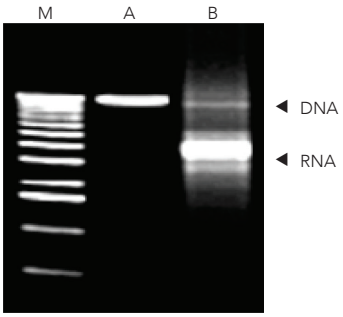
Highlights:

- **Fast & Simple:** Clean and concentrate up to 5 µg of DNA in 2 mins.
- **Highly Concentrated:** Column and plate designs allow DNA to be eluted into minimal volumes (≥ 6 µl) of water or TE buffer.
- **Ultra-Pure:** Eluted DNA is optimal for any downstream molecular biology application, including Next-Gen Sequencing, PCR, restriction digestion, ligations, etc.

Description:

The DNA Clean & Concentrator®-5 (DCC®-5) and ZR-96 DNA Clean & Concentrator®-5 kits allow the purification of up to 5 µg of DNA from PCR, endonuclease digestions, DNA modification reactions, isotope/fluorescence labeling reactions, etc. The kits facilitate the removal of enzymes, as well as free dNTPs and their analogs including radiolabeled and fluorescent derivatives. Eluted DNA is suitable for PCR, arrays, ligation, sequencing, etc.

DNA Clean & Concentrator® – 25 Kits



The DNA Clean & Concentrator® yields high-quality DNA for efficient transcription reactions. Lanes: M: 1 kb Marker (Zymo Research); (A) DNA template purified using the DNA Clean & Concentrator®; (B) a 7 kb RNA transcript generated in vitro from A.

Highlights:

- **Quick Protocol:** Clean and concentrate up to 25 µg of DNA in 2 mins.
- **Highly Concentrated:** Unique column design allows DNA to be eluted in as little as 25 µl.
- **Ultra-Pure:** Eluted DNA is optimal for any downstream molecular biology application, including Next-Gen Sequencing, PCR, restriction digestion, ligations, etc.

Description:

The DNA Clean & Concentrator®-25 (DCC®-25) is designed for rapid desalting and purification of up to 25 µg DNA from enzymatic reactions (e.g., PCR), endonuclease digestions, or cell-free lysates. Simply add the specially formulated DNA Binding Buffer to your sample and transfer to the supplied Zymo-Spin™ Column. The product features Zymo-Spin™ Column technology, which yields high-quality, purified DNA in just minutes and is compatible with cDNA and ssDNA. Eluted DNA is suitable for sequencing, microarray analysis, PCR, nucleotide blotting, and restriction endonuclease digestion procedures.

Product	Cat. No.	Size	Specifications	Uses
DNA Clean & Concentrator® -5 (uncapped columns) SK	D4003T D4003 D4004	10 preps 50 preps 200 preps	Format: Spin-Column Elution Volume: ≥ 6 µl Processing Time: 2 minutes Binding Capacity: 5 µg DNA Size Limits: 50 bp - 23 kb	PCR clean-up; Enzyme removal; dNTP removal, dye removal; cDNA/ssDNA purification; probe purification; lysate DNA clean-up; M13 phage
DNA Clean & Concentrator® -5 (capped columns)	D4013 D4014	50 preps 200 preps		
ZR-96 DNA Clean & Concentrator®-5 (deep well)	D4023 D4024	2 x 96 preps 4 x 96 preps	Format: 96-Well Plate Elution Volume: ≥ 10 µl Processing Time: 15 minutes Binding Capacity: 5 µg DNA Size Limits: 50 bp - 23 kb	
DNA Clean & Concentrator® -25 (uncapped columns)	D4005 D4006	50 preps 200 preps	Format: Spin-Column Elution Volume: ≥ 25 µl Processing Time: 2 minutes Binding Capacity: 25 µg DNA Size Limits: 50 bp - 23 kb	
DNA Clean & Concentrator® -25 (capped columns)	D4033 D4034	50 preps 200 preps		

SK - Sample Kit Available

DNA Clean & Concentrator® – 100 & 500 Kits

Description:

The DNA Clean & Concentrator®-100 & 500 are designed for the rapid desalting and purification of up to 100 µg & 500 µg of DNA, respectively, from PCR, large format restriction endonuclease digestions, or cell-free lysates. Eluted DNA is ideal for nucleotide sequencing, array analysis, PCR, nucleotide blotting, restriction endonuclease digestion procedures, as well as many other downstream applications requiring high-quality DNA. The entire DNA purification/concentration procedure takes less than 20 minutes.

ZR-96 DNA Clean-up Kit™

Description:

The ZR-96 DNA Clean-up Kit™ provides for rapid, 96-well purification and concentration of high-quality DNA from PCR samples, endonuclease digestions, or crude plasmid preparations. Simply add the specially formulated DNA Binding Buffer to your samples and transfer to the wells of the supplied Silicon-A™ Plate. No need for organic denaturants or chloroform, instead our Zymo-Spin™ Plate technology yields high-quality, purified DNA in just minutes.

DNA Clean & Concentrator® MagBead Kit

Description:

The DNA Clean & Concentrator® MagBead Kit is a magnetic bead-based clean-up kit that can purify DNA from PCR, enzymatic reactions, impure extractions, and other sources. The MagBinding Bead technology provides a rapid and scalable workflow that can be adapted for low to high-throughput automated methods for purification and concentration of DNA. The simple single buffer procedure consists of adding DNA MagBinding Buffer and MagBinding Beads to the sample and then washing and eluting high quality DNA.

Product	Cat. No.	Size	Specifications	Uses
DNA Clean & Concentrator® -100	D4029 D4030	25 preps 50 preps	Format: Spin-Column Elution Volume: ≥ 150 µl Processing Time: < 20 minutes Binding Capacity: 100 µg DNA Size Limits: 50 bp - 23 kb	PCR clean-up; enzyme removal; nucleotide/dye removal; cDNA/ssDNA purification; probe purification; lysate DNA clean-up; M13 phage
DNA Clean & Concentrator® -500	D4031 D4032	10 preps 20 preps	Format: Spin-Column Elution Volume: ≥ 2 ml Processing Time: 20 minutes Binding Capacity: 500 µg DNA Size Limits: 50 bp - 23 kb	
ZR-96 DNA Clean-up Kit™ (shallow-well)	D4017 D4018	2 x 96 preps 4 x 96 preps	Format: 96-Well Plate Elution Volume: ≥ 30 µl Processing Time: 20 minutes Binding Capacity: 5 µg DNA Size Limits: 50 bp - 23 kb	
DNA Clean & Concentrator® MagBead Kit	D4012	100 preps	Format: Magnetic Bead Elution Volume: ≥ 30 µl Processing Time: < 30 minutes Binding Capacity: 4 µg DNA Size Limits: 25 bp – 150 kb	

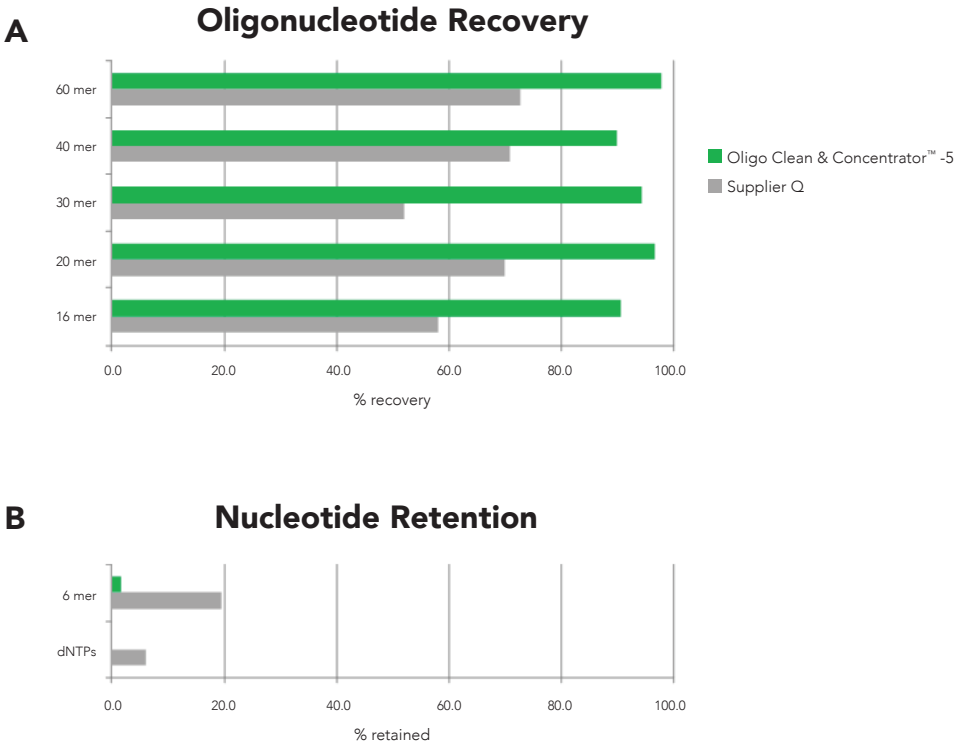
Oligo Clean & Concentrator™ Kits

Highlights:

- **Quick & Simple:** Clean and concentrate DNA and RNA oligonucleotides in 2 minutes.
- **Complete Removal:** Eliminate dyes, salts, enzymes, and short oligos from samples.
- **Ultra-Pure:** Recovered oligos are ready for hybridization, Next-Gen Sequencing, PCR, ligations, etc.

Description:

The Oligo Clean & Concentrator™ provides a streamlined method for efficient recovery and clean-up of DNA/RNA fragments, and oligonucletides from labeling (radioactive, biotin, DIG, etc.) and other enzymatic reactions. Unincorporated nucleotides, short oligos, dyes, enzymes, and salts are effectively removed by the clean-up procedure. There is no need for organic denaturants or chloroform since our Zymo-Spin™ Columns employ a single-buffer system that allows for efficient DNA/RNA adsorption. DNA/RNA is washed and concentrated into an elution of ≥ 6 µl. Purified DNA/RNA is available in just two minutes and is ideal for hybridization, gel shift assays, enzymatic reactions, ligation, sequencing, microarray analysis, etc.



The Oligo Clean & Concentrator™ facilitates > 90% recovery of ssDNA oligo nucleotides (A) and efficient short oligo and nucleotide removal (B).

Product	Cat. No.	Size	Specifications	Uses
Oligo Clean & Concentrator™	D4060 D4061	50 preps 200 preps	Format: Spin-Column Elution Volume: ≥ 6 µl Processing Time: 2 minutes Binding Capacity: 10 µg ssDNA/RNA or 5 µg dsDNA Size Limit: ≥ 16 - 200 nt	Oligonucleotide clean-up; cDNA/ssDNA purification; Probe purification; Enzyme removal; Nucleotide/Dye removal
ZR-96 Oligo Clean & Concentrator™	D4062 D4063	2 x 96 preps 4 x 96 preps	Format: 96-Well Plate Elution Volume: ≥ 10 µl Processing Time: 20 minutes Binding Capacity: 10 µg ssDNA/RNA or 5 µg dsDNA Size Limit: ≥ 16 - 200 nt	

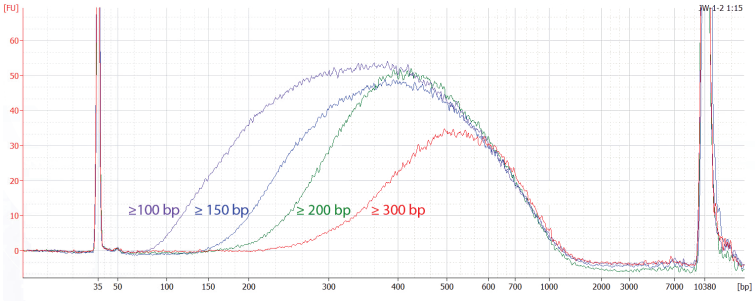
Select-a-Size DNA Clean & Concentrator® Kits

Highlights:

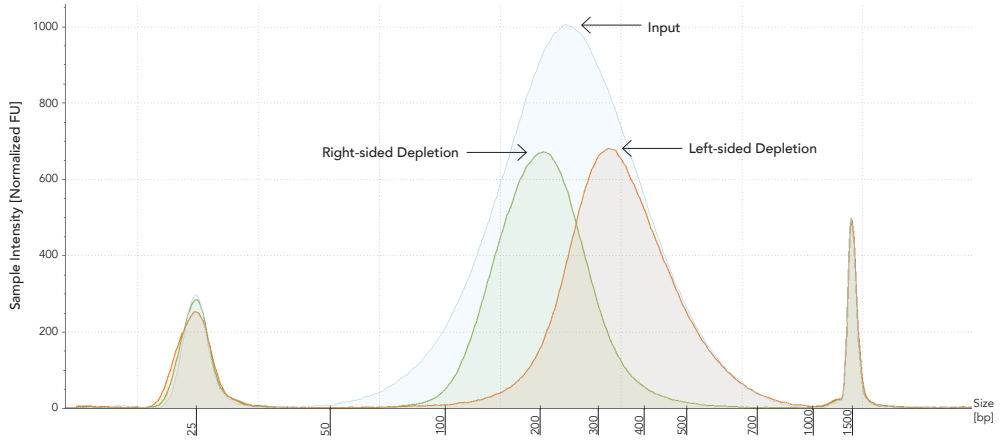
- **Tunable:** Size selection can be tuned from 100 bp to 900 bp with left, right, or double size selection.
- **Highly Concentrated & Ultra-Pure:** 10 µl elutions are well suited for Next-Gen Sequencing, library prep, ligation PCR, etc.
- **Automation Ready:** Magnetic bead format is automation friendly and scalable with scripts readily available.

Description:

The *Select-a-Size* DNA Clean & Concentrator® Kits provide the quickest and easiest method for purifying a desired range of DNA fragment sizes from PCR, endonuclease digestions, ligations, etc. Simply adjust the binding conditions for the desired cutoff then bind, wash, and elute. Selectively recover 100-400 bp DNA fragments or perform a double size selection. Using either our Zymo-Spin™ Column technology or magnetic bead formats yields high-quality DNA in as little as seven minutes, that is ideal for Next-Gen Sequencing, PCR, and other downstream applications.



***Select-a-Size* DNA Clean & Concentrator® allows for selection at ≥300 bp, ≥200 bp, ≥150 bp, ≥100 bp and ≥50 bp.** DNA was size selected according to the *Select-a-Size* DNA Clean and Concentrator® protocol and the results were analyzed by Bioanalyzer. 700 ng of sonicated salmon sperm DNA was used as a standard input to evaluate size selection efficiency and cutoff. Eluted DNA was diluted 1:20 prior to being loaded on the High Sensitivity DNA Chip for analysis.



***Select-a-Size* DNA Clean & Concentrator™ Magbead Kit provides consistent performance in both short fragment (left-sided) depletion and large fragment (right-sided) depletion size selections.** The workflow allows for specific cutoffs that can be modified to suit reaction clean-up, left-sided, right-sided or even double-sided size selection. The DNA fragment size selection range is 150 – 800 bp.

Product	Cat. No.	Size	Specifications	Uses
Select-a-Size DNA Clean & Concentrator® Kit	D4080	25 preps	Format: Spin-Column Elution Volume: ≥ 10 µl Processing Time: 7 minutes Binding Capacity: 3 µg DNA Size Limits: 50 bp - 23 kb Cutoffs: ≥ 300, 200, 150, 100, 50 bp Double Size Selection: Yes	DNA Size Selection, Next-Gen Sequencing, PCR Clean-Up, Library Prep, DNA Clean-Up, Restriction Digestions, and Ligations
Select-a-Size DNA Clean & Concentrator® MagBead Kit SK	D4084 D4085	10 ml 50 ml	Format: Magnetic Bead Elution Volume: ≥ 10 µl Processing Time: 10 minutes Left Cutoffs: 100 bp – 400 bp Right Cutoffs: 200 bp – 900 bp Double Size Selection: Yes	DNA Size Selection, Next-Gen Sequencing, PCR Clean-Up, Library Prep, DNA Clean-Up, Restriction Digestions, Ligations and Automation.

SK - Sample Kit Available

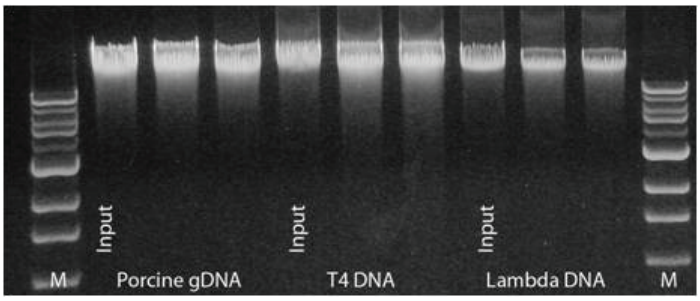
Genomic DNA Clean & Concentrator® Kits

Highlights:

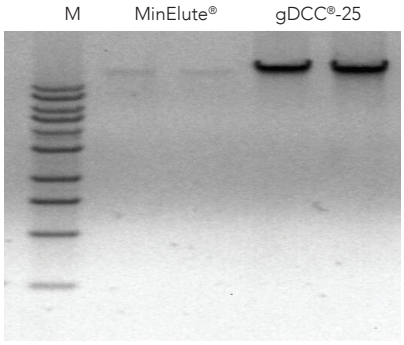
- **Fast and Simple:** Clean and concentrate high molecular weight DNA (e.g., genomic, mitochondrial, plasmid (BAC/PAC), viral, phage, whole genome amplified DNA, etc.) from any enzymatic reaction or impure preparation in 5 minutes.
- **Highly Concentrated:** Unique column design allows DNA to be eluted in as little as 10 µl.
- **Ultra-Pure:** Eluted DNA is optimal for any downstream molecular biology application, including Next-Gen Sequencing, PCR, restriction digestion, ligations, etc.

Description:

The Genomic DNA Clean & Concentrator® is designed for the quick recovery of ultra-pure, large-sized DNA (e.g., genomic, mitochondrial, plasmid (BAC/PAC), viral, phage, etc.) from any enzymatic reaction or impure preparation (e.g., Proteinase K digestion). No need for organic denaturants, chloroform, or messy precipitations, simply add the specially formulated ChIP DNA Binding Buffer to a sample and then transfer the mixture to the supplied Zymo-Spin™ Column. Eluted DNA is ideal for sequencing, PCR, endonuclease digestion, and other enzymatic procedures. The product is also compatible with smaller DNA fragments (50 bp to 10 kb) from PCR, digestions, crude plasmid preparations, cDNA synthesis, etc.



High molecular weight DNA is efficiently purified using the Genomic DNA Clean & Concentrator®-10. Porcine gDNA (~35-50 kb), T4 phage DNA (170 kb), and lambda (λ) phage DNA (48.5 kb) were purified (in duplicate) from input material using the Genomic DCC®. Eluted DNAs were analyzed in a 0.8% (w/v) TAE/agarose/EtBr gel. The size marker "M" is a 1 kb ladder (Zymo Research).



High molecular weight DNA is efficiently purified using the Genomic DNA Clean & Concentrator®-25. Lambda (λ) phage DNA (48.5 kb) was purified (in duplicate) from input material using the Minelute® (Qiagen) and the Genomic DCC®-25 (gDCC®-25). The gDCC®-25 resulted in yields > 40% compared to the MinElute®. Eluted DNAs were analyzed in a 0.8% (w/v) TAE/agarose/EtBr gel. The size marker "M" is a 1 kb ladder (Zymo Research).

Product	Cat. No.	Size	Specifications	Uses
Genomic DNA Clean & Concentrator®-10 SK	D4010 D4011	25 preps 100 preps	Format: Spin-Column Elution Volume: ≥ 10 µl Processing Time: 5 minutes Binding Capacity: 10 µg DNA Size Limit: 50 bp to ≥ 200 kb	High-molecular weight DNA clean-up; PCR clean-up; enzyme removal; nucleotide/dye removal; lysate DNA clean-up
Genomic DNA Clean & Concentrator®-25	D4064 D4065	25 preps 100 preps	Format: Spin-Column Elution Volume: ≥ 35 µl Processing Time: 5 minutes Binding Capacity: 25 µg DNA Size Limit: 50 bp to ≥ 200 kb	

SK - Sample Kit Available

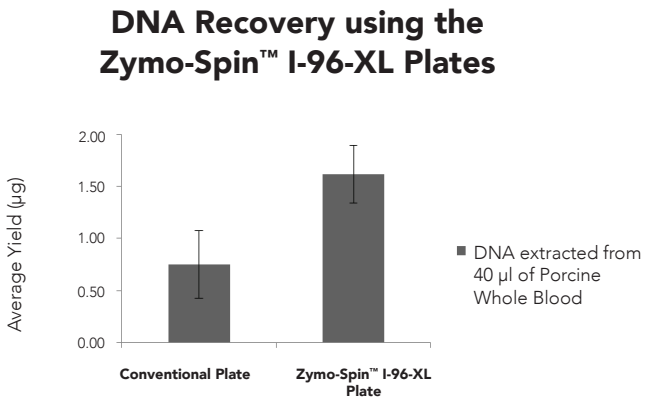
ZR-96 Genomic DNA Clean & Concentrator®-5

Highlights:

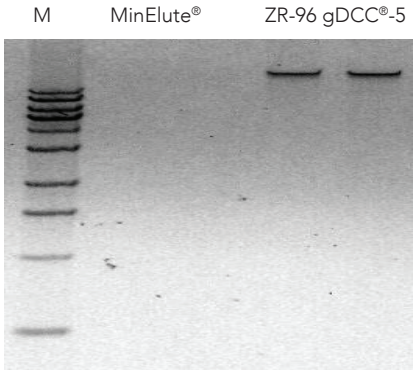
- **High-Throughput Processing:** Clean and concentrate up to 5 µg of high molecular weight DNA from 96 enzymatic reactions or impure preparations simultaneously.
- **Highly Concentrated:** Unique spin-plate design allows DNA to be eluted in as little as 15 µl.
- **Ultra-Pure:** Eluted DNA is optimal for any downstream molecular biology application, including Next-Gen Sequencing, PCR, restriction digestion, ligations, etc.

Description:

The ZR-96 Genomic DNA Clean & Concentrator®-5 (DCC®) is made for high-throughput recovery of ultra-pure, large-sized DNA (e.g., genomic, mitochondrial, plasmid (BAC/PAC), viral, phage, (wga) DNA, etc.) from any enzymatic reaction or impure preparation (e.g., Proteinase K digestion). There is no need for organic denaturants, chloroform, or messy precipitations: simply add the specially formulated ChIP DNA Binding Buffer to a sample and then transfer the mixture to the supplied Zymo-Spin™ I-96-XL Plate. Eluted DNA is suitable for sequencing, PCR, endonuclease digestion, and other enzymatic procedures. The product is also compatible with smaller DNA fragments (50 bp to 10 kb) from PCR, digestions, crude plasmid preparations, cDNA synthesis, etc.



Zymo-Spin™ I-96-XL Plates result in superior yields to other conventional market columns. Genomic DNA extracted using the Zymo-Spin™ I-96-XL Plate results in higher yields from porcine whole blood.



High molecular weight DNA is efficiently purified using the ZR-96 Genomic DCC®-5. Lambda (λ) phage DNA (48.5 kb) was purified (in duplicate) from input material using the Minelute® (Qiagen) and the ZR-96 Genomic DCC®-5 (ZR-96). The ZR-96 Genomic DCC®-5 resulted in yields > 340% compared to the MinElute®. Eluted DNAs were analyzed in a 0.8% (w/v) TAE/agarose/EtBr gel (shown above). The size marker "M" is a 1 kb ladder (Zymo Research).

Product	Cat. No.	Size	Specifications	Uses
ZR-96 Genomic DNA Clean & Concentrator®-5	D4066 D4067	2 x 96 preps 4 x 96 preps	Format: 96-Well Plate Elution Volume: ≥ 15 µl Processing Time: 20 minutes Binding Capacity: 5 µg DNA Size Limits: 50 bp - 200 kb	High-molecular weight DNA clean-up; PCR clean-up; enzyme removal; nucleotide/dye removal; lysate DNA clean-up

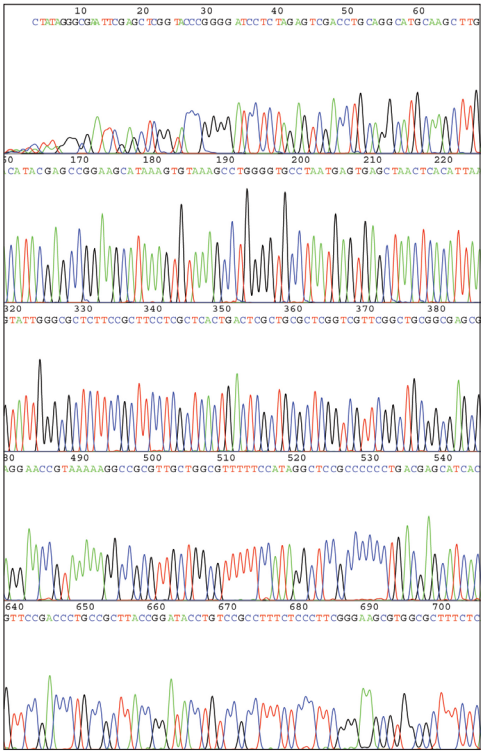
ZR DNA Sequencing Clean-Up Kits™

Highlights:

- **Achieve Long Read Lengths:** Complete elimination of "dye blobs" for high-quality Phred scores.
- **Economical:** Columns can be reused.
- **Flexible Protocol:** 6-20 µl elution volumes allow for direct loading of samples without precipitation or drying.

Description:

The ZR DNA Sequencing Clean-Up Kits™ provide a simple and rapid method for removal of post-cycle sequencing reaction contaminants (i.e., unincorporated fluorescent dyes, residual salts, dNTPs, primers, and enzymes) from DNA extension products. These contaminants can often interfere with the quality and signal strength of sequencing data, including dye peaks or "dye blobs" which may obscure portions of the sequencing chromatogram and interfere with base-calling accuracy of sequencing analysis software. DNA can be eluted with a small volume of water or loading dye containing formamide.



Sequencing chromatogram of pGEM® DNA generated using an ABI 3730xl DNA analyzer. DNA was labeled with ABI BigDye® v3.1 Terminators and cleaned using the ZR DNA Sequencing Clean-up Kit™.

Product	Cat. No.	Size	Specifications	Uses
ZR DNA Sequencing Clean-Up Kits™	D4050 D4051	50 preps 200 preps	Format: Spin-Column Elution Volume: ≥ 6 µl Processing Time: 2 minutes Binding Capacity: 5 µg	Sequencing DNA clean-up; enzyme removal; dye terminator removal; nucleotide/dye removal
ZR-96 DNA Sequencing Clean-Up Kits™	D4052 D4053	2 x 96 preps 4 x 96 preps	Format: 96-Well Plate Elution Volume: ≥ 15 µl Processing Time: 10 minutes Binding Capacity: 5 µg	

OneStep™ PCR Inhibitor Removal Kits

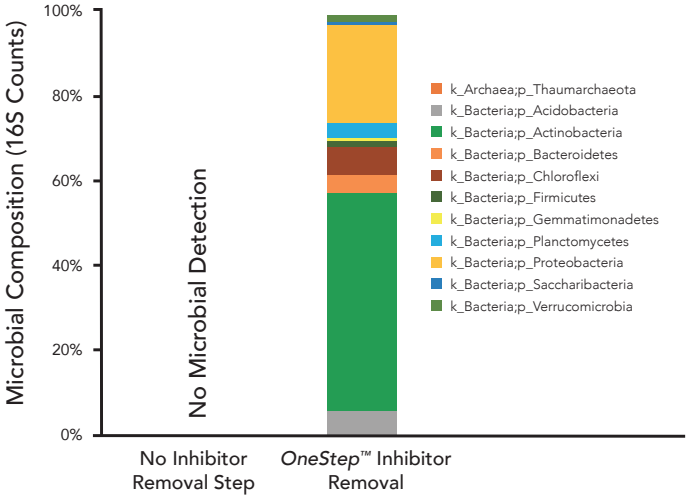
Highlights:

- **Quick & Easy Workflow:** One step procedure for cleaning inhibitor rich DNA & RNA.
- **Robust Inhibitor Removal:** Effi ciently eliminate polyphenolics, such as humic/fulvic acids, tannins, and melanin from extracted DNA & RNA samples for PCR & NGS.
- **High DNA & RNA Yields:** ≥ 80% recovery of PCR inhibitor-free DNA & RNA.

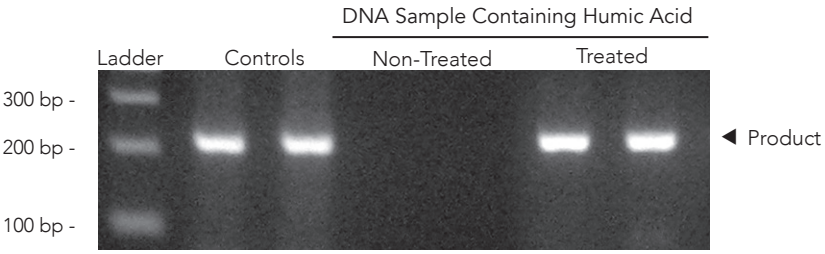
Description:

The *OneStep*™ PCR Inhibitor Removal Kits contain all the components needed for efficient removal of contaminants that can inhibit downstream enzymatic reactions (e.g. PCR and RT) from DNA and RNA preparations. The column or plate formats have been specifically designed for the efficient removal of polyphenolic compounds, humic/fulvic acids, tannins, melanin, etc. from the most impure DNA and RNA preparations. Sample clean-up is as simple as applying, spinning, and recovering a sample from the column or plate.

Obtain NGS Data from Inhibitor Rich Samples



Microbes are successfully detected in DNA extracted from soil using 16S sequencing following treatment with the *OneStep*™ Kit. DNA samples were extracted from soil using the *Quick*-DNA Fecal/Soil Microbe kit (Cat # D6010) and eluted in 100 µl. 50 µl of each eluate was either treated or not treated with the *OneStep*™ PCR Inhibitor Removal Kit. 16s rRNA sequencing was performed on two DNA samples from each group. The taxonomy bar plot represents the phyla of the microbes present in the samples. Samples that did not undergo any inhibitor removal step failed microbe detection.



DNA is efficiently amplified by PCR following humic acid removal with the *OneStep*™ PCR Inhibitor Removal Kit. The figure shows amplification of a 200 bp product from DNA containing humic acid that was treated with the kit. The ladder is a 100 bp DNA marker (Zymo Research).

Product	Cat. No.	Size	Specifications	Uses
OneStep™ PCR Inhibitor Removal Kit SK	D6031	50 preps	Format: Spin-Column Elution Volume: 50 - 200 µl Processing Time: < 5 minutes DNA (RNA) Recovery: 80 - 100%	Polyphenolic PCR inhibitor removal from DNA & RNA (e.g. humic/fulvic acids, tannins, melanin)
OneStep™-96 PCR Inhibitor Removal Kit	D6035	2 x 96 preps	Format: 96-Well Plate Elution Volume: 50 - 100 µl Processing Time: 13 minutes DNA (RNA) Recovery: 50 - 90%	

SK - Sample Kit Available

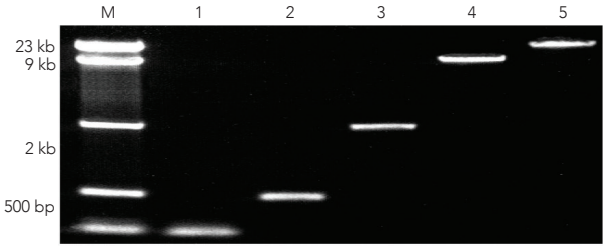
Zymoclean™ Gel DNA Recovery Kits

Highlights:

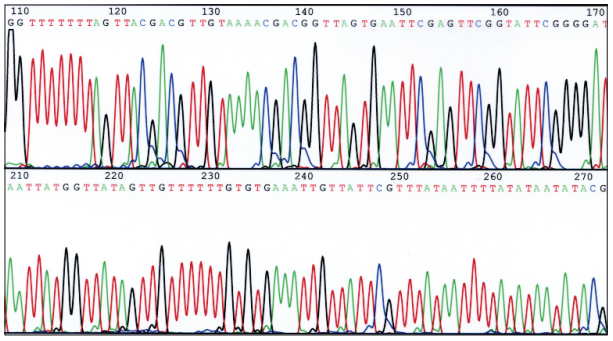
- **Superior Yields:** Recover 80% of DNA from agarose gels.
- **Highly Concentrated:** Unique column design allows DNA to be eluted in as little as 6 µl.
- **Ultra-Pure:** Eluted DNA is optimal for any downstream molecular biology application, including sequencing, PCR, restriction digestion, ligations, etc.

Description:

The Zymoclean™ Gel DNA Recovery and ZR-96 Zymoclean™ Gel DNA Recovery Kits allow for the rapid purification of high-quality DNA from TAE/TBE-buffered agarose gels. The products feature Zymo-Spin™ technology to yield high-quality, purified DNA in just minutes. DNA purified using the Zymoclean™ Gel DNA Recovery Kits is perfectly suited for use in DNA ligation reactions, sequencing, DNA labeling reactions, PCR, etc.



DNA fragments recovered from an agarose gel using the Zymoclean™ Gel DNA Recovery Kit. Lanes: M: DNA Ladder; 1-5: individual ladder DNA fragments.



DNA sequencing chromatogram of a PCR product recovered using the Zymoclean™ Gel DNA Recovery Kit. DNA was recovered from a 2% (w/v) agarose gel and used directly for sequencing.

Product	Cat. No.	Size	Specifications	Uses
Zymoclean™ Gel DNA Recovery Kit (uncapped columns) SK	D4001T D4001 D4002	10 preps 50 preps 200 preps	Format: Spin-Column Elution Volume: ≥ 6 µl Processing Time: 15 minutes Binding Capacity: 5 µg DNA Size Limits: 50 bp - 23 kb	Recover DNA from TAE/TBE agarose gel slices
Zymoclean™ Gel DNA Recovery Kit (capped columns)	D4007 D4008	50 preps 200 preps		
ZR-96 Zymoclean™ Gel DNA Recovery Kit	D4021 D4022	2 x 96 preps 4 x 96 preps	Format: 96-Well Plate Elution Volume: ≥ 15 µl Binding Capacity: 5 µg DNA Size Limits: 50 bp - 23 kb	

SK - Sample Kit Available

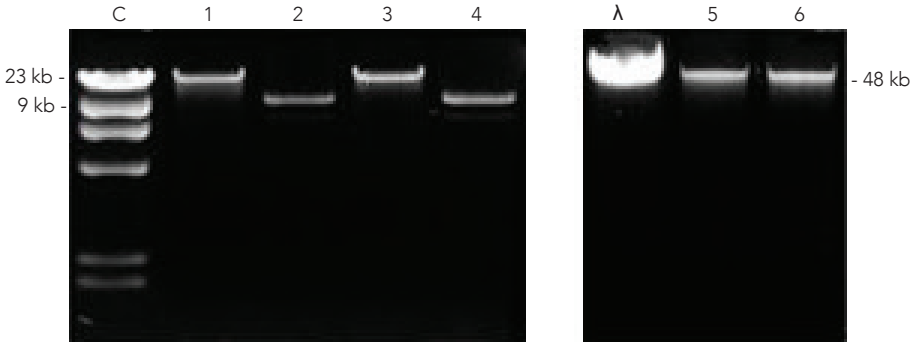
Zymoclean™ Large Fragment DNA Recovery Kit

Highlights:

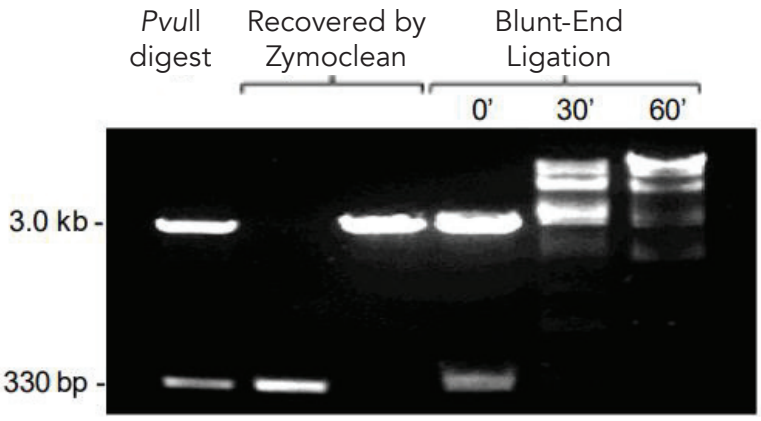
- **Quick and Easy:** Recover high molecular weight DNA (e.g., genomic, plasmid (BAC/PAC), viral, phage, etc.) from agarose gels in 15 minutes.
- **Highly Concentrated:** Unique column design allows DNA to be eluted in as little as 10 µl.
- **Ultra-Pure:** Eluted DNA is optimal for any downstream molecular biology application, including sequencing, PCR, restriction digestion, ligations, etc.

Description:

The Zymoclean™ Large Fragment DNA Recovery Kit provides a streamlined method for the rapid (15 minute) purification and concentration of high-quality large-sized DNA from agarose gels. Simply add the specially formulated Agarose Dissolving Buffer (ADB) to the gel slice containing a DNA sample, dissolve, and then transfer to the supplied Zymo-Spin™ IC-XL Column. No need for organic denaturants or chloroform, our Zymo-Spin™ Column technology yields high-quality, purified DNA in just minutes. DNA purified from this kit is ideal for PCR, sequencing, endonuclease digestion, ligation, etc.



Recovery of large DNA fragments. The Zymoclean™ Large Fragment DNA Recovery Kit was used to recover λ DNA digested with HindIII and separated by agarose gel electrophoresis. Lane C: λ-HindIII digest; lanes 1 & 3: recovered 23 kb λ-HindIII fragments; lanes 2 & 4: recovered 9 kb λ-HindIII fragments. Lane λ: intact λ phage DNA; lanes 5, 6: intact λ ~48 kb bands.



Blunt-ended ligation of DNA fragments purified using the Zymoclean™ Large Fragment DNA Recovery Kit. Fragments from plasmid DNA digested with PvuII were purified, then mixed and ligated for the times indicated in the figure (above).

Product	Cat. No.	Size	Specifications	Uses
Zymoclean™ Large Fragment DNA Recovery Kit	D4045 D4046	25 preps 100 preps	Format: Spin-Column Elution Volume: ≥ 10 µl Processing Time: 15 minutes Binding Capacity: 10 µg DNA Size Limits: ≥ 50 bp ~ 200 kb	Recover high molecular weight DNA from TAE/TBE agarose gel slices

The Missing Link in Divergent Evolution

Unanswered Questions Remain

While genetic evolution is taught in almost every introductory biology class, some questions remain unanswered. One of the most significant questions that evolutionary biologists still face is how differences in the genetic code translate into the vast array of phenotypic differences throughout the natural world. Since changes in the genome do not always clearly correlate to a change in phenotype, studies of speciation can be confounding. Additionally, pinpointing which genetic change corresponds to a particular phenotype can be exceedingly difficult.

An article published in 2019 aims to address some of these challenges by employing advanced genetic screening.[1] The study describes a method of genetic screening that examines the genetic differences between two fungi incapable of sexual reproduction: *Saccharomyces cerevisiae* and *Saccharomyces uvarum*. Given that *S. uvarum* is relatively heat sensitive and *S. cerevisiae* is heat tolerant, scientists wanted to examine the genetic causation behind this phenotypic difference.

Determining A Genetic Bias

To elucidate the genetic basis for the heat-related phenotype, the researchers screened 4,792 nonessential yeast genes and created hemizygotic crosses between *S. cerevisiae* and *S. uvarum* to identify genes of interest for the heat tolerance phenotype. They also examined the mitochondrial genome in a similar manner. After creating their hemizygotes, the researchers isolated the genomic DNA using the *Quick*-DNA™ Fungal/Bacterial Microprep Kit and enriched the mtDNA fractions using a custom enrichment protocol. Subsequently, they eliminated residual inhibitors and concentrated their DNA samples by performing a cleanup with the DNA Clean & Concentrator® Kit. The researchers then created sequencing libraries using the Nextera DNA Library Preparation Kit™ and sequenced the libraries with the Illumina MiniSeq™.

Achieving Greater Insight

Their results indicate that a combination of genetic differences contributed to the observed phenotype. A notable discovery was that many genomic effectors were derived from the mitochondrial genome, including important genes such as COX1 (Cytochrome c oxidase subunit 1), which created a significant heat tolerance phenotype in the hybrid yeast. Advances in genetic screening and similar genomic techniques, made possible by the technological revolution in genomics, are allowing greater insight into molecular genetics. Such studies are crucial in establishing methods to evaluate the process of speciation on a molecular level.

References:
1. Li, X. C., Peris, D., Hittinger, C. T., Sia, E. A., & Fay, J. C. (2019). Mitochondria-encoded genes contribute to evolution of heat and cold tolerance in yeast. Science Advances, eaav1848.

DNA Analysis

Tools for Effective DNA Analysis:

Zymo Research has developed a collection of accurate and affordable solutions for DNA Analysis, enabling researchers to achieve better results more efficiently. Working with human, fungal, or bacterial DNA? Zymo Research has engineered our Femto™ Quantification Kits to ensure your DNA quantification is accurate. These products allow for the quantification of 20 femtograms of DNA in as little as 1 µl of sample. The Femto™ Quantification Kits have a high specificity and sensitivity to ensure accurate quantification, even with a non-target DNA background. Also, our DNA ladders are available in a range of sizes, making DNA size approximation easy for both PCR products as well as plasmid DNA.

Femto™ Quantification Kits

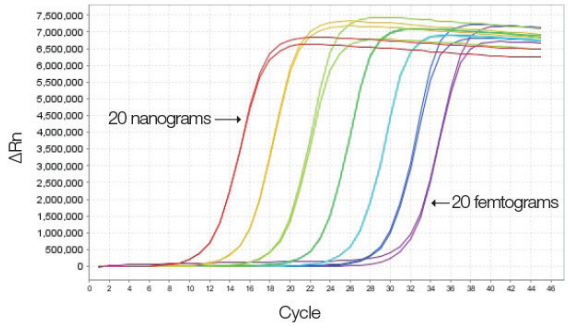
Highlights:

- **High Sensitivity and Specificity:** Accurately quantify as little as 20 femtograms of DNA in a background of non-target DNA in as little as 1 µl of sample.
- **Fast and simple:** Add samples to the PreMix and quantify.
- **Comprehensive Offering:** Kits available for human, bacterial or fungal DNA Quantification.

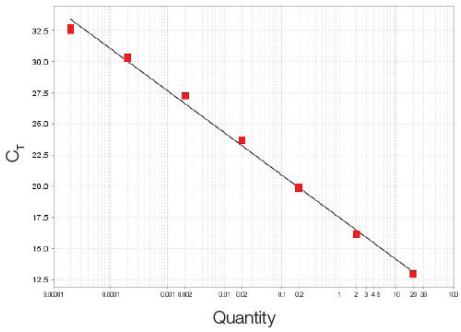
Description:

The Femto™ DNA Quantification Kits can detect and quantify human, bacterial or fungi DNA with high specificity and sensitivity. Human, bacterial or fungi DNA can be reliably quantified in a background of non-target DNA accurately. This is essential for downstream applications that require accurate DNA input amounts including STR analysis, quantifying bacteria DNA template for Next-Gen Sequencing library preparation, and metagenomic analysis. As little as 20 fg from 1 µl of purified biological liquids or other samples can be dependably quantified.

Amplification Plot



Standard Curve



Reliable standards for the quantification of bacterial DNA: Bacterial DNA Standards (measured in duplicates) comprise a 10-fold dilution series ranging from 20 ng to 20 fg.

Product	Cat. No.	Size	Uses	Specifications
Femto™ Human DNA Quantification Kit	E2005	100 rxns	Human DNA detection and quantification	Detection Dye: SYTO 9® DNA Input: 20 fg - 20 ng Standards Included
Femto™ Bacterial DNA Quantification Kit	E2006	100 rxns	Bacterial DNA detection and quantification	
Femto™ Fungal DNA Quantification Kit	E2007	100 rxns	Fungal DNA detection and quantification	

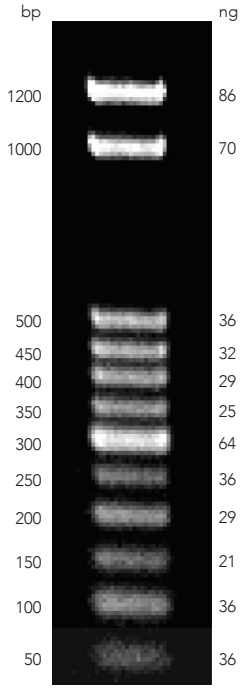
ZR DNA Markers™

Highlights:

- **Ideal for Routine Molecular Biology Techniques:** Markers are available in size ranges suitable for size approximation of PCR products, plasmids, and DNA fragments less than 10 kb.
- **Accurate Analysis:** Each marker contains at least one intensified band for easier and more precise size determination.
- **Convenient Format:** All DNA markers are also available premixed with loading dye for immediate use.

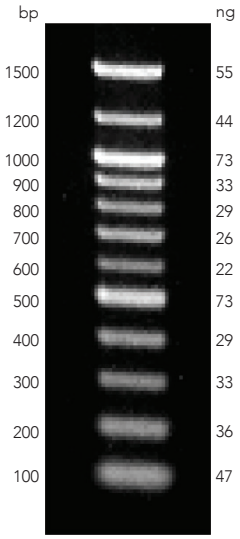
Description:

The ZR DNA Markers™ are defined DNA size fragments that encompass a range of sizes from 50 bp up to 10 kb. This makes DNA size approximation easy for both PCR products as well as plasmid DNA. The ZR 50 bp DNA Marker™, ranging from 50 bp to 1200 bp, is well within the common range of PCR generated DNA fragments. For larger DNA, the ZR 100 bp DNA Marker™ and ZR 1 kb DNA Marker™ are appropriate. Inclusion of an intensified band is provided in each marker for easy identification. Each marker comes with product information detailing the product and its application.



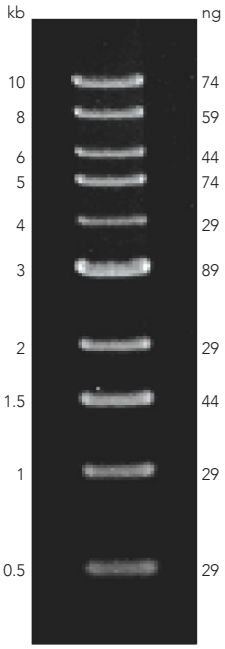
ZR 50 bp DNA Marker™

500 ng of the ZR 50 bp DNA Marker™ was separated in a 1.8% w/v agarose/EtBr/TAE gel.



ZR 100 bp DNA Marker™

500 ng of the ZR 100 bp DNA Marker™ was separated in a 1.5% w/v agarose/EtBr/TAE gel.



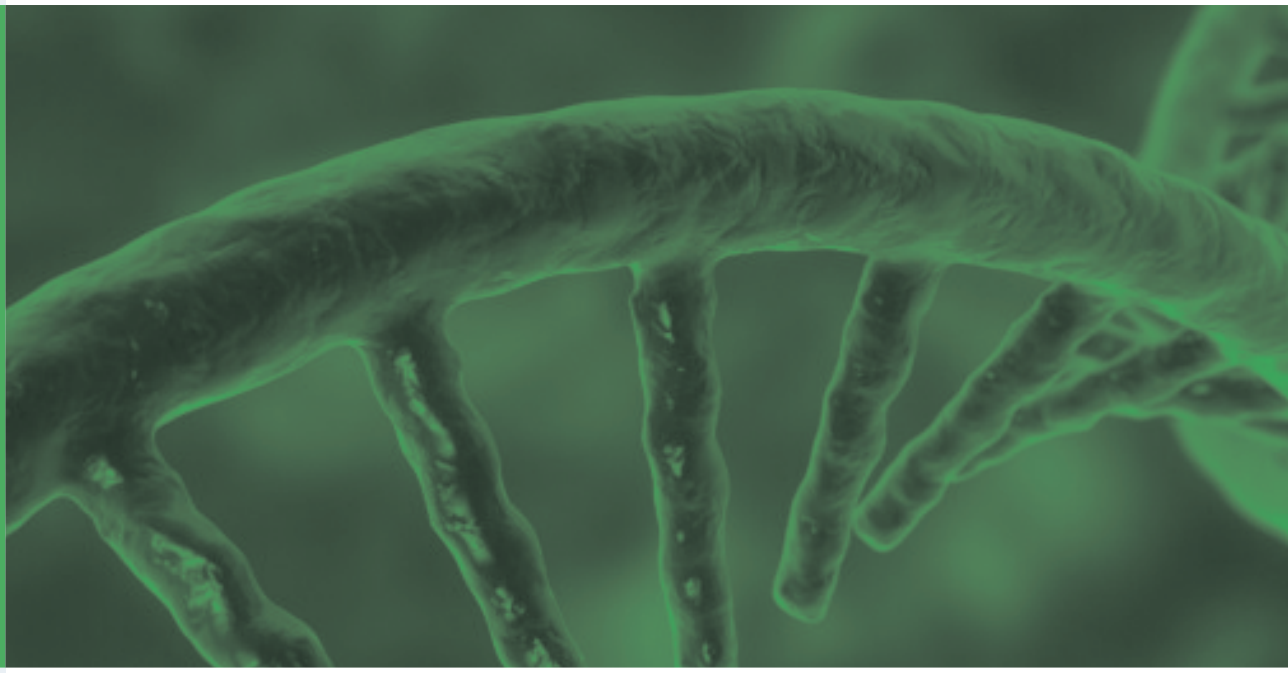
ZR 1 kb DNA Marker™

500 ng of the ZR 1 kb DNA Marker™ was separated in a 0.8% w/v agarose/EtBr/TAE gel.

Product	Cat. No.	Size	Specifications	Uses
ZR 50 bp DNA Marker™	M5001-50 M5001-200	50 µg/100 µl 200 µg/400 µl	Applicable Size Range: 50 - 1200 bp	DNA size standard for gel electrophoresis
ZR 50 bp DNA Marker™ (ready-to-load)	M5004-50	50 µg / 600 µl		
ZR 100 bp DNA Marker™	M5002-50 M5002-200	50 µg / 100 µl 200 µg/400 µl	Applicable Size Range: 100 - 1500 bp	
ZR 100 bp DNA Marker™ (ready-to-load)	M5005-50	50 µg / 600 µl		
ZR 1 kb DNA Marker™	M5003-50 M5003-200	50 µg / 100 µl 200 µg/400 µl	Applicable Size Range: 0.5 - 10 kb	
ZR 1 kb DNA Marker™ (ready-to-load)	M5006-50	50 µg / 600 µl		

RNA Purification

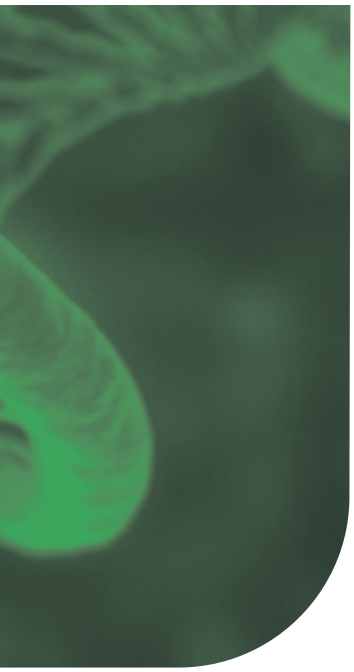
03



RNA is truly an amazing and important biological molecule, playing absolutely critical roles in regulating many types of biological pathways and processes in all species of life. RNA is widely thought to have been both the first catalytic molecule and the first form of self-replicating genetic material during a period of history referred to as "The RNA World". Despite its obvious importance to biology, the numerous functions and activities carried out by RNA molecules have been underappreciated until recently, largely due to previous limitations in the technologies and tools available to use in RNA research. Recent work is uncovering new classes of RNAs and new activities mediated by RNA molecules. It has also become clear that the majority of genomes for most organisms, once thought to be "junk DNA", are actively transcribed to produce functional RNA species. Now, more than ever, it is evident that we are living in the New RNA World.

Zymo Research understands the central role that RNA plays in biological processes and now offers a complete portfolio of products to help researchers perform their RNA experiments efficiently and effectively. This section features information on our RNA products, ranging from the quickest and highest quality RNA purification procedures available to products for cleaning, concentrating, and isolating RNA from a wide variety of sources. The success of all RNA-based experiments depends on first isolating ultra-pure, high-quality RNA. Our industry-leading products ensure that your RNA samples are ready for all standard and Next-Generation applications to investigate this New RNA World!

RNA Purification Made Simple®



RNA Isolation

Samples in TRIzol®, TRI Reagent®, etc.

Direct-zol™ RNA Miniprep Plus Kit

100 µg total RNA (≥17 nt).

*DNase I included

Format: Spin-Column
96-Well Plate
Magnetic Bead

Cells

Quick-RNA™ Miniprep Kit

100 µg total RNA (≥17 nt).

*DNase I included

Format: Spin-Column
96-Well Plate
Magnetic Bead

Biological Fluids & Tissues

Quick-RNA™ Miniprep Plus Kit

100 µg total RNA (≥17 nt) from cells, all tissue types, & blood.

*DNase I, Proteinase K, DNA/RNA Shield™ included

Format: Spin-Column
Magnetic Bead

Quick-RNA™ Viral Kits

Serum, plasma, culture supernatant, urine, saliva, blood, CSF.

Format: Spin-Column
96-Well Plate
Magnetic Bead

Quick-RNA™ Whole Blood Kit

Mammalian whole blood, plasma, serum, pelleted blood cells, nucleated blood.

Format: Spin-Column

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RNA Isolation

Fixed Tissues

Quick-RNA™ FFPE Kit

Zymo-Spin™ column isolation of high-quality RNA.

Format: Spin-Column

Pinpoint™ Slide RNA Isolation System I & II

Total RNA from fresh (I) and FFPE (II) tissue.

Format: Spin-Column

Microbial

Culture

Quick-RNA™ Fungal/Bacterial Kits

50 µg total RNA (≥17 nt).

*BashingBeads™ included

Format: Spin-Column

YeaStar™ RNA Kit

25 µg total RNA.

*Zymolyase included

Format: Spin-Column

Environmental (Fecal, soil, water filtrate and others)

ZymoBIOMICS® RNA Miniprep Kit

Accurate inhibitor-free RNA for microbiomics, metagenomics, and any other molecular applications.

Format: Spin-Column
Magnetic Bead

Quick-RNA™ Fecal/Soil Microbe Microprep Kit

50 µg total RNA (≥17 nt).

*OneStep PCR Inhibitor Removal, BashingBeads™ included

Format: Spin-Column

Plant

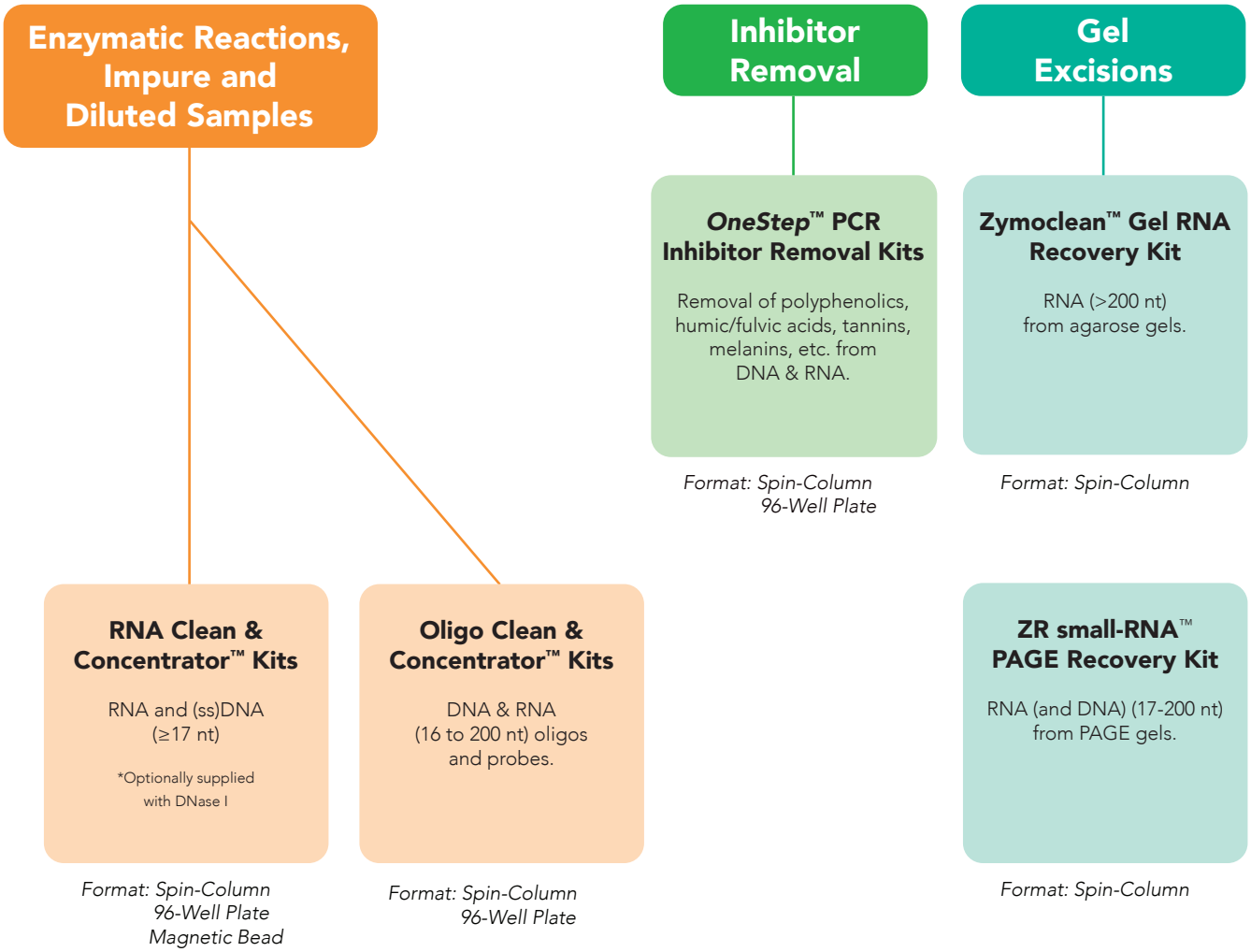
Quick-RNA™ Plant Miniprep Kit

50 µg total RNA (≥17 nt) from leaves, stems, seeds, etc.

*OneStep PCR Inhibitor Removal, BashingBeads™ included

Format: Spin-Column

RNA Clean-Up



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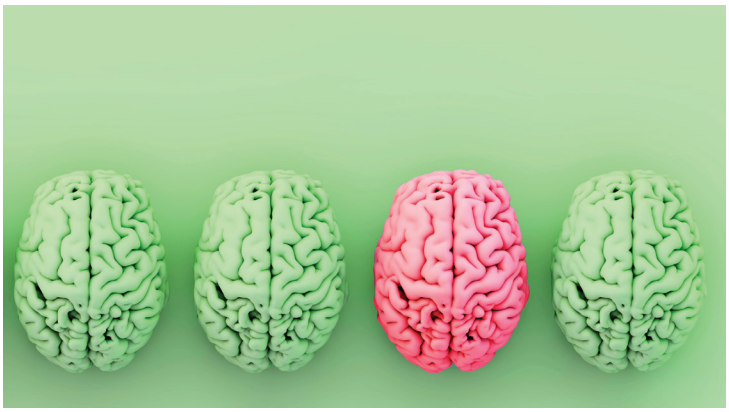
Total RNA Purification

Innovation. Pure & Simple.™

High-quality RNA from Diverse Sample Sources

Zymo Research offers an assortment of products that allow for the simple, rapid, and efficient isolation of total RNA from a variety of biological sources including fresh, frozen, or paraffin-embedded tissues, cultured cells, buccal cells/swabs, whole blood, plasma, serum, urine, yeast, or RNA viruses. All of our spin-column RNA isolation kits feature Zymo-Spin™ Column technology, which yields highly concentrated RNA perfect for applications such as microarrays, denaturing-gel electrophoresis, Northern blotting, and RT-PCR, Next-Gen Sequencing, or other sensitive downstream applications. Each kit has been optimized for a particular application with specialized, nuclease-free components to ensure: 1) Maximum levels of membrane solubilization and cellular disruption, 2) Total inhibition of nuclease activity, 3) Complete deproteinization of the sample, 4) Efficient isolation and concentration of the RNA, 5) Stabilization and safe storage of the RNA.

How to Extract RNA from Hard-to-Lyse Samples in TRIzol®



The Challenge of RNA Isolation

RNA isolation is a challenging procedure. Unlike DNA, which is highly stable, RNA is very unstable and can be quickly digested by RNase enzymes if their activity isn't immediately inhibited. Traditional RNA isolation protocols are also tedious, time-consuming, and unscalable. Since RNA isolation is critical to many scientific enterprises, researchers have optimized protocols and reagents to speed up and simplify the process.

One popular reagent in RNA isolation protocols is TRIzol®. Composed of phenol and guanidine thiocyanate in a mono-phase solution, TRIzol® (or TRI Reagent®) is a cell lysis and RNase-inhibiting solution used for the simultaneous isolation of RNA, DNA, and proteins from biological samples. The components of TRI Reagent® facilitate immediate and effective inhibition of RNase activity, allowing for the isolation of RNA from human, animal, plant, yeast, bacterial, and viral samples with consistent performance on all quantities of tissues or cultured cells.

TRIzol® for Isolating RNA from A Range of Samples

TRIzol® was specifically formulated to isolate total RNA from any sample type in the modern research laboratory, whether in academia or industry: cells, hard to lyse or solid tissue, and infectious biological samples.

Cells

TRIzol® permits efficient RNA isolation from cells, because it quickly breaks down cell structures and inactivate RNases in the sample, protecting RNA from degradation.

Hard-to-Lyse Samples or Solid Tissue

The chemical makeup of TRIzol® also facilitates the release of RNA from hard-to-lyse cells and tissue samples with the aid of mechanical homogenization and/or Proteinase K treatment.

Infectious Biological Samples

TRIzol® inactivates pathogens in plasma, serum, stool, blood, and other biological sample types, eliminating infection risk for researchers and simplifying RNA extraction.

Tips for Efficient RNA Extraction with TRIzol®

RNA extraction with TRIzol® combines phenol and guanidine thiocyanate in a mono-phase solution, facilitating immediate and effective inhibition of RNase activity. However, when preparing biological samples for RNA isolation, certain considerations should be taken into account for an optimal outcome. Here are some sample preparation tips to ensure efficient RNA extraction from cells, hard-to-lyse/solid tissue, and infectious biological samples:

Tech Tip (continued)

How to Extract RNA from Hard-to-Lyse Samples in TRIzol®

Cells
Due to their cellular structure, mammalian cells are the easiest to lyse in TRIzol®, typically needing no additional chemical lysis or mechanical homogenization. To maximize RNA isolation efficiency, adhere to the following while preparing cells in TRIzol®:

- **Add 1 ml TRIzol®** to 5-10 x 10^6 fresh, pelleted mammalian cells. Pipette up and down until cells are fully lysed and homogenous.
- **Tip 1:** If the lysate remains cloudy, opaque, and/or viscous, increase the volume of TRIzol® until clear.
- **Tip 2:** After lysis with TRIzol®, centrifuge the lysate at max speed for 1-2 minutes and transfer the supernatant into a new tube prior to processing. Leave at least 50 µl at the bottom of the old tube to avoid transferring debris.

Hard-to-lyse/Solid Tissue and Infectious Biological Samples
Solid tissues, including heart, lung, liver, muscle, and cartilage, are more difficult to lyse than cells. Additionally, gram-positive bacteria and yeast cells (ex: *Bacillus, Listeria, Saccharomyces*) are also considered hard-to-lyse due to polysaccharides in their cell walls.

Infectious biological samples, such as plasma, serum, stool, and whole blood, are complex, highly proteinated samples with a mixture of easy and tough-to-lyse components, and therefore should be handled like hard-to-lyse samples. To maximize RNA isolation efficiency, adhere to the following while preparing tough-to-lyse samples, solid tissue, and infectious biological samples in TRIzol®:

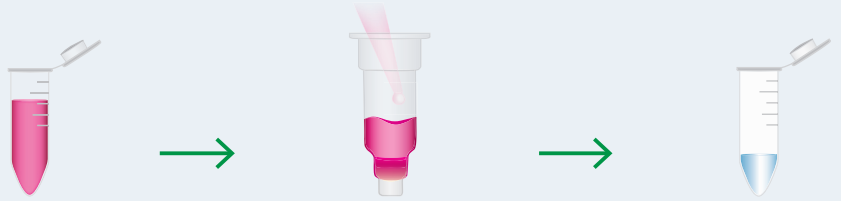
- **Tip 1:** Unlike cells, these sample types require additional chemical lysis and/or mechanical homogenization.
    - We recommend mechanical homogenization as the optimal approach for lysing these samples. For high-speed homogenization (e.g., Bertin Precellys), add 1 ml TRIzol® to a fresh tissue sample (10% w/v) and bead beat at maximum speed for 30-60 seconds. For low-speed homogenization (e.g., Vortex Genie), bead beat at maximum speed for 5-10 minutes. The exact amount of time is sample type-dependent.
    - Chemical lysis with Proteinase K treatment can also be performed prior to the addition of TRIzol®, either with or without mechanical homogenization. If mechanical homogenization was performed, treat the sample in Proteinase K for 30 minutes. If not, increase Proteinase K treatment time to 2-5 hours.
- **Tip 2:** After homogenization and/or Proteinase K treatment, centrifuge down any debris and transfer the supernatant into a new tube prior to purification.
- **Tip 3:** If the supernatant/lysate is still cloudy, opaque and/or viscous, increase the volume of TRIzol® until clear.

Extract RNA from TRIzol® in 7 Minutes with Direct-zol™ RNA Kits

Traditional TRIzol® RNA extraction is an elaborate, time-consuming protocol. Once cells are lysed, then the homogenate must be phase-separated by adding bromochloropropane or chloroform and centrifuging the sample. After centrifugation, three phases are visible: the aqueous phase (RNA), the organic phase (DNA), and the interphase (proteins).

Tech Tip (continued)

How to Extract RNA from Hard-to-Lyse Samples in TRIzol®



When extracting RNA with Direct-zol™ RNA Kits, simply add TRIzol® sample to the spin-column, bind, wash, and elute high-quality RNA in 7 minutes.

RNA is precipitated from the aqueous phase by adding isopropanol, washing with ethanol, and solubilizing the final RNA pellet. Each step in this process is tedious and time consuming, taking more than an hour for the entire process, and must be performed with care. RNA yields and purity are often compromised due to incomplete cell lysis, contamination of the aqueous phase by the phenol phase, or incompletely dissolved final RNA pellets.

The Direct-zol™ RNA kits by Zymo Research, designed to work with TRIzol®, TRI Reagent®, or similar acid-guanidinium-phenol based reagent, achieves total RNA extraction, including small/miRNAs, from any sample in only seven minutes. With the Direct-zol™ RNA kit, you'll achieve consistent results, higher RNA yields (up to four-fold more), and a quicker processing time compared to the conventional RNA isolation method.

No chloroform or phase separation is necessary, and there are no precipitation steps, eliminating aqueous phase contamination and incompletely dissolved RNA pellets.

To isolate RNA with the Direct-zol™ RNA kit, simply add sample lysed in TRIzol® directly to the Zymo-Spin™ Column and then bind, wash, and elute the RNA. The resulting DNA-free RNA is ready for any downstream application, including next-generation sequencing (NGS), RT/qPCR, northern blots, and other protocols requiring pure RNA.

The Direct-zol™ method can also be scaled up and automated with the Direct-zol™-96 MagBead RNA kit, which is compatible with any robotic sample processor (e.g., Hamilton, Kingfisher, and Tecan) — making high-throughput, rapid extraction of high-quality RNA accessible to any research laboratory.

The Experience of Rapid, Efficient RNA Extraction

RNA extraction doesn't have to be a dreaded part of your scientific protocols. The Direct-zol™ RNA kit makes RNA isolation from any sample type — including hard to lyse/solid tissue samples — a breeze. Due to its unsurpassed speed and ability to isolate high-yield, pure RNA from a variety of cell and tissue types, the Direct-zol™ RNA kit is the optimal solution for RNA extraction from samples in TRIzol®. If you'd like to experience for yourself the power of rapid, scalable RNA extraction, visit our website to learn more about Direct-zol™ RNA kits and to request your free sample.

Tech Tip

Tips & Tricks for RNA Isolation

RNA extraction is a notoriously difficult endeavor. Common challenges include RNA degradation, low yield and/or purity, and DNA contamination. Additionally, different sample types have their own unique features that require special attention. For example, microbes (e.g. gram positive/negative bacteria, fungi, archaea, etc.) can have tough cell walls that are refractory to chemical and enzymatic lysis. Other sample types such as feces and plants contain inhibitors (e.g. polyphenolics, humic/fulvic acids, tannins, etc.) that can co-precipitate with RNA and can inhibit downstream analysis such as RT-qPCR.

Below, top scientists have shared their best RNA isolation tips, specifically best practices for maximizing the recovery of high quality, DNA-free RNA.

Stabilizing RNA After Collection

RNA can be unstable and highly susceptible to degradation. Many samples contain high levels of RNases which rapidly and efficiently degrade RNA. To minimize this, it is best to stabilize samples at the moment of collection. Common methods for sample stabilization include snap freezing with liquid nitrogen, dry-ice ethanol baths, or storage in a -80°C freezer. However, these approaches have drawbacks, such as freeze-thaw damage of nucleic acids, and not all researchers have immediate access to these methods at the time of sample collection.
Best RNA Stabilization Methods:

1. Immediate solubilization in a lysis buffer that inactivates RNases (e.g. TRIzol®, RNA Lysis Buffer, etc.). Samples can then be processed immediately or stored frozen.
2. Submersion in a stabilization reagent (e.g. DNA/RNA Shield™) that inactivates nucleases and protects nucleic acids at ambient temperature for extended periods of time. This is particularly helpful for researchers that are collecting samples in the field or working with precious patient samples (e.g. tissue biopsies, whole blood, etc.).

Ensure Complete Sample Lysis

During RNA extraction, the best way to maximize RNA yield and quality is to ensure complete sample lysis. However, not all samples will be susceptible to the same lysis regimen. For example, blood cells (e.g. lymphocytes, PBMCs, etc.) and microbial cells tend to be more difficult to efficiently lyse. Simply adding a detergent-based lysis buffer may not always be sufficient. To help improve lysis, it is helpful to pair the lysis buffer with a mechanical lysis step (e.g. bead beating) or include an enzymatic lysis step upstream (e.g. proteinase K, lysozyme, etc.) (Figure 1).

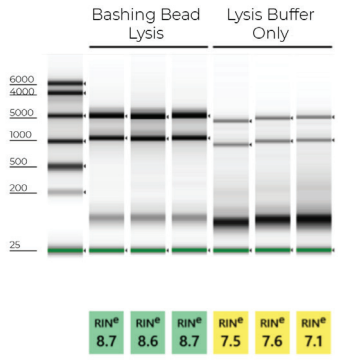


Figure 1: Total RNA extracted from *E. coli* cells collected in lysis buffer and mechanically homogenized with bashing beads (samples 1-3) vs extraction with the lysis buffer alone (samples 4-6). Mechanical homogenization in lysis buffer yields robust 23S/16S ribosomal bands and higher ribosomal integrity numbers (RIN). Agilent 2200 TapeStation®.

Furthermore, it is important to note that complete sample lysis also helps the extraction procedure run smoothly. Incomplete lysis with column-based extraction methods can cause column clogging, buffer carryover, DNA contamination, and incomplete elution. With all of this in mind, Zymo Research has gone to great lengths to optimize the most efficient lysis regimens for all common sample types.

Tech Tip (continued)

Tips & Tricks for RNA Isolation

How to Eliminate DNA Contamination

Another common problem associated with RNA extraction is DNA contamination. The presence of DNA can skew UV/VIS based quantification methods (e.g. Nanodrop), artificially increasing the RNA quantification results. Plus, it can also result in false readings in more sensitive downstream applications (e.g. RNA-seq). To ensure that you are getting the most accurate quantification measurements and to avoid any discrepancies in downstream analysis, it is important to eliminate any DNA carryover. This can be done in a variety of ways (e.g. TRIzol® phase separation, DNA removal columns, and DNase treatment).

The fastest method for confirming the presence of DNA is to visualize the RNA samples (e.g. agarose gel, Agilent TapeStation®, etc.) and look for any high molecular weight fragments above the 28S ribosomal RNA band (Figure 2). Other methods, such as qPCR or Qubit, can also be used and are preferable if you are performing downstream applications sensitive to DNA contamination.

Zymo Research has developed its RNA extraction kits with novel buffer and column systems that bind and extract RNA while eliminating contaminating DNA. In comparison, many other products on the market are co-purification based, and thus retain high levels of DNA contamination. As an added value, out best RNA isolation kits include a DNase I set for on-column treatment. This removes the need for a post-extraction DNase treatment and clean-up steps as well as streamlines the process from extraction to downstream application. Figure 3 below illustrates how effective the Zymo on-column DNase treatment is based on the lack of DNA amplification via PCR.

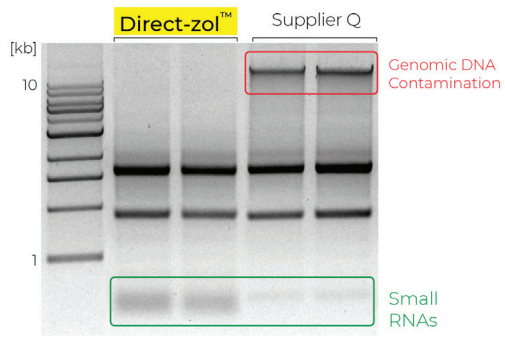


Figure 2: RNA profiles from human epithelial cells visualized using agarose gel electrophoreses. The RNA extracted using a Zymo Research kit is free of contaminating genomic DNA and has a higher recovery of small RNAs compared to Supplier Q.

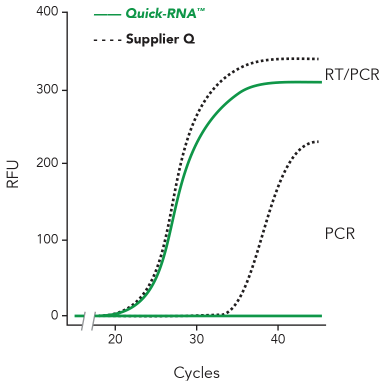


Figure 3: RNA isolated with the Zymo Research *Quick*-RNA™ kit (green) is DNA-free vs. sample isolated with Supplier Q's kit (dashed line). Total RNA was isolated from 10^6 human epithelial cells (with on-column DNase treatment for both kits). Each amplification curve represents an average of three independent isolation experiments.

Choosing the Best RNA Isolation Kits for the Job

Knowing that RNA isolation is not a one-size fits all process, Zymo Research has developed a wide array of the best RNA isolation kits that are tailored to fit most sample types. Plus, most of these RNA isolation kits are available in various formats (i.e. Microprep, Miniprep, 96-well, Magnetic Bead, etc.) to suit different input amounts and throughput.

Tech Tip (continued)

Tips & Tricks for RNA Isolation

As a reference, Table 1 shows specific sample types with the recommended RNA extraction method/kit from Zymo Research. Also, the Zymo Research technical support team is always available to help ensure successful RNA extractions in any workflow.

Samples in TRIzol®	Direct-zol™ RNA Kits
Cells, Tissue, Blood, and other Biological Fluids	*Quick*-RNA™ Kits
Viral RNA	*Quick*-RNA™ Viral Kit
Whole Blood	*Quick*-RNA™ Whole Blood
Urine	ZR Urine RNA Isolation Kit™
Tissue Sections	Pinpoint™ Slide RNA Isolation System
FFPE Samples	*Quick*-RNA™ FFPE Miniprep
cfRNA from Serum, Plasma, CSF, and Amniotic Fluid	*Quick*-cfRNA™ Serum & Plasma Kit
Feces, Soil, Biofilm, Water	ZymoBIOMICS™ RNA Miniprep Kit
Plant Samples	*Quick*-RNA™ Plant
Microbial Cultures	*Quick*-RNA™ Fungal/Bacterial Kits
Insects (mosquitos, bees, drosophila, ticks, etc.)	*Quick*-RNA™ Tissue/Insect Kit
RNA from Enzymatic Reactions, aqueous phase, etc.	RNA Clean & Concentrator™ Kits (RCC)
RNA from Agarose Gels	Zymoclean™ Gel RNA Recovery Kit
RNA containing PCR inhibitors (polyphenolics, humic/fulvic acids, tannins, etc.)	OneStep™ PCR Inhibitor Removal Kit
Sample Collection and RNA Stabilization	DNA/RNA Shield™

Table 1. Recommended RNA extraction kit for each sample type

Mastering RNA Extractions

High-quality total RNA can be recovered from any sample type by keeping in mind three simple tips: ensure sample stabilization post collection, lyse the sample thoroughly and completely, and eliminate any potential DNA contamination. These tips will make it easier to recover RNA that is suitable for any downstream application and obtain downstream results that are accurate and reliable every time. Also, all-inclusive products, like those listed above, can simplify the extraction procedure, and are supported by free technical support teams that can provide any additional recommendations and help anyone become an RNA extraction master!

GET IT DIRECT

TRIzol® In. RNA Out.

Direct-zol™ RNA Kits

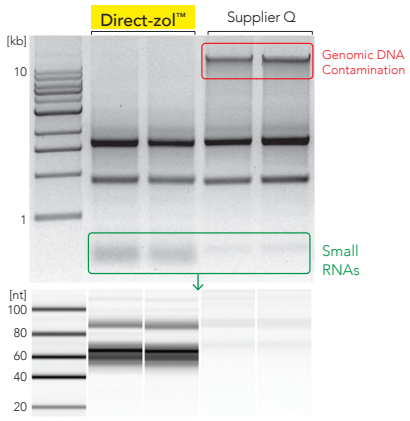
- **Easy Handling:** No phase separation or precipitation steps.
- **NGS-Ready:** Ultra-pure RNA without phenol carryover. No DNA contamination (DNase I included).
- **Non-Biased:** Complete RNA recovery without miRNA loss.

Description:

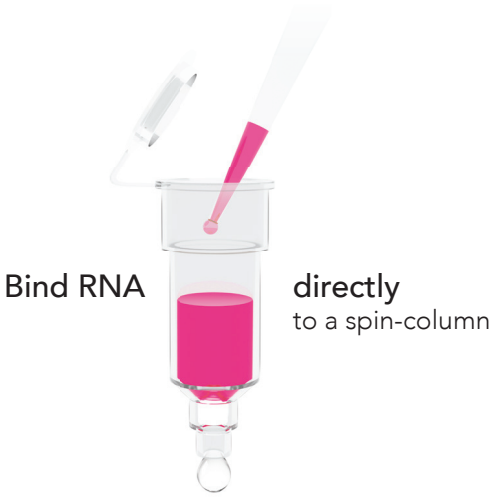
The Direct-zol™ RNA kits facilitate efficient and consistent purification of high-quality (DNA-free) total RNA (including miRNAs) directly from samples stored in TRIzol®, TRI Reagent®, and all other acid-guanidinium-phenol based reagents. The innovative Direct-zol™ procedure bypasses phase separation and precipitation steps, saving time and also eliminating phenol carryover without compromising RNA quality. Direct-zol™ technology couples the effectiveness of TRI Reagent®, useful for infectious agent inactivation and sample preservation, with a convenient, hassle-free, mess-free procedure for DNA-free RNA.

www.zymoresearch.com | info@zymoresearch.com | tel: (949) 679-1190 | toll-free: (888) 882-9682 | fax: (949) 266-9452

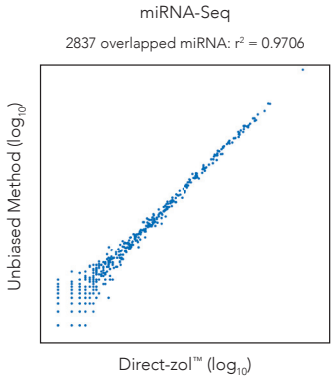
NGS-Ready RNA from TRIzol® in 7 Minutes



High-quality, intact, small and large RNA are efficiently recovered using a Direct-zol™ RNA kit compared to using a Supplier Q kit. RNA is DNA-free and ready for all downstream applications, including NGS.

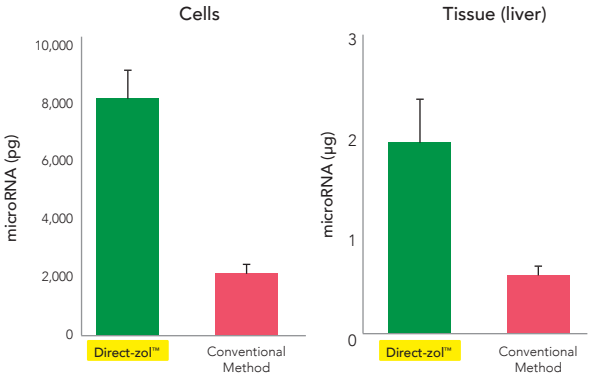


Non-Biased miRNA Recovery



RNA purified from TRIzol® using Direct-zol™ RNA compared to an unbiased method (mirVana™, Ambion). Data is highly correlated (2837 overlapped miRNA: r2 = 0.9706). Analysis was performed using miRNA-Seq (MiSeq™, Illumina).

Highest Yields



Direct-zol™ RNA kits recovered ~4-fold more miRNA (<40 nt) than conventional methods. miRNA purified from cells and tissue were quantified using Bioanalyzer small RNA chip.

Product	Cat. No.	Size	Binding Capacity	Minimum Elution	(Animal) Cells	Tissue
Direct-zol™ RNA Miniprep Plus Kit	R2070, R2071* R2072, R2073*	50 preps 200 preps	100 µg	50 µl	≤ 10^7	≤ 50 mg
Direct-zol™ RNA Miniprep Kit SK	R2050, R2051* R2052, R2053*	50 preps 200 preps	50 µg	25 µl	≤ 5 x 10^6	≤ 25 mg
Direct-zol™ RNA Microprep Kit SK	R2060, R2061* R2062, R2063*	50 preps 200 preps	10 µg	6 µl	≤ 10^6	≤ 5 mg
Direct-zol™ -96 RNA Kit	R2054, R2055* R2056, R2057*	2 x 96 preps 4 x 96 preps	10 µg	10 µl	≤ 10^6	≤ 5 mg
Direct-zol™ -96 MagBead RNA Kit	R2100, R2101* R2102, R2103*	96 preps 4 x 96 preps	10 µg	50 µl	≤ 10^6	≤ 5 mg
Direct-zol™ DNA/RNA Miniprep Kit	R2080T R2080 R2081*	10 preps 50 preps 50 preps	25 µg DNA and 50 µg RNA	25 µl	≤ 5 x 10^6	≤ 25 mg

* Supplied with TRI Reagent®. Compatible with samples stored in TRIzol®, TRI-Reagent®, RNAzol®, QIAzol®, and all other acid-guanidinium-phenol reagents. SK - Sample Kit Available

Direct-zol™ 96 MagBead RNA Kit

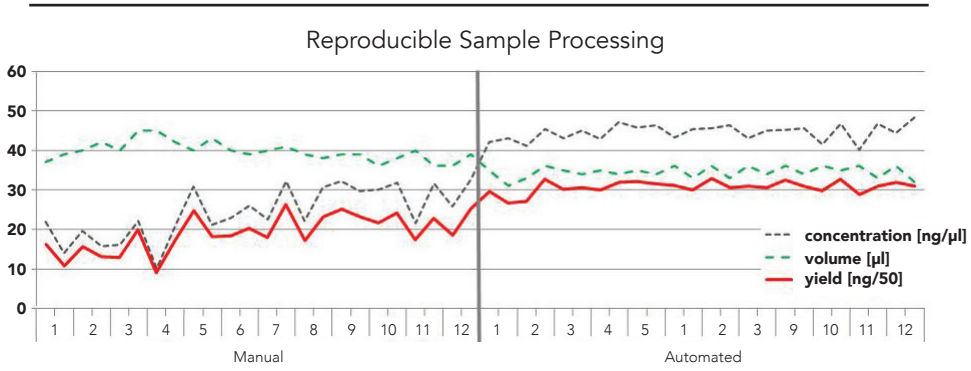
Highlights:

- High-throughput, magnetic bead based purification of high-quality (DNA-free) total RNA directly from samples stored in TRIzol®, TRI Reagent® and all other acid-guanidinium-phenol based reagents.
- Eliminates phase separation and precipitation procedures.
- Efficient, broad range purification of small and large RNAs from cells, tissues, biological liquids, *in vitro* transcripts, etc.
- Automation ready!

Description:

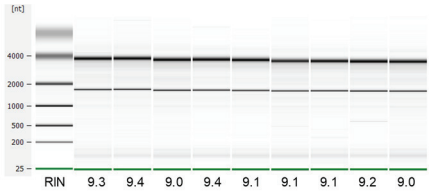
The Direct-zol™ 96 MagBead RNA Kit is a high-throughput adaptation of Direct-zol™ technology for high-quality RNA isolation directly from samples in TRI Reagent® and similar. The magnetic bead format allows the procedure to be easily automated. The extraction method inactivates viruses and other infectious agents. Total RNA including small and non-coding RNAs (17-200 nt) is effectively isolated from a variety of sample sources (cells, tissues, serum, plasma, blood, biological liquids, etc.) using this product.

RNA Directly from TRI Reagent® – Now Automated!



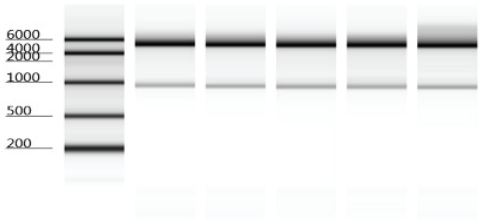
Comparison between manual and automated (Freedom EVO®, Tecan) sample processing with the Direct-zol™ 96 MagBead RNA Kit across a 96-Well plate. RNA was purified from human epithelial cells (5 x 10^5/well).

High-Quality Total RNA



RNA quality (RIN) assessed using a Bioanalyzer. RNA was purified from epithelial cell using the the **Direct-zol™-96 MagBead RNA kit** on Freedom EVO® (Tecan).

Efficient Small RNA Recovery



Small RNA recovery with the **Direct-zol™-96 MagBead RNA kit**. (Small RNA Chip gel image shown; Bioanalyzer).

Product	Cat. No.	Size	Specifications	Uses
Direct-zol™ 96 MagBead RNA Kit	R2100, R2101* R2102, R2103*	96 preps 4 x 96 preps	Format: Magnetic Bead Elution Volume: 50 µl Binding Capacity: 10 µg/prep. Size Limit: ≥ 17 nt Processing Time: 45 minutes	High-throughput & automated RNA isolation from samples stored in TRI Reagent® (Molecular Research Center, Inc.), RNAzol®, QIAzol®, TriPure®, TriSure® (Bioline) and all other acid-guanidinium-phenol reagents including cells from culture; Solid tissue; Plasma; Serum; Whole blood; *in vitro* processed RNA

* Supplied with TRI Reagent®. Compatible with samples stored in TRIzol®, TRI-Reagent®, RNAzol®, QIAzol®, and all other acid-guanidinium-phenol reagents.

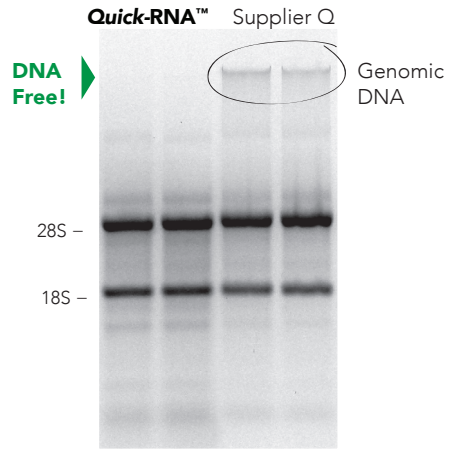
Technology Overview: *Quick*-RNA™

High Quality DNA-free RNA from Diverse Sample Sources

The *Quick*-RNA kits facilitates fast, precise, and phenol-free purification of total RNA (including small RNAs ≥ 17 nt) from diverse sample sources. These kits have been optimized for rapid, specific isolation of total (≥17 nt), large (≥200 nt), or small (17-200 nt) RNA species. The included Zymo-Spin™ Column and Plate technologies enable unprecedented sample concentration with elution volumes as little as 6 µl. The *Quick*-RNA™ kits remove the vast majority of genomic DNA (Spin-Away™ Filter) and feature convenient in-column DNase I treatment.

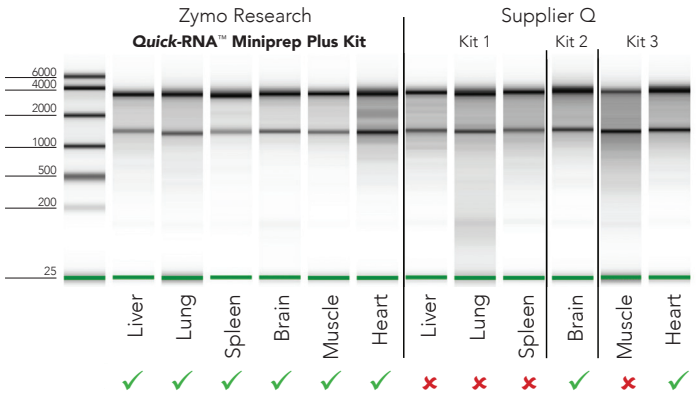
All *Quick*-RNA™ kits include DNase I for DNA-free RNA – Right Away!

Quality



The *Quick*-RNA™ kits yield high quality total RNA. High levels of genomic DNA contamination are present in the preps from Suppliers Q but not with the *Quick*-RNA™ kits. Total RNA was isolated from human epithelial cells (sans DNase treatment).

Versatility



High-quality total RNA is isolated from various tissue types using the *Quick*-RNA™ Miniprep Plus Kit. In comparison, RNA isolated from the same tissue types using three kits recommended by Supplier Q (Agilent 2200 TapeStation®; Red = low quality).

Value

	Quick-RNA™	Supplier Q
Small RNA (≥17 nt) recovery	Yes	No
DNase I included	Yes	No
gDNA removal column included	Yes	No
Proteinase K	Yes*	No
DNA/RNA Shield™ (for sample storage)	Yes*	No

**Quick*-RNA™ Miniprep Plus Kit*

Quick-RNA™ Kits

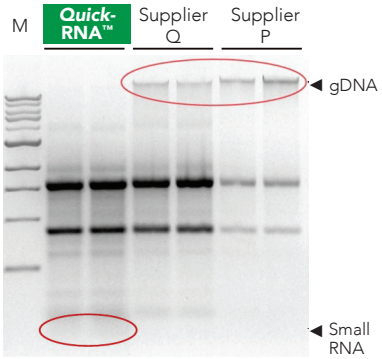
Highlights:

- **Broad Range:** Extract total RNA (including small/micro RNA) from any sample.
- **DNA-Free:** Genomic DNA removal column and DNase I included.
- **NGS-Ready:** RNA is ready for all downstream applications including Next-Gen Sequencing, RT-qPCR, hybridization, etc.

Description:

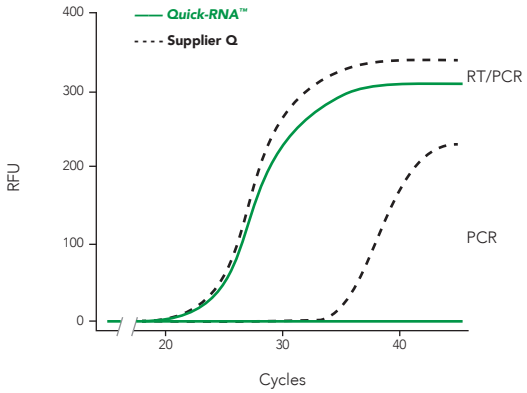
The *Quick*-RNA™ kits are innovative products designed for the easy, reliable, and rapid isolation of DNA-free total RNA from a wide range of cell and tissue samples. *Quick*-RNA™ and Zymo-Spin™ Column technologies enable high yields of quality total RNA (including small RNAs 17-200 nt) in minutes. Simply add the provided RNA Lysis Buffer to extract total RNA from the sample of interest, then purify the RNA using the provided Zymo-Spin™ columns or plate. The result is highly-concentrated, DNA-free RNA that is suitable for subsequent RNA-based methods including RT-qPCR, hybridization, sequencing, etc. In addition, the kit can be used for enrichment of small and large RNAs in two separate fractions.

High-Quality RNA



Broad range RNA without genomic DNA contamination. The *Quick*-RNA™ Miniprep Kit compared to kits from Suppliers Q and P. 1% (w/v) agarose gel, M is a 1 kb DNA marker.

Ultra-Pure



RNA isolated with *Quick*-RNA™ is DNA-free compared to a Supplier Q kit. Total RNA was isolated from 10^6 human epithelial cells (with in-column DNase treatment for both kits, n=3).

Product	Cat. No.	Size	Binding Capacity	Minimum Elution	(Animal) Cells	Tissue	Sample Inputs
Quick-RNA™ Microprep SK	R1050 R1051	50 preps 200 preps	10 µg	6 µl	≤ 10^6	≤ 5 mg	Cells; Soft Tissue
Quick-RNA™ Miniprep SK	R1054 R1055	50 preps 200 preps	100 µg	50 µl	≤ 10^7	≤ 50 mg	Cells; Soft Tissue
Quick-RNA™ Midiprep	R1056	25 preps	1 mg	200 µl	≤ 10^8	≤ 100 mg	Cells; Soft Tissue
Quick-RNA™ 96	R1052 R1053	2 x 96 preps 4 x 96 preps	10 µg	25 µl	≤ 10^6	≤ 5 mg	Cells; Soft Tissue
Quick-RNA™ MagBead	R2132 R2133	96 preps 4 x 96 preps	15 µg	50 µl	≤ 10^6	≤ 5 mg	Cells; Any Tissue; Whole Blood

SK - Sample Kit Available

Quick-RNA™ Miniprep Plus Kit

Highlights:

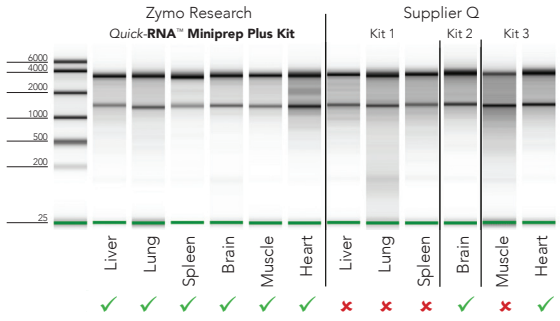
- High-quality total RNA (including small/micro RNAs) from all tissues, cells, whole blood, and biological fluids.
- Worry-free sample storage at ambient temperatures with provided DNA/RNA Shield™.
- DNA-free RNA is ready for use in any downstream application.
- No organic denaturants!

Description:

The *Quick*-RNA™ Miniprep Plus Kit is an innovative and versatile product designed for the easy, reliable, and rapid isolation of DNA-free RNA from all tissue types (up to 50 mg), cells (up to 10^7 animal), whole blood, and biological fluids. The provided DNA/RNA Shield™ stabilizes samples, allowing them to be stored without the need for immediate freezing or processing for up to one month. Furthermore, DNA/RNA Shield™ inactivates RNases as well as microbial pathogens (viruses, bacteria, etc.). The procedure combines a unique buffer system with Zymo-Spin™ Column technology to yield high quality total RNA (including small RNAs 17-200 nt).

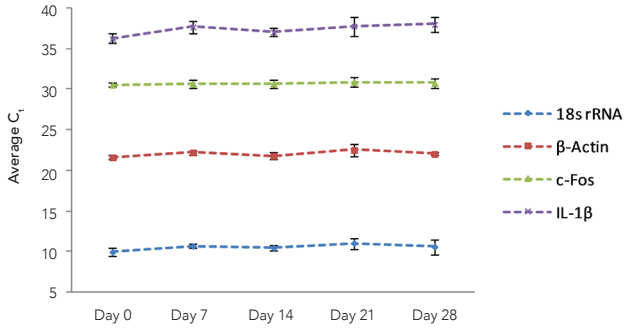
Simply add DNA/RNA Shield™ and Proteinase K to extract total RNA from any tissue, then purify the RNA using the Zymo-Spin™ Column workflow. The result is highly-concentrated, DNA-free RNA that is suitable for RT-qPCR, hybridization, sequencing, etc. In addition, the kit can be used for the enrichment of small and large RNAs in two separate fractions.

Versatility



High-quality total RNA is isolated from various tissue types using the *Quick*-RNA™ Miniprep Plus Kit. In comparison, RNA isolated from the same tissue types using three kits recommended by Supplier Q (Agilent 2200 TapeStation®; Red = low quality).

RNA Preservation at Ambient Temperature



RNA from tissue stored in DNA/RNA Shield™ (included with the *Quick*-RNA™ Miniprep Plus Kit) is preserved at ambient temperature. RNA from muscle tissue (mouse) was purified using the *Quick*-RNA™ Miniprep Plus Kit and analyzed by RT-PCR.

Product	Cat. No.	Size	Specifications	Uses
Quick-RNA™ Miniprep Plus Kit (SK)	R1057T R1057 R1058	10 preps 50 preps 200 preps	Format: Spin-Column Elution Volume: ≥ 50 µl Binding Capacity: 100 µg Sample Size: ≤ 50 mg	RNA isolation from all tissue types (fibrous, lipid, tough-to-lyse); Whole blood; Cells (buccal/buffy coat; Swabs; Biological fluids

(SK) - Sample Kit Available

Quick-RNA™ MagBead

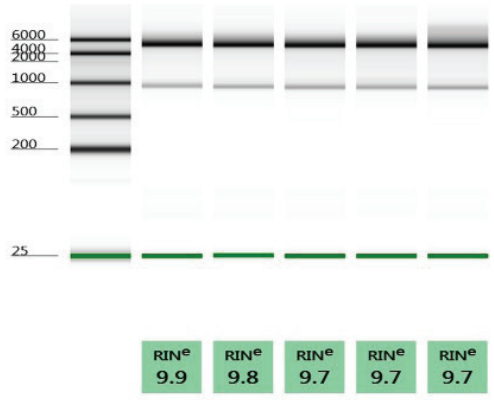
Highlights:

- **Versatile:** High-throughput, magnetic bead-based isolation total RNA (including small/micro RNAs) from any sample including cells, solid tissue, whole blood, biological liquids, FFPE tissue, environmental (plant/seed), swabs (stool, soil, microbial samples), etc.
- **NGS-Ready**: High-quality RNA is ready for any downstream application. DNase I is included.

Description:

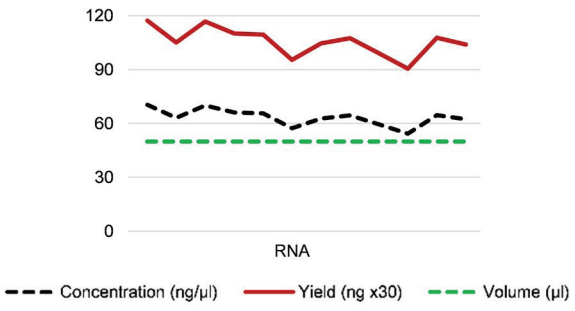
The *Quick*-RNA™ MagBead kit provides a high-throughput, magnetic bead-based purification of high-quality total RNA (including small/microRNAs) from any sample source (e.g., cells, solid tissue, whole blood, biological fluids, FFPE tissue, environmental (plant/seed), swabs (stool, soil, microbial samples), samples stored in DNA/RNA Shield™, etc). The provided DNA/RNA Shield™ inactivates infectious agents and is ideal for sample storage at ambient temperatures. Total RNA is eluted into ≥50 µl of DNase/RNase-Free Water and is ready for any downstream application including Next-Gen Sequencing, RT/PCR, hybridization, etc.

High-Quality Total RNA



Total RNA quality is assessed using Agilent 2200 TapeStation. RNA was purified from HeLa cells using the ***Quick*-RNA™ MagBead** kit.

Reproducible Sample Processing



Concentration, yield, and elution volume across replicate samples extracted with the ***Quick*-RNA™ MagBead** are reproducible and consistent. RNA was purified from HeLa cells (2.5 x 10^5/well).

Product	Cat. No.	Size	Specifications	Uses
Quick-RNA™ MagBead	R2132 R2133	96 preps 4 x 96 preps	Format: Magnetic Bead Binding Capacity: 15 µg total RNA per 30 µl MagBinding Beads Size Limits: Total RNA including small/microRNAs ≥ 17nt	RNA isolation from all tissue types (fibrous, lipid, tough-to-lyse); Whole blood; Buccal Cells; Buffy Coat; Swabs; Biological fluids

Quick-RNA™ Viral Kits

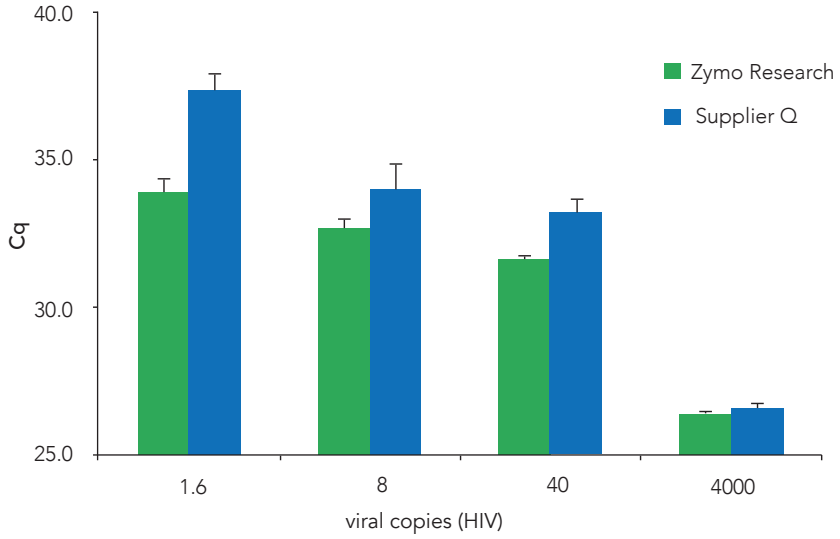
Highlights:

- **Sample Input:** Compatible with plasma/serum, cell culture media, biological fluids, swabs, feces.
- **Streamlined Workflow:** Sample inactivation and easy one-step lysis enables fast processing.
- **High-Sensitivity:** Optimized for low viral copy detection for Next-Gen Sequencing and RT-qPCR.

Description:

The *Quick*-RNA™ Viral and *Quick*-RNA™ Viral 96 Kit enable rapid isolation of high-quality viral RNA from a wide range of biological sources. Powerful enough to isolate viral RNA from cell-free body fluids as well as cellular suspensions, this kit has been rigorously tested and used to isolate viral RNA from samples containing enteroviruses, rhinoviruses, coronaviruses, HIV, HCV, influenza A virus, flaviviruses, measles virus, parainfluenza virus and parvovirus (a ssDNA virus). The eluted RNA is ideal for use in various subsequent procedures including Next-Gen Sequencing and RT-qPCR.

High Sensitivity Viral Detection



The *Quick*-RNA™ Viral Kit from Zymo Research ensures high sensitivity viral detection compared to that of Supplier Q. Viral RNA was isolated from plasma samples using the *Quick*-RNA™ Viral Kit. Data are the mean (+/- SD) of triplicate RT-qPCR measurements.

Product	Cat. No.	Size	Specifications	Uses
Quick-RNA™ Viral Kit SK	R1034 R1034-E* R1035 R1035-E*	50 preps 200 preps	Format: Spin-Column Elution Volume: ≥ 6 µl Binding Capacity: 10 µg Processing Time: 5 minutes	Viral RNA recovery from cultured cells; Plasma; Serum; Culture supernatant; Urine; Virus
Quick-RNA™ Viral 96 Kit	R1040 R1040-E* R1041 R1041-E*	2 x 96 preps. 4 x 96 preps	Format: 96-Well Plate Elution Volume: ≥ 10 µl Binding Capacity: 10 µg Processing Time: 15 minutes	
Quick-DNA/RNA™ Viral MagBead Kit SK	R2140 R2140-E* R2141 R2141-E*	250 preps 1000 preps	Binding Capacity: 5 µg DNA/RNA per 10 µl MagBinding Beads Minimum Elution: ≥ 15 µ Format: Magnetic Bead	Plasma, Serum, CSF, Cell culture media, cellular suspensions, whole blood, urine, saliva, swab, fecal, and any sample in DNA/RNA Shield™

SK - Sample Kit Available *CE IVD

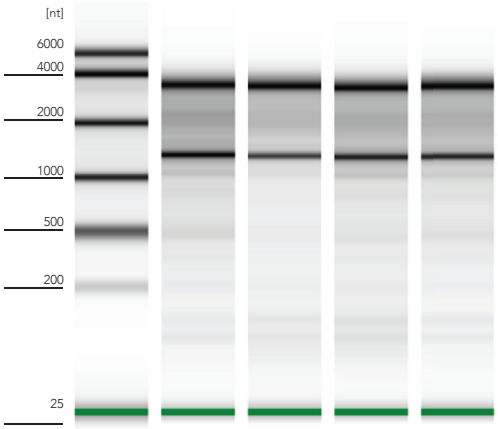
Quick-RNA™ Whole Blood Kit

Highlights:

- **Superior Yields:** Recover total RNA (including small/micro RNA) without sample loss.
- **Protection:** Worry-free blood sample storage at ambient temperatures for up to 30 days.
- **High-Quality:** RNA is ready for all downstream applications including Next-Gen Sequencing, RT-PCR, etc.

Description:

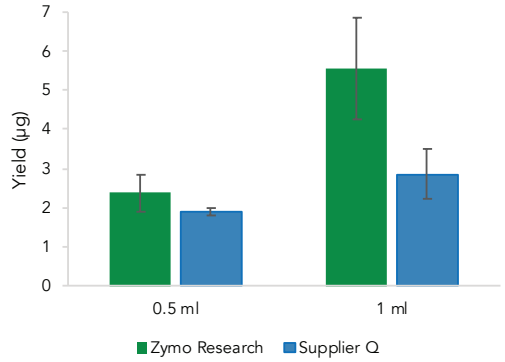
The *Quick*-RNA™ Whole Blood Kit utilizes DNA/RNA Shield™, a unique preservation and lysis technology, to enable rapid isolation of total RNA from whole, partitioned blood, or a cell pellet (after red blood cell lysis). The procedure uses Zymo-Spin™ Column technology, enabling concentrated, ultra-pure RNA. The RNA is eluted into ≥ 6 µl of RNase-free water and is ready for any downstream application including RT-qPCR, sequencing, etc.



High-Quality RNA

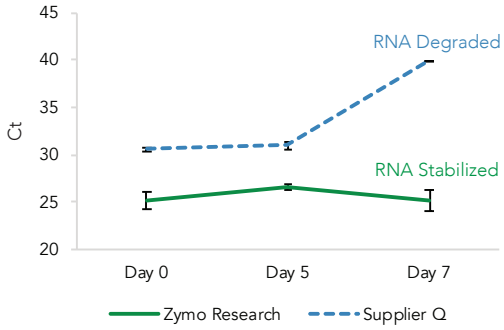
High-quality RNA was extracted from human whole blood using the *Quick*-RNA™ Whole Blood Kit. Blood was stored in DNA/RNA Shield™ at ambient temperatures for two days prior to extraction (n=4). RNA was visualized using the Agilent 2200 Tapestation® system.

Superior Yields



Amount of RNA extracted from 1 ml of human whole blood was significantly higher using the *Quick*-RNA™ Whole Blood Kit vs the Supplier Q kit (n=3).

Protection



RT-qPCR shows the Zymo Research workflow stabilizes RNA, while the Supplier Q workflow leads to degradation. Whole blood was stored up to 7 days at ambient temperatures and extracted at the indicated time points using the Zymo Research or Supplier Q preservatives and workflows.

Product	Cat. No.	Size	Specifications	Uses
Quick-RNA™ Whole Blood Kit	R1201	50 preps	Format: Spin-Column Elution Volume: ≥ 6 µl Binding Capacity: 10 µg Sample Size: ≤ 1 ml	RNA isolation from mammalian whole blood (fresh or stored in DNA/RNA Shield™ 2X concentrate); Plasma; Serum; Pelleted blood cells (PBMCs, WBCs, buffy coat, pelleted samples from PAXgene® Blood RNA Tube (Qiagen), etc.); Nucleated blood

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ZR Urine RNA Isolation Kit™

Highlights:

- Quick, simple, and reliable recovery of RNA from cells and biological sediment in urine.
- Ideal for recovering total RNA from large volume liquid samples that contain a low concentration of cells.
- Column design allows RNA to be eluted at high concentration into minimal volume.

Description:

Isolate total RNA from cells and biological sediment in urine reliably and rapidly with the ZR Urine RNA Isolation Kit™. Urine RNA isolation has never been easier! This innovative product enables isolation of cells from urine using a syringe fitted with a uniquely-designed syringe filter. Following separation, cells are lysed and the collected lysate may be processed immediately or at a later time following transportation and/or storage. The RNA isolation procedure is simple and can be performed in under 10 minutes with the technologies featured in the kit. Total RNA isolated with the ZR Urine RNA Isolation Kit™ is ideal for RT-qPCR, etc.

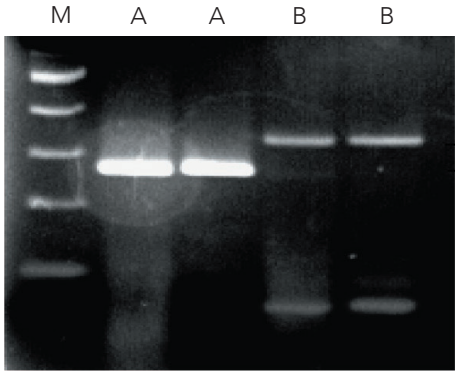
Pinpoint™ Slide RNA Isolation System Kits

Highlights:

- Allows for the isolation of total RNA from fresh or FFPE tissue sections.
- Simple procedure combines Pinpoint® tissue sampling technology with a one-step RNA extraction/purification method.
- Omits the use of organic denaturants.

Description:

The Pinpoint™ Slide RNA Isolation Systems I and II are innovative products for the isolation of RNA from any targeted area of fresh (Systems I) or paraffin-embedded (System II) tissue sectioned onto a glass slide. The systems combine powerful Pinpoint™ tissue sampling methodology, a unique single-step RNA extraction/binding buffer, and Zymo-Spin™ Column purification technology to yield high-quality RNA. Unlike current UV-based methods, these products make isolation of tissue RNA simple and quick. No expensive specialized equipment is needed. Eluted RNA is well suited for subsequent RNA analyses including RT-qPCR.



RT-PCR of RNA recovered from human tissue using the Pinpoint™ RNA Isolation System. Amplicons (in duplicate) are from A) a human β-actin transcript; B) an arbitrary human transcript from Chromosome 3. M is 100 bp DNA Marker (Zymo Research).

Product	Cat. No.	Size	Specifications	Uses
ZR Urine RNA Isolation Kit™	R1038 R1039	20 preps 50 preps	Format: Spin-Column Elution Volume: ≥ 6 µl Binding Capacity: 10 µg RNA Size Limits: ≥17 nt Processing Time: 10 minutes	RNA isolation from up to 30 ml urine; Cells; Biological sediment; Microvesicles; Exosomes
Pinpoint™ Slide RNA Isolation System I Kit	R1003	50 preps	Format: Spin-Column Elution Volume: ≥ 6 µl Binding Capacity: 10 µg RNA Size Limits: ≥17 nt	RNA isolation from: Cells from fresh or frozen tissue sections fixed glass slides1 by ethanol, acetone, methanol, etc.
Pinpoint™ Slide RNA Isolation System II Kit	R1007	50 preps	Format: Spin-Column Elution Volume: ≥ 6 µl Binding Capacity: 10 µg RNA Size Limits: ≥17 nt	RNA isolation from: FFPE tissue sections on glass slides

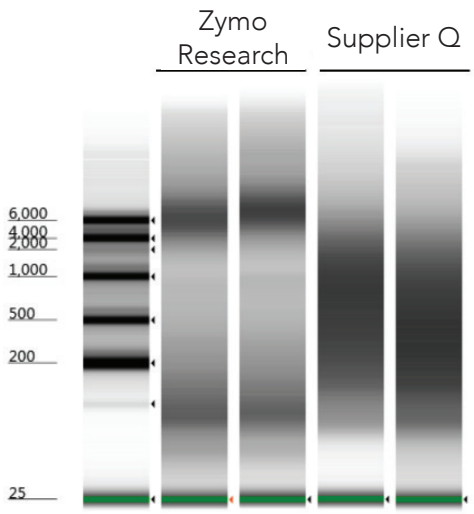
Quick-RNA™ FFPE Kit

Highlights:

- **Easy Processing:** Includes Deparaffinization Solution for simple paraffin removal. No xylene necessary.
- **Improved Recovery:** Optimized Proteinase K digestion ensures maximum recovery.
- **High-Quality:** Non-crosslinked DNA and DNA-free RNA are ready for all downstream applications including PCR, Next-Gen Sequencing, etc.

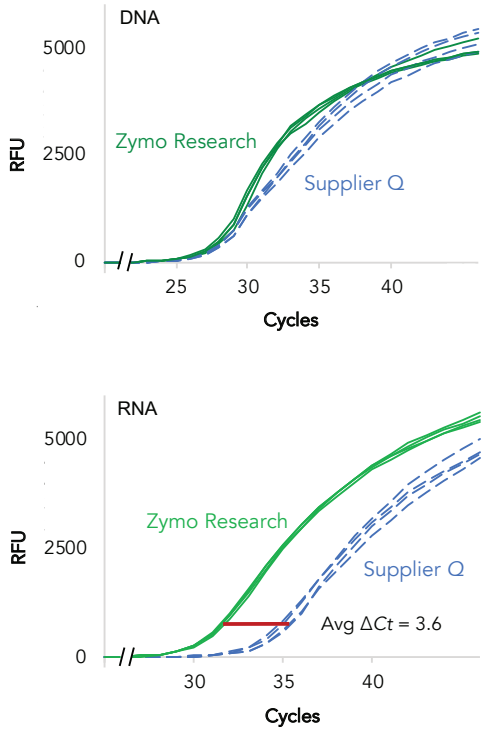
Description:

The *Quick*-RNA™ FFPE Kit provides a simple and reliable method for RNA isolation from formalin-fixed, paraffin embedded (FFPE) tissue samples. The unique chemistries of this kit have been optimized for maximum recovery of both large and small RNA species. Simply deparaffinize tissues using the Deparaffinization Solution, digest using Proteinase K, heat to reverse chemical crosslinks, and then purify using Zymo-Spin™ Column technology. The result is high-quality total RNA (including small RNAs 17-200 nt), which is DNA-free and is ready for RT-qPCR, hybridization, sequencing, etc.



RNA isolated with the *Quick*-RNA™ FFPE Kit is higher quality (left); compared to Supplier Q procedures (right). Quality assessed by Agilent TapeStation 2200®.

Improved Recovery



DNA & RNA isolated using the *Quick*-DNA/RNA™ FFPE Kit are high quality and consistently outperforms RNA isolated using a Supplier Q kit (Avg ΔCt = 3.6) as depicted by the RT-PCR amplification curves (n=4).

Product	Cat. No.	Size	Specifications	Uses
Quick-RNA™ FFPE Kit	R1008	50 preps	Format: Spin-Column Elution Volume: ≥ 25 µl Binding Capacity: 50 µg RNA Size Limits: ≥17 nt	RNA isolation from: FFPE blocks; FFPE tissue sections

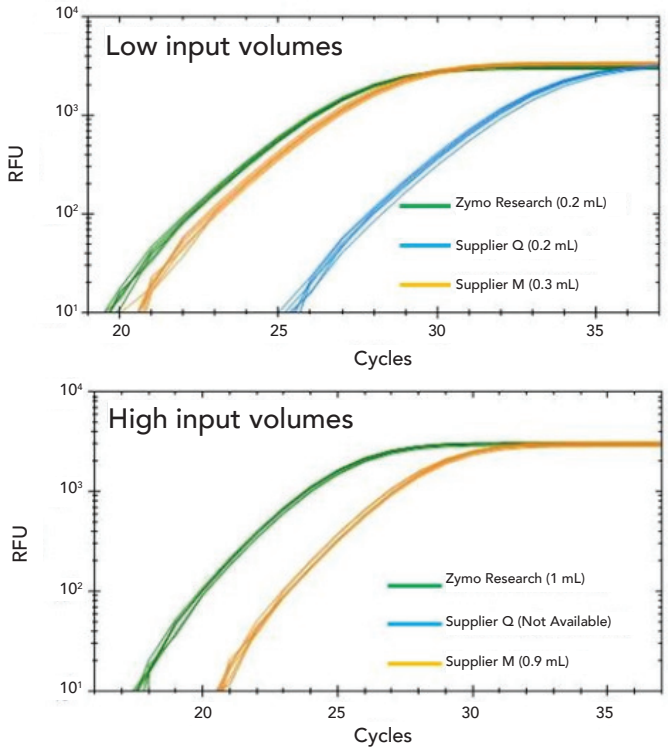
Quick-cfRNA™ Serum & Plasma Kit

Highlights:

- **Quick & Easy:** Simple spin-column based isolation. No phenol/chloroform or precipitation.
- **Highest Yields:** Efficient isolation of total cell-free RNA. Recover up to 515 times more microRNA.
- **Ultra-Pure:** Ready for RT-qPCR, Next-Gen Sequencing, nCounter®, etc.

Description:

The *Quick*-cfRNA™ Serum & Plasma enables simple, reliable, and efficient preparation of high-quality circulating cell-free RNA (including protein-bound, exosomal, miRNA and other small RNAs) from serum, plasma and other biological fluids. Zymo-Spin™ technology allows for ultra-pure RNA, suitable for all downstream applications including RT-qPCR and Next-Generation sequencing.



2x and 8x more yields achieved from low and high input volumes, respectively, compared to the next best product from other suppliers. Kit from Supplier Q cannot process input volume higher than 0.2 ml. Common sample source used (55y male plasma).

Product	Cat. No.	Size	Specifications	Uses
Quick-cfRNA™ Serum & Plasma Kit	R1059	50 preps	Format: Spin-Column Elution Volume: ≥ 6 µl RNA Recovery: 1 - 100 ng/ml of human plasma or serum RNA Size Limits: ≥17 nt	RNA isolation from: Serum; Plasma; Amniotic fluid; Cerebrospinal fluid

Environmental RNA Purification with *Quick*-RNA™ Kits

Innovation. Pure & Simple.™

Are you isolating RNA from tough-to-lyse and environmental samples? We offer a variety of kits which feature our superior mechanical lysis, BashingBead™, technology. With these kits, RNA can be isolated from samples otherwise resistant to conventional lysis procedures, including solid tissues, plants, seeds, food, arthropods, Gram-positive and Gram-negative bacteria, yeast, filamentous fungi, unicellular or filamentous algae, and protozoa. The result is high-yield, high-quality RNA that is suitable for downstream applications such as RT-qPCR, Next-Gen Sequencing, and more.

Technology Overview: BashingBeads™ Lysis Tubes & Environmental RNA Purification

Our BashingBead™ RNA purification kits feature novel technology designed for quick recovery of RT-ready total RNA from tough-to-lyse environmental samples. RNA can be isolated from a broad range of samples including plants, seeds, insects and microorganisms in soil, sludge, sediment, or fecal samples. Kits are available in Microprep and Miniprep spin-column formats.

Simply transfer samples into the provided ZR BashingBead™ Lysis Tubes and bead beat, as normal, in any bead mill, pulverizer, or vortex that can accommodate standard 2.0 ml tubes. The tubes contain a specially formulated lysis buffer. Following lysis, RNA is isolated using Zymo-Spin™ technology and special filtration technologies, which remove polyphenolic inhibitors that can inhibit reverse transcriptase (RT) for plant, fecal, and soil samples.

By the tube

Our state-of-the-art BashingBeads™ are created with the densest and highest-quality ceramic material. The beads are ideal for when a sample requires homogenization/lysis. Novel technology enables the beads to be chemically inert, minimizing RNA shearing by physical and chemical methods.

Our state-of-the-art BashingBeads™ are constructed of the highest quality, densest ceramic material available today. They are used when thorough sample homogenization/lysis is required by the researcher. RNA shearing by physical and chemical methods are minimized since the beads are fracture resistant and chemically inert. They are unique amongst the lysis matrices offered by other companies for RNA isolation from tough-to-lyse materials.

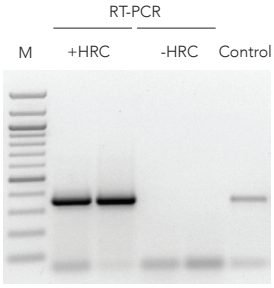
Quick-RNA™ Fecal/Soil Microbe Microprep Kit

Highlights:

- Simple and efficient method for inhibitor-free RNA from soil and fecal samples.
- Ultra-high density BashingBeads™ can be used with any bead mill, disrupter, or vortex.

Description:

Purify inhibitor-free RNA from soil and fecal samples rapidly and reliably with the *Quick*-RNA™ Fecal/Soil Microbe Microprep Kit. The kit is designed for isolation of total RNA including small RNAs (≥ 17 nt) from tough-to-lyse bacteria, fungi, protozoa, algae, etc. in various soil types, sludge, sediment, and/or fecal samples. Samples are efficiently homogenized by ZR BashingBead™ Lysis Tubes. Zymo-Spin™ Column technologies allow for quick removal of genomic DNA and polyphenolic RT/PCR inhibitors (e.g., humic acids, polyphenols, tannins). The purified RNA is highly-concentrated and ideal for subsequent RNA-based methods including RT-qPCR, Next-Gen Sequencing, hybridization, etc.



PCR amplification of a eukaryotic transcript post-RT: Total RNA isolated from sludge with or without inclusion of the Zymo-Spin™ IV-HRC spin filter during the *Quick*-RNA™ Fecal/Soil Microbe Microprep Kit protocol. M is a ZR 1 kb DNA Marker (Zymo Research).

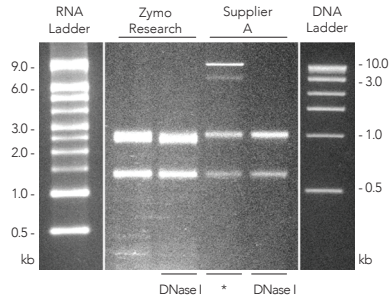
Quick-RNA™ Fungal/Bacterial Kits

Highlights:

- Quick (15 minute) isolation of total RNA from tough-to-lyse bacteria, yeast, and fungi.
- Zymo-Spin™ Column technology allows RNA to be eluted into minimal volumes (≥ 6 µl).

Description:

The *Quick*-RNA™ Fungal/Bacterial Microprep and Miniprep Kit delivers rapid (15 minute) isolation of total RNA from pelleted tough-to-lyse bacteria (e.g., Gram-positive), yeast, and/or fungal cells. Both kits utilize ultra-high density BashingBeads™ for sample homogenization and a robust buffer system for total RNA purification (small RNAs included). Zymo-Spin™ Column technology allows eluted RNA volumes in as little as 6 µl (Microprep), which is ideal for subsequent procedures including RT-PCR and Next-Gen Sequencing.



Total RNA was isolated from equal amounts of *E.coli* cells containing plasmid DNA (pGEM®) using the *Quick*-RNA™ Fungal/Bacterial Microprep Kit or kit from Supplier A. The samples were resolved in a 2% (w/v) agarose gel. RNA Millenium™ Markers (Ambion) and ZR 1 kb DNA Marker (Zymo Research) were used.

* = genomic (> 10 kb) and plasmid (> 3 kb) DNA contamination
DNase I = samples treated with DNase I.

Product	Cat. No.	Size	Specifications	Uses
Quick-RNA™ Fecal/Soil Microbe Microprep Kit	R2040	50 preps	Format: Spin-Column Elution Volume: ≥ 6 µl Binding Capacity: 10 µg	RNA isolation from: Soil; Sediment; Sludge; Feces
Quick-RNA™ Fungal/Bacterial Microprep Kit	R2010	50 preps	Format: Spin-Column Elution Volume: ≥ 6 µl Binding Capacity: 10 µg	RNA isolation from: Gram (+) and (-) bacteria; Yeast; Filamentous fungi; Unicellular algae; Filamentous algae; Protists; Soft tissue (limited); Food
Quick-RNA™ Fungal/Bacterial Miniprep Kit	R2014	50 preps	Format: Spin-Column Elution Volume: ≥ 25 µl Binding Capacity: 50 µg	

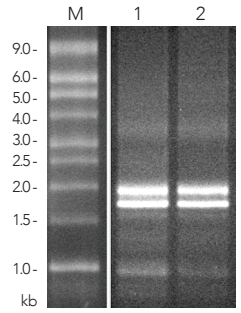
Quick-RNA™ Tissue/Insect Microprep Kit

Highlights:

- Quick (15 minute) isolation of RNA from insects and tough-to-lyse tissues.
- Omits the use of organic denaturants and proteases.

Description:

The *Quick*-RNA™ Tissue/Insect Microprep Kit delivers rapid (15 minute) isolation of total RNA from various tissue samples, insect and other arthropod specimens (e.g., mosquitoes, bees, lice, ticks, *Drosophila melanogaster*). Mammalian tissues can also be processed with this kit. The product utilizes ultra-high density BashingBeads™ for sample homogenization and a robust buffer system to deliver total RNA purification (small RNAs included). RNA eluted in DNase/RNase-Free Water is perfect for subsequent procedures including RT-qPCR and Next-Gen Sequencing.



Analysis of *Quick*-RNA™ Tissue/Insect Microprep Kit. Isolation of total RNA from n=2 *Drosophila sp.* individuals was performed in duplicate (lanes 1 and 2). Samples were processed (2 x 30 sec at 6 m/s) using a FastPrep®-24 Instrument (MP Biomedicals) and resolved alongside (lane M) RNA Millenium™ Markers (Ambion) in a 1% (w/v) non-denaturing agarose gel.

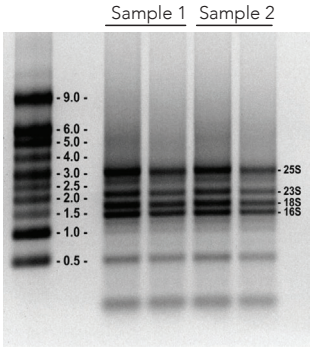
Quick-RNA™ Plant Miniprep Kit

Highlights:

- Quick, 15 minute isolation of inhibitor-free total RNA (~50 µg) from a wide variety of plant samples using ultra-high density BashingBeads™ and Zymo-Spin™ Column technologies.
- High-quality RNA eluted in ≥ 25 µl is ready for reverse transcription, microarray, sequencing, etc.

Description:

Isolation of total RNA from various plant samples (e.g., leaves, stems, buds, flowers, fruit, seeds, etc.) has never been easier with the *Quick*-RNA™ Plant Miniprep Kit. Taking only 15 minutes, the kit completely eliminates DNA and polyphenolic inhibitors from samples. The RNA is eluted into volumes as little as 25 µl and is suitable for use in various downstream procedures including RT-qPCR and Next-Gen Sequencing.



Isolation of total RNA from 10 mg of a fresh leaf material (*Nicotiana sp.*) using the *Quick*-RNA™ Plant Miniprep Kit. Leaves were minced, then processed using a FastPrep®-24 instrument (MP Biomedicals). Samples 1 and 2 were loaded in 2x and 1x volume aliquots, respectively, and resolved in a 1% (w/v) nondenaturing agarose gel. RNA Millenium™ Markers (Ambion) were used as size standards.

Product	Cat. No.	Size	Specifications	Uses
Quick-RNA™ Tissue/Insect Microprep Kit	R2030	50 preps	Format: Spin-Column Elution Volume: ≥ 6 µl Binding Capacity: 10 µg	RNA isolation from: Soft tissue; Solid tissue; Tough-to-lyse tissues; Tough-to-lyse organisms; Insects/arthropods; Food
Quick-RNA™ Plant Miniprep Kit	R2024	50 preps	Format: Spin-Column Elution Volume: ≥ 25 µl Binding Capacity: 50 µg	RNA isolation from: Plant material; Seeds; Fruit

RNA Clean-Up

Inhibitor-free RNA from Any Enzymatic Reaction

The RNA Clean & Concentrator™ (RCC™) kits facilitate the efficient removal of RNA polymerases, ligases, and RNA modifying enzymes as well as free NTPs and their analogs including fluorescent and radio-labeled derivatives. Our Zymoclean™ Gel RNA Recovery Kit and the ZR small-RNA™ PAGE Recovery Kit are designed for the recovery of RNA from agarose and polyacrylamide gel matrices. All clean-up kits feature our state-of-the-art Zymo-Spin™ Column technology, which enables RNA to be eluted in minimal volumes (i.e., ≥ 6 µl) of water. This allows for highly concentrated RNA that is well suited for applications like microarrays, RNA transfection, denaturing-gel electrophoresis, Northern blotting, and RT-(q)PCR, and Next-Gen Sequencing.

RNA Clean & Concentrator™ Kits

Highlights:

- **NGS-Ready:** RNA is ready for all downstream applications including Next-Gen Sequencing, RT-qPCR, hybridization, etc.
- **Ultra-Pure:** Eliminate contaminants and inhibitors in 5 minutes.
- **Maximum Recovery:** Recover >90% and elute in as little as 6 µl.

Description:

The RNA Clean & Concentrator™ kits provide simple and reliable methods for the rapid preparation of high-quality RNA. The kit owes its simplicity to a unique single-buffer system and Zymo-Spin™ technology. Simply add the binding buffer to your sample, adjust the conditions for binding by adding ethanol, then wash and elute the concentrated RNA. RNA ≥ 17 bases can be safely treated and recovered using these kits. The result is highly-concentrated, purified RNA that is perfect for subsequent RNA-based methods including RT-PCR, Next-Gen Sequencing, hybridization, etc.

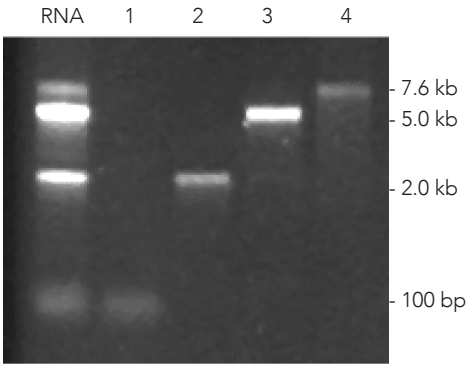
Product	Cat. No.	Size	Specifications	Uses
RNA Clean & Concentrator™-5 (SK)	R1015 R1016	50 preps 200 preps	Format: Spin-Column Elution Volume: ≥ 6 µl Binding Capacity: 10 µg RNA Size Limits: ≥ 17 nt Processing Time: 5 minutes	RNA clean-up; DNA-free RNA; Enzyme removal; Nucleotide/dye removal; Small-RNA/probe purification
RNA Clean & Concentrator™-5 w/ DNase I	R1013 R1014	50 preps 200 preps		
RNA Clean & Concentrator™-96	R1080	2 x 96 preps	Format: 96-Well Plate Elution Volume: ≥ 10 µl Binding Capacity: 10 µg RNA Size Limits: ≥ 17 nt Processing Time: 20 minutes	
RNA Clean & Concentrator™-25	R1017 R1018	50 preps 100 preps	Format: Spin-Columns Elution Volume: ≥ 25 µl Binding Capacity: 50 µg RNA Size Limits: ≥ 17 nt Processing Time: 5 minutes	
RNA Clean & Concentrator™-100	R1019	25 preps	Format: Spin-Columns Elution Volume: ≥ 100 µl Binding Capacity: 1 mg RNA Size Limits: ≥ 17 nt Processing Time: 15 mins	
RNA Clean & Concentrator™ MagBead Kit	R1081	96 preps	Elution Volume: ≥ 15 µl Binding Capacity: 10 µg RNA Size Limits: ≥ 17 nt Format: Magnetic Bead	RNA Clean up; Automation
RNA Clean & Concentrator™ MagBead Kit (supplied with DNase I Set)	R1082	96 preps		

(SK) - Sample Kit Available

Zymoclean™ Gel RNA Recovery Kit

Highlights:

- Quick (30 minute) recovery of purified RNA fragments from agarose gels.
- Recovery ≥ 80% for RNA > 500 nt



The recovery of RNA from an agarose gel. Different sized RNAs on the left were excised from the gel and recovered using the Zymoclean™ Gel RNA Recovery Kit (lanes 1-4).

Description:

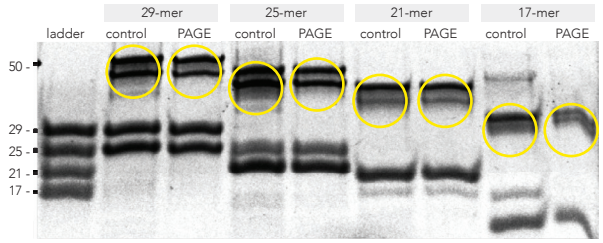
Recover purified RNA fragments from agarose gels in only 30 minutes with the Zymoclean™ Gel RNA Recovery Kit. The procedure combines a unique, single-step agarose dissolving/RNA binding buffer with Zymo-Spin™ Column technology to yield high-quality, purified RNA in just minutes. The purified RNA is eluted into small volumes of DNase/RNase-Free Water for highly concentrated samples suitable for subsequent RNA-based manipulations. Compatible with MOPS, TAE, and TBE buffered agarose gels (formaldehyde up to 2.0%).

ZR small-RNA™ PAGE Recovery Kit

Highlights:

- For concentrated recovery of small RNA (& DNA) fragments from polyacrylamide gels.
- Compatible with up to 25% (w/v) polyacrylamide.

Self-ligated ssRNA Fragments



ladder = ZR small RNA ladder

control = ssRNA oligo ligation control

PAGE = recovered ssRNA oligo self-ligated

Recovery and ligation of single-stranded RNA oligonucleotides. In the image above, the RNA fragments were recovered from a 17.5% (w/v) native polyacrylamide gel using the ZR small-RNA™ PAGE Recovery Kit. All fragments shown were resolved in a native PAGE gel following ligation. T4 polynucleotide kinase and T4 RNA ligase I (New England Biolabs) were used for the phosphorylation and subsequent ligation of the ssRNA samples. Ligated RNAs are circled in yellow. RNA in the gel was visualized with GelStar® Stain (Lonza).

Description:

Extract high-quality small RNAs from polyacrylamide gels (native or denatured) easily and efficiently with the ZR small-RNA™ PAGE Recovery Kit. This kit is an improvement of the "crush and soak" method, which incorporates a unique buffer system together with Zymo-Spin™ Column technologies for improved recovery and convenience. Recovered RNA can be concentrated into volumes ≥ 6 µl, making it ideal for downstream enzymatic reactions and manipulations.

Can be used for extraction/isolation of DNA fragments with equal efficiency.

Product	Cat. No.	Size	Specifications	Uses
Zymoclean™ Gel RNA Recovery Kit	R1011	50 preps	Format: Spin-Columns Elution Volume: ≥ 6 µl Binding Capacity: 10 µg RNA Size Limits: ≥ 200 nt Processing Time: 30 minutes	RNA from agarose gel slices
ZR small-RNA™ PAGE Recovery Kit	R1070	20 preps	Format: Spin-Columns Elution Volume: ≥ 6 µl Binding Capacity: 10 µg Size Limits: 17 - 200 nt Processing Time: 45 minutes	RNA (and DNA) from polyacrylamide gel slices

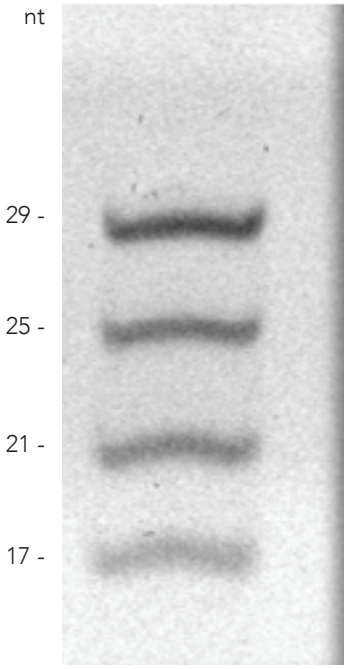
ZR small-RNA™ Ladder

Highlights:

- Ladder consists of four single-stranded RNA oligonucleotides 17, 21, 25, and 29 bases in length

Description:

The ZR small-RNA™ Ladder is a microRNA size marker for use in polyacrylamide gel separation methods and small RNA size approximation. The ladder consists of four single-stranded RNA oligonucleotides 17, 21, 25, and 29 bases in length. The marker is supplied in water and can be stained with dyes specific for single-stranded nucleic acid species e.g, GelStar™. Sequence available upon request.

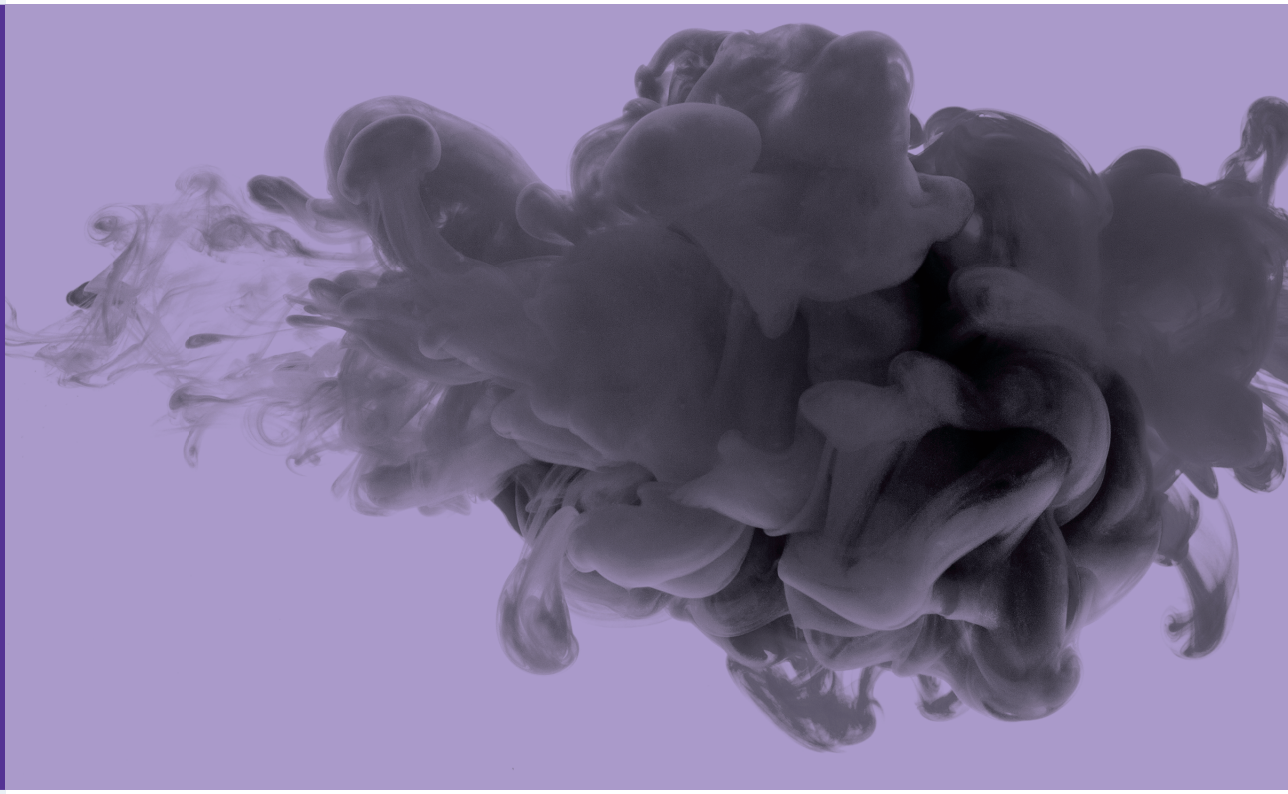


ZR small-RNA™ Ladder. ZR small-RNA™ Ladder (350 ng) was resolved in a 25% (w/v) non-denaturing PAGE gel and visualized after staining with GelStar™ for 5 minutes.

Product	Cat. No.	Size	Specifications	Uses
ZR small-RNA™ Ladder	R1090	10 µg	Ladder for four microRNAs (17, 21, 25, 29 nt) Concentration: 20 ng/µl Amount: 10 µg Storage: -20° C	Isolated RNA; Small RNA fraction

DNA/RNA Co-Purification

04



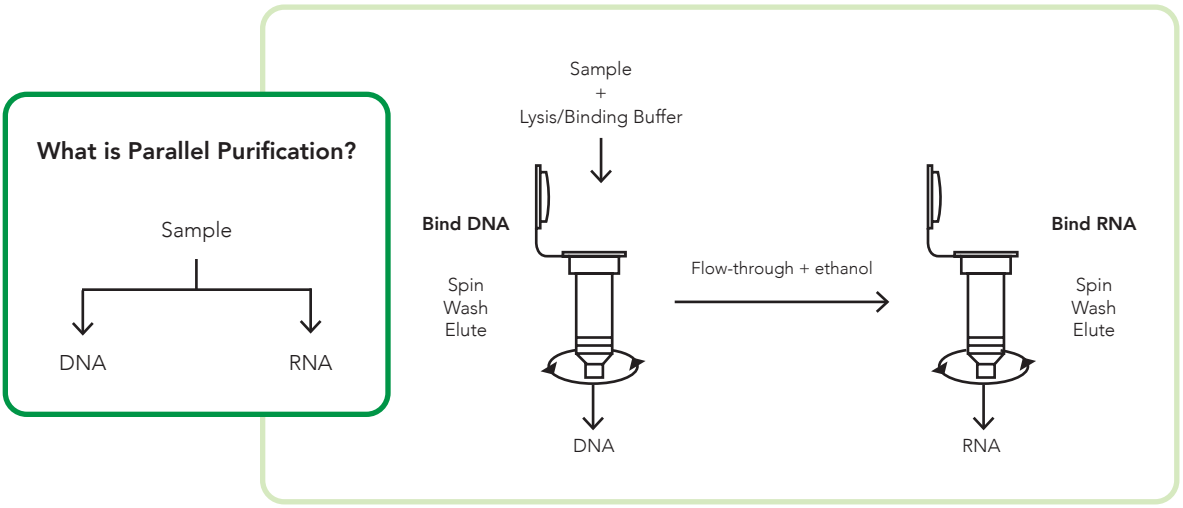
To meet the needs of researchers who wish to extract DNA and RNA from the same source simultaneously, Zymo Research developed a line of DNA/RNA co-purification kits. Both parallel purification (DNA and RNA separately) and co-purification (DNA and RNA together) products provide high-quality DNA and total RNA using procedures that are fast and simple to perform without the use of phenol. The *Quick*-DNA/RNA™ Miniprep Kit is designed for parallel purification of DNA and RNA from the same sample of cells and tissue. The *Quick*-DNA/RNA™ Viral Kit is a fast viral DNA/RNA purification kit from plasma, serum, cell culture media, cellular suspensions, urine, blood, saliva, and any other biological samples stored in DNA/RNA Shield™. The ssDNA/RNA Clean & Concentrator™ facilitates the rapid recovery of small oligos, probes, and transcripts while removing enzymes, dNTPs and other reaction components. The spin-column format facilitates concentration of single stranded nucleic acids ≥ 17 nt into as little as 6 µl. The revolutionary ZymoBIOMICS® DNA/RNA kits are designed to handle a wide variety of sample inputs and eliminate bias during extraction by lysing all microbes including Gram-negative bacteria, Gram positive bacteria, fungus, protozoans, and algae. Together, the Zymo Research DNA/RNA purification kits quickly and easily handle a wide variety of sample types to extract high-quality, inhibitor-free nucleic acids that are ready for downstream applications.

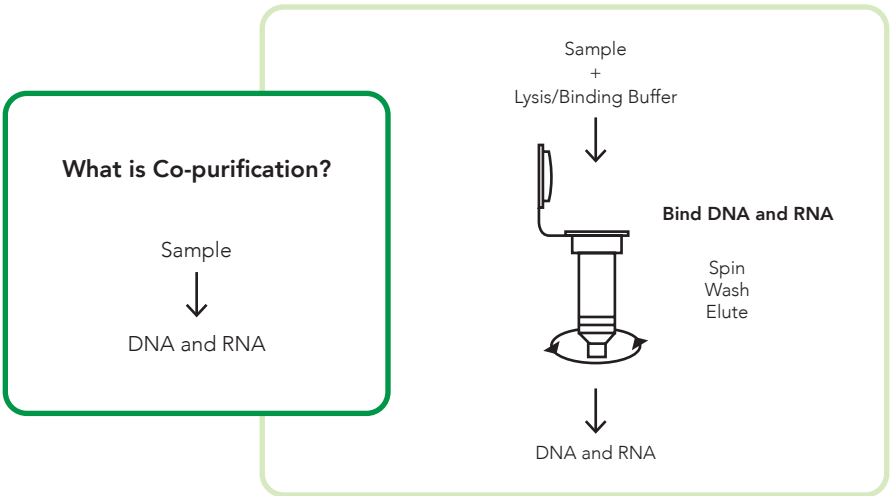
DNA/RNA Co-Purification

Technology Overview:
Parallel Purification & Co-Purification

Purify DNA & RNA from the Same Sample

Zymo Research provides DNA/RNA co-purification kits that simplify the process of isolating both DNA and total RNA (including small RNAs 17-200 nt) simultaneously from the same sample. These kits incorporate advanced technologies such as DNA/RNA Shield™ and ZR BashingBead™ Lysis Tubes to ensure high nucleic acid integrity and complete sample lysis, from challenging sample types and small sample inputs. Extracted high-quality DNA and RNA are ready for sensitive downstream applications including RT-PCR, microarrays, Next-Gen Sequencing, and more. With options for both column-based and magnetic bead-based technologies, these kits are flexible across various applications and streamline the extraction of high-quality nucleic acid for a wide range of input capacity.



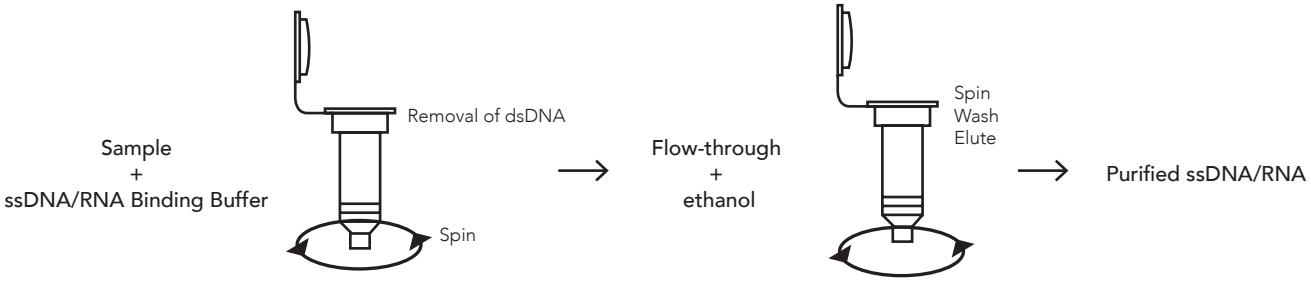


ssDNA/RNA Clean & Concentrator™

Highlights:

- **Quick and Reliable:** 10 min clean-up and concentration of ssDNA/RNA (17-200 nt).
- **Concentrated:** Up to 10 µg sample in ≥ 6 µl elution.
- **Clean and Pure:** ssDNA/RNA ready for downstream applications like PCR, RT-qPCR, etc.

Clean and Concentrate ssDNA/RNA into ≥ 6 µl in 10 minutes



Zymo-Spin™ column technology and a single buffer system removes dsDNA (e.g. genomic DNA) from ssDNA/RNA samples (transcripts, probes, primers, etc.) in 10 minutes. Column format allows for elution in ≥ 6 µl, keeping purified DNA/RNA concentrated for downstream applications such as PCR, RT-qPCR, hybridization, etc.

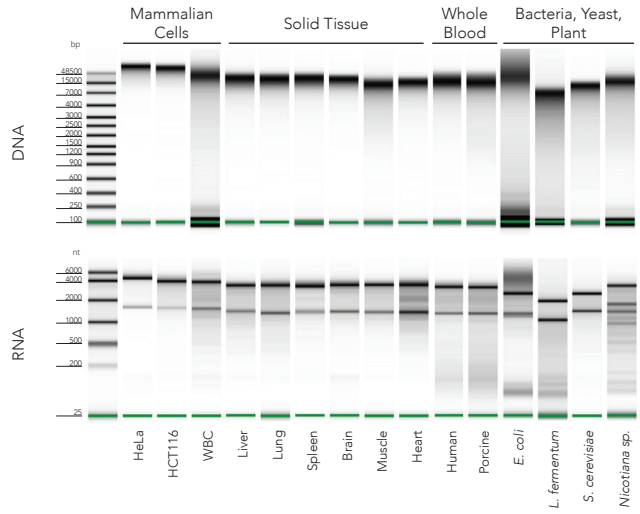
Product	Cat No.	Size	Specifications	Uses
ssDNA/RNA Clean & Concentrator™	D7010 D7011	20 preps 50 preps	Format: Spin-Column Elution Volume: ≥ 6 µl Processing Time: 10 minutes Binding Capacity: 10 µg ssDNA/RNA Size Limits: 17 - 200 nt	Isolate single-stranded nucleic acids from a mixture of single-stranded and double-stranded species

Quick-DNA/RNA™ Kits

Highlights:

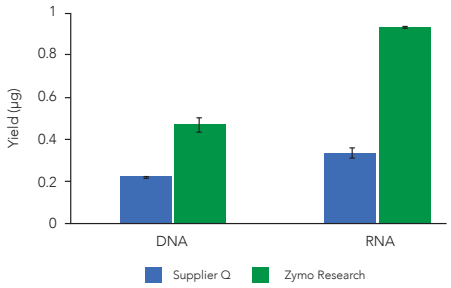
- **Quick & Easy:** Extract DNA and RNA from any sample.
- **Sensitive:** Single cell-level recovery of DNA and RNA.
- **Ultra-Pure:** Ready for Next-Gen Sequencing, RT-qPCR, arrays, etc.

Universal Sample Compatibility



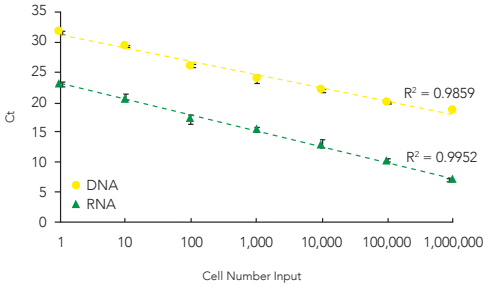
The *Quick*-DNA/RNA™ Plus technology is universal and accommodates any sample input including cultured cells, any tissue, blood, tough-to-lyse samples, etc.

Highest Yields



DNA and total RNA recovery is higher using the *Quick*-DNA/RNA™ Microprep Plus Kit compared to a Supplier Q kit. Nucleic acids were extracted from 50K HeLa cells (n=2).

Single-Cell Detection



HeLa cells were titrated down to a single cell, and DNA and total RNA were extracted using the *Quick*-DNA/RNA™ Microprep Plus Kit. Analysis by RT-qPCR shows high linear recovery of DNA & RNA down to the single-cell level (n=2).

Product	Cat No.	Size	Binding Capacity	Minimum Elution	Sample Input
Quick-DNA/RNA™ Miniprep Kit	D7001	50 preps	100 µg DNA/50 µg RNA	25 µl	Cells, Soft Tissue
Quick-DNA/RNA™ Miniprep Plus Kit	D7003T D7003	10 preps 50 preps	100 µg DNA/RNA	50 µl	Cells, Any Tissue, Whole Blood
Quick-DNA/RNA™ Microprep Plus Kit	D7005T D7005	10 preps 50 preps	5 µg DNA/10 µg RNA	6 µl	
Quick-DNA/RNA™ MagBead Kit	R2130 R2131	96 preps 4 x 96 preps	15 µg DNA/RNA per 30 µl magnetic beads	50 µl	

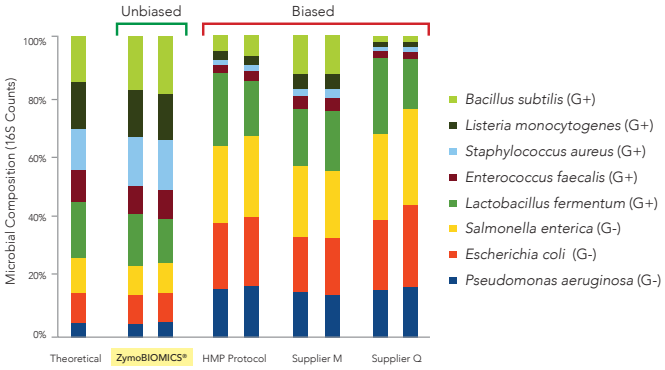
ZymoBIOMICS® DNA/RNA Kits

Highlights:

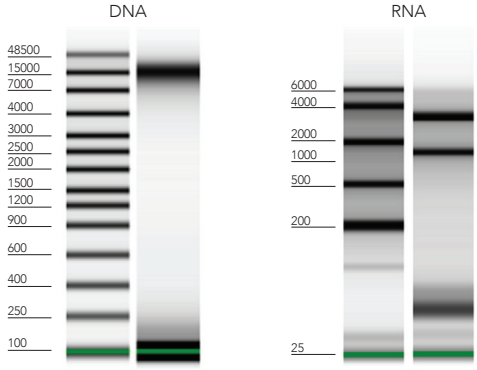
- **Unbiased Lysis:** Efficient and unbiased lysis of microbes including Gram-positive/negative bacteria, fungi, protozoans, and viruses from any sample.
- **High Sensitivity:** Increased detection limit of very low abundance organisms.
- **Ultra-Pure:** Inhibitor-free DNA/RNA (including small/micro RNAs) are ready for qPCR and microbiome measurements using Next-Gen Sequencing.

Accurate Community Profiling

The ZymoBIOMICS® DNA/RNA Miniprep Kit provides accurate representation of the organisms extracted from the ZymoBIOMICS® Microbial Community Standard.

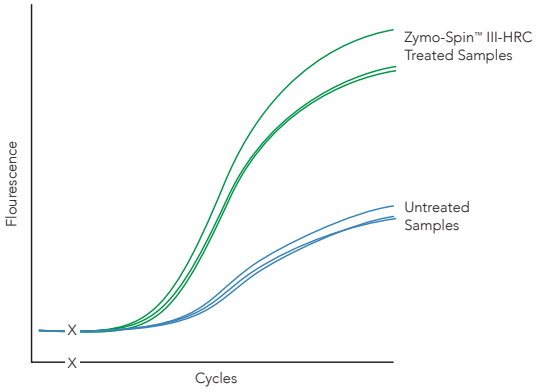


High Quality



Human stool genomic DNA and total RNA isolated with the ZymoBIOMICS® DNA/RNA Miniprep Kit is highly intact. Quality assessed by Agilent 2200 TapeStation®.

Ultra-Pure RNA from Inhibitor-rich Samples



Total RNA isolated from human stool with or without inclusion of the Zymo-Spin™ III-HRC Spin Filter during the ZymoBIOMICS® DNA/RNA Miniprep Kit protocol. Earlier amplification cycles indicate complete removal of PCR inhibitors.

Product	Cat No.	Size	Specifications	Uses
ZymoBIOMICS® DNA/RNA Miniprep Kit SK	R2002	50 preps	Format: Spin Column Binding Capacity: 100 µg DNA/RNA Elution Volume: ≥ 50 µl RNA Size: ≥ 17 nucleotides	Accurate DNA/RNA isolation of microbial communities from any sample type (feces, soil, water, biofilms, swabs, body fluid, etc.)
ZymoBIOMICS® MagBead DNA/RNA Kit	R2135 R2136	96 preps 4 x 96 preps	Format: Magnetic Bead Binding Capacity: 15 µg DNA/RNA per 30 µl ZymoBIOMICS® MagBinding Beads Elution Volume: ≥ 50 µl RNA Size: ≥ 17 nucleotides	

SK - Sample Kit Available

Quick-DNA/RNA™ HT Kits

Highlights:

- **Broad Range:** Compatible with any biological or clinical sample including swabs, biological liquids, and collection matrices.
- **Rapid:** Automated extraction on any open automated platform including KingFisher, Hamilton, Tecan, Opentrons, etc.
- **High Sensitivity:** Inhibitor-free nucleic acids ready for all downstream applications: Next-Gen Sequencing, (RT)-PCR.

Broad Clinical Use

- ✓ **Swabs:** Nasal, oropharyngeal, buccal, vaginal, fecal, etc.
- ✓ **Biological liquids:** Saliva, blood, plasma, serum, urine, etc.
- ✓ **Collection matrices and devices:** DNA/RNA Shield™, VTM/UTM, RNA*later*™, PBS, etc.

Automated Workflow

- ✓ Validated workflows on KingFisher™, Hamilton®, Tecan®, Opentrons®, etc.
- ✓ Automation scripts ready-to-go
- ✓ Free consultations & support at **automation@zymoresearch.com**

Load N' Go™ *Quick*-DNA/RNA™ HT

- **Save Time and Focus on Discovery:** Prefilled 96-well reagent plate technology that offers multi-platform compatibility and reduces hands on time by 75%.
- **Precision Meets Versatility:** High-throughput, magnetic bead based purification of DNA and RNA from plasma, serum, urine, cell culture media, blood, saliva, cellular suspensions, swab, fecal, and biopsy samples

High Sensitivity

- ✓ Inhibitor-free nucleic acids for sensitive downstream analysis
- ✓ Detection down to one copy (GEC) – compatible with a broad range of input loads

Dilution Series

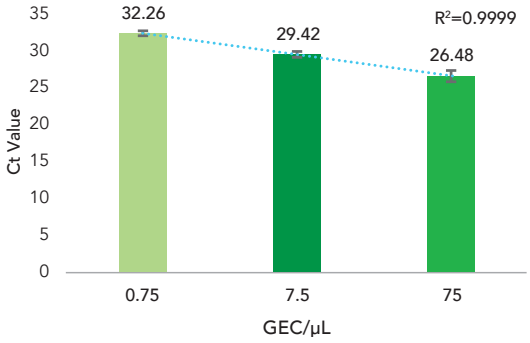


Figure 1: Detection threshold (Ct) values for samples spiked with heat-inactivated SARS-CoV-2 virus in dilution series (1:10 dilutions, n = 8, 32, 8). Genome Equivalent Copies (GEC).

Amplification

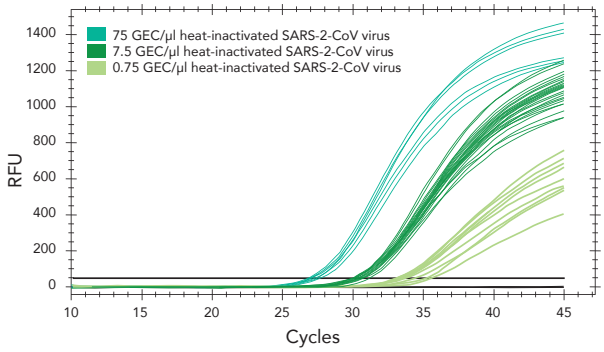
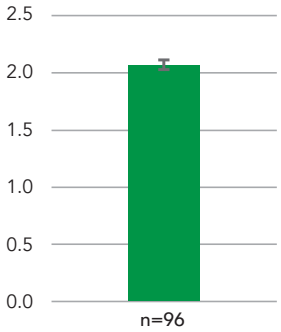


Figure 2: rRT-PCR amplification graphs of viral RNA from throat swabs in DNA/RNA Shield™ spiked with heat-inactivated SARS-CoV-2 virus. Samples were analyzed with the *Quick* SARS-CoV-2 Multiplex Kit with 2019 CoV-N3(CV-3) target primer.

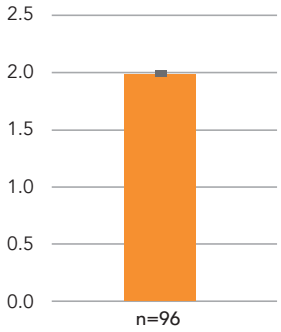
High Yield and Purity

- ✓ Consistent and reproducible automated extraction protocol

A260/A230 Ratios



A260/A280 Ratios



Concentration (ng/µL)

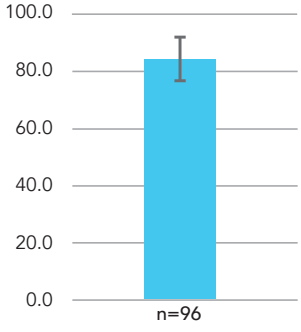


Figure 3: Concentration and purity ratios for extracted total nucleic acid from 96 samples of 150,000 HeLa cells per sample.

Product	Cat No.	Size	Binding Capacity	Minimum Elution	Sample Input
Quick-DNA/RNA™ HT	R2150 R2151	250 preps 1000 preps	5 µg DNA/RNA per 10 µl MagBinding Beads	15 µl	Any clinical sample including swabs, biological liquids, and collection matrices
Quick-DNA/RNA™ HT - Dx	R2150-E* R2151-E*	250 preps 1000 preps			
Load N' Go™ *Quick*-DNA/RNA™ HT	R2152	96 preps			

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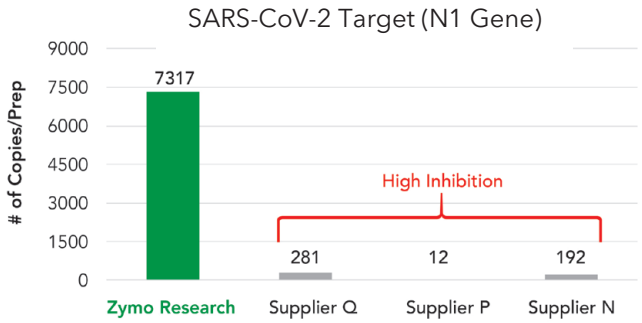
Quick-DNA/RNA™ Water Kit

Highlights:

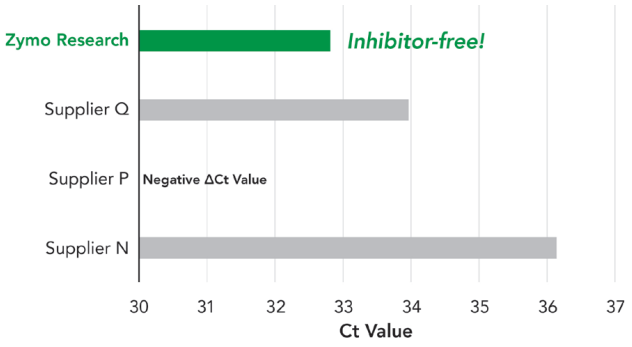
- **Highest Sensitivity:** Inhibitor-free DNA and/or RNA from liquid samples including raw wastewater, ready for NGS, qPCR, ddPCR, RT-qPCR, and RT-ddPCR.
- **No Vacuum Filtration Required:** Features Wastewater Stabilization Buffer, a unique buffer for viral, microbial, and free nucleic acid pelleting, eliminating the need for vacuum filtration for high-volume samples.
- **Broad Range:** Purify total DNA/RNA, covering viral, pathogen, and microbial genetic material. One kit serves multiple applications, including pathogen and AMR surveillance, microbial analysis, etc.

The *Quick*-DNA/RNA™ Water Kit facilitates High Recovery of Inhibitor-free Nucleic Acid from Wastewater



Viral RNA Detection

Figure 1. Comparison of concentration of SARS-CoV-2 from positive raw wastewater by RT-qPCR using *Quick*-DNA/RNA™ Water Kit and other commercial kits.



PCR Inhibition

Figure 2. Comparison of inhibition level in the final eluate using *Quick*-DNA/RNA™ Water Kit and other commercial kits. Eluates were diluted ten-fold to determine inhibition levels. All samples analyzed using R3013 *Quick* SARS-CoV-2 Multiplex kit.

Product	Cat No.	Size	Binding Capacity	Minimum Elution	Sample Input
Quick-DNA/RNA™ Water Kit	R2044	50 preps	25 µg DNA/100 µg RNA	50 µl	≤ 50 mL raw wastewater ≤ 1 L low biomass liquid samples

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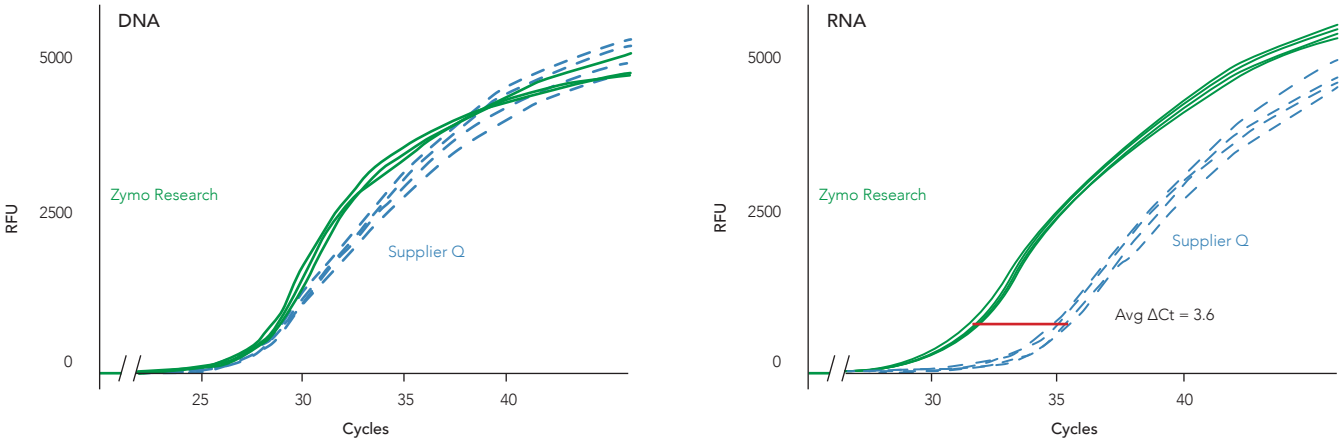
Quick-DNA/RNA™ FFPE Kit

Highlights:

- **Easy Processing:** Includes Deparaffinization Solution for simple paraffin removal. No xylene necessary.
- **Improved Recovery:** Optimized Proteinase K digestion and heat ensures maximum recovery.
- **High Quality:** Non-crosslinked DNA and DNA-free RNA are ready for all downstream applications including PCR, Next-Gen Sequencing, etc.

Improved Recovery



DNA & RNA isolated using the *Quick*-DNA/RNA™ FFPE Kits are high quality and consistently outperforms RNA isolated using a Supplier Q kit (Avg ΔCt = 3.6) as depicted by the RT-PCR amplification curves (n=4).

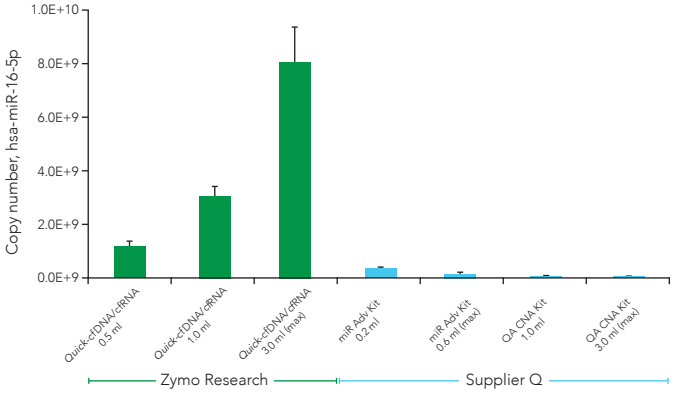
Product	Cat No.	Size	Binding Capacity	Minimum Elution	Sample Input
Quick-DNA/RNA™ FFPE Kit	R1009	50 preps	50 µg	25 µl	≤ 25 mg

Quick-cfDNA/cfRNA™ Serum & Plasma Kit

Highlights:

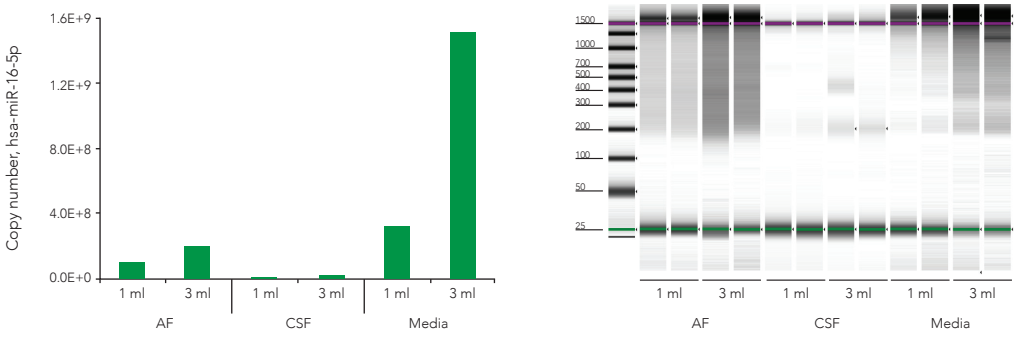
- **Quick & Easy:** Simple spin-column based isolation. No phenol/chloroform or precipitation.
- **Highest Yields:** Efficient isolation of total cell-free RNA. Recover up to 515 times more microRNA.
- **Ultra-Pure:** Ready for Next-Gen Sequencing, RT-qPCR, nCounter®, etc.

Highest Recovery of Cell-Free miRNA



Cell-free RNA recovery scales proportionally with sample input using the *Quick*-cfDNA/cfRNA™ Serum & Plasma Kit. Cell-free RNA yields from the same plasma donor (61y-F) show linear and efficient recovery of plasma microRNA (hsa-miR-16-5p) when analyzed by RT-qPCR.

Proven Compatibility with Various Biological Fluids



Cell-free nucleic acids were isolated from Amniotic fluid (AF), cerebrospinal fluid (CSF), or spent HeLa cell culture media (Media) using the *Quick*-cfDNA/cfRNA™ Serum & Plasma kit. (Right) Endogenous cell-free DNA from each sample type visualized using the Agilent TapeStation. (Left) Human miR-16-5p assay using the protocol from Busk P. K., BMC Bioinformatics, 2014.

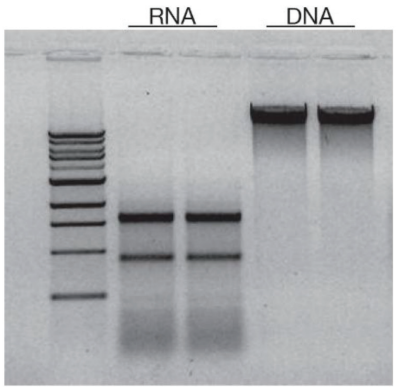
Product	Cat No.	Size	Sample Input
Quick-cfDNA/cfRNA™ Serum & Plasma Kit	R1072	50 preps	Up to 3 ml of serum, plasma, CSF or amniotic fluid

Quick-DNA/RNA™ Blood Tube Kit

Highlights:

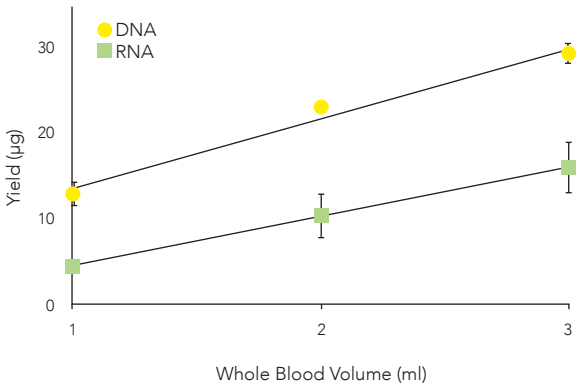
- **Quick & Easy:** Sample protection in DNA/RNA Shield™ using R1150 for high quality extraction.
- **Highest Yields:** Purify up to 50 µg DNA and up to 100 µg RNA from 3 ml blood in 50 µl elution volumes.
- **Ultra-Pure:** Ready for Next-Gen Sequencing, RT-qPCR, Microarray, etc.

High Quality DNA/RNA Without Reagent Removal



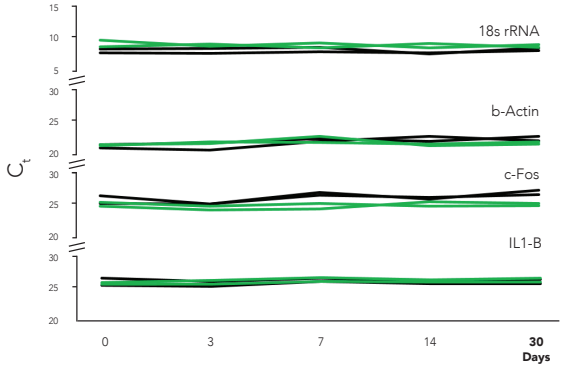
High quality DNA and RNA is effectively purified from blood stored in DNA/RNA Shield™. High molecular weight DNA remains with no apparent degradation. Also, RNA was high quality, DNA-free and includes small RNAs.

Highest Yields



Linear recovery of DNA and RNA using the *Quick*-DNA/RNA™ Blood Tube Kit. Aliquots (1-3 ml) of whole blood stored in DNA/RNA Shield™ were used for purification and the total DNA/RNA yield measured (n=3).

Nucleic Acid Stabilization at Ambient Temperature



RNA in blood is effectively stabilized in DNA/RNA Shield™ at ambient temperature. Graph shows cellular RNA from human whole blood stabilized in DNA/RNA Shield™ at the indicated time points and analyzed by (RT)-qPCR.

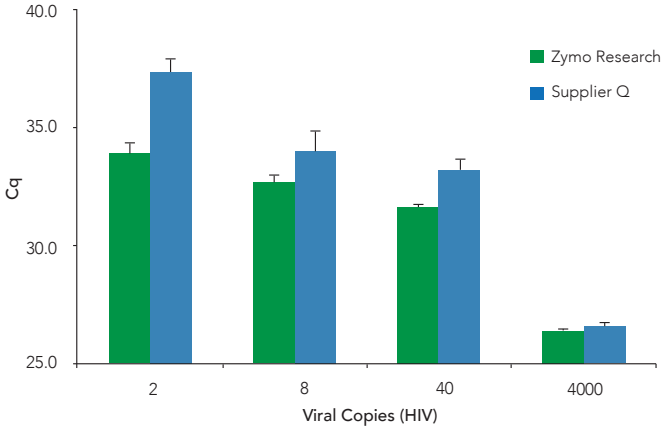
Product	Cat No.	Size	Sample Input
Quick-DNA/RNA™ Blood Tube Kit	R1151	50 preps	Up to 3 ml whole blood

Quick-DNA/RNA™ Viral Kits

Highlights:

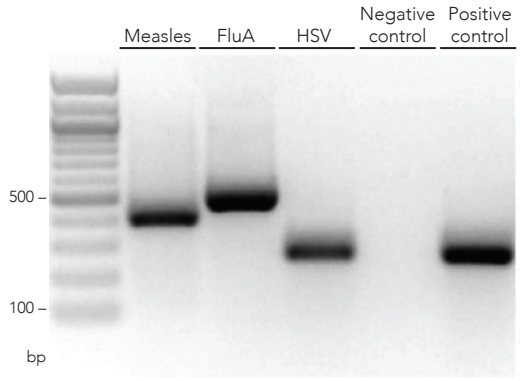
- **Quick & Easy:** Co-purify DNA and RNA from samples (e.g. plasma, serum, etc.).
- **High Sensitivity:** Optimized for recovery of low viral copy.
- **Ultra-Pure:** Ready for Next-Gen Sequencing, RT-qPCR, arrays, etc.

Sensitive Detection



The *Quick*-DNA/RNA™ Viral Kits ensure high sensitivity viral detection compared to the Supplier Q kit. Viral RNA was isolated from plasma samples. Data shows the mean (+/- SD) of triplicate RT-qPCR measurements.

High Quality DNA/RNA



RT-PCR detection of DNA/RNA from a mixed virus population extracted using the *Quick*-DNA/RNA™ Viral Kit. Influenza type A (FluA); Herpes-simplex virus (HSV); Negative control (no template); Positive control (HSV).

Product	Cat No.	Size	Binding Capacity	Minimum Elution	Sample Input
Quick-DNA/RNA™ Viral Kit	D7020 D7021	50 preps 200 preps	50 µg DNA/RNA	35 µl	Plasma, Serum, CSF, Cell culture media, cellular suspensions, whole blood, urine, saliva, swab, fecal, and any sample in DNA/RNA Shield™
Quick-DNA/RNA™ Viral 96 Kit	D7022 D7023	2 x 96 preps 4 x 96 preps	10 µg DNA/RNA	10 µl	
Quick-DNA/RNA™ Viral MagBead Kit	R2140/R2140-E* R2141/R2141-E*	250 preps 1000 preps	5 µg DNA/RNA per 10 µl MagBinding Beads	15 µl	
Load N' Go DNA/RNA Viral Kit	R2143	1 x 96 preps	5 µg DNA/RNA per reaction	15 µl	

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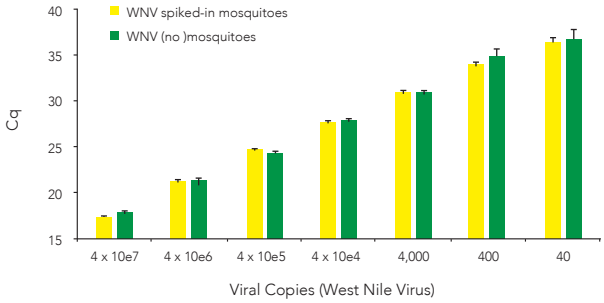
Quick-DNA/RNA™ Pathogen Kits

Highlights:

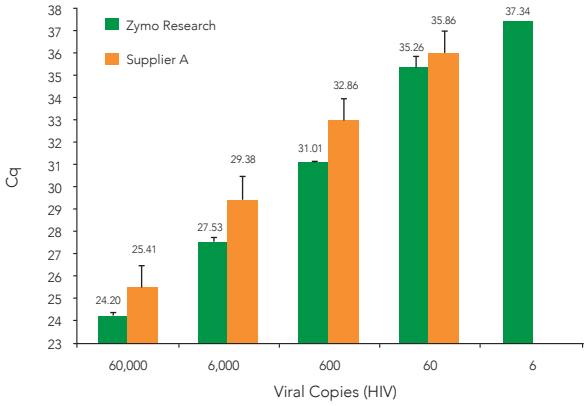
- **Quick & Easy:** Pathogen inactivation and DNA/RNA extraction from a variety of vectors with provided DNA/RNA Shield™.
- **High Sensitivity:** Reliable recovery of total nucleic acid.
- **Ultra-Pure:** Ready for Next-Gen Sequencing, RT-qPCR, arrays, etc.

Sensitive Detection of West Nile Virus in Mosquitoes



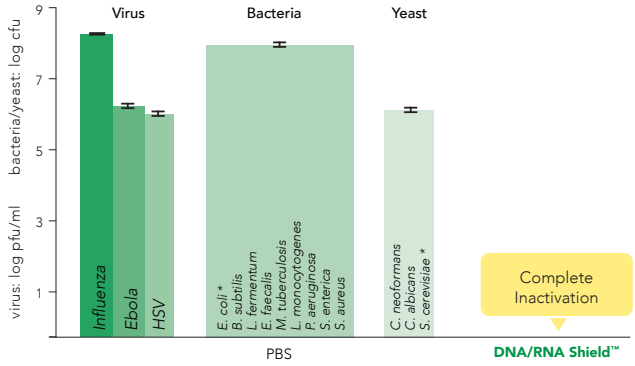
Hard-to-lyse and inhibitor-rich mosquito vectors were homogenized using ZR BashingBeads™ and purified using *Quick*-DNA/RNA™ Pathogen Miniprep. Ultra-pure, inhibitor-free West Nile Virus nucleic acids (spike-in) were detected by RT-qPCR down to 40 viral copies.

High Sensitivity Detection of HIV-1 Virus at Low Titer



HIV-1 viral RNA particles (spiked-in plasma), purified using the *Quick*-DNA/RNA™ Pathogen kit and detected by RT-qPCR.

Pathogen Inactivation



Viruses, bacteria, and yeast are effectively inactivated by DNA/RNA Shield™ (included in workflow) compared to mock (PBS) treatment for 5 minutes. Titer was subsequently determined by plaque assay (PFU) or growth assay (CFU).

Product	Cat No.	Size	Binding Capacity	Minimum Elution	Sample Input
Quick-DNA/RNA™ Pathogen Miniprep Kit	R1042 R1043	50 preps 200 preps	50 µg DNA/RNA	≥ 25 µl	Vectors, Tissue, Biological liquids
Quick-DNA/RNA™ Pathogen MagBead Kit	R2145 R2146	96 preps 4 x 96 preps	10 µg DNA/RNA per 20 µl magnetic beads	≥ 30 µl	

NGS Library Prep

05

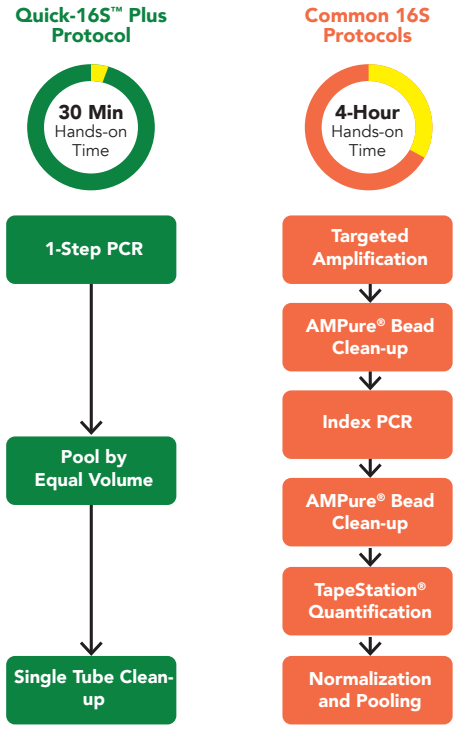
Next-Gen Sequencing (NGS) has revolutionized genomic research by enabling high-throughput, cost-effective analysis of genetic information. With its capacity for rapid large-scale sequencing of DNA, NGS has accelerated the pace of genomic studies, allowing for *de novo* sequencing, genome-wide associatioan studies (GWAS), detection of structural variations, epigenetic analyses, metagenomics, RNA sequencing (RNA-Seq), and single-cell sequencing. This technology has significantly advanced our understanding of genetics, gene regulation, disease mechanisms, microbial diversity, and cellular heterogeneity, impacting fields ranging from medicine to ecology.

The scientists at Zymo Research have developed unique NGS library preparation kits and other library preparation methods featuring easy-to-use, streamlined workflows. These methods generate ready-to-sequence libraries compatible with Illumina®-based sequencing chemistries.

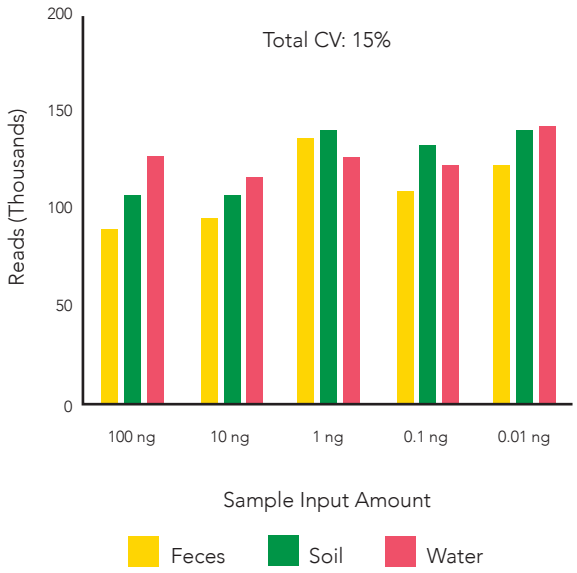
Microbiome Analysis

NGS has made 16S rRNA gene sequencing indispensable in microbiome research, offering a cost-effective means to identify bacterial taxa inaccessible via traditional culture-based methods. Its applications span environmental research for pollution assessment, medical research for infection diagnosis and microbiome investigation in diseases, and various fields like biotech, pharmaceuticals, food safety, and wastewater treatment. 16S rRNA's conserved and hypervariable regions make it ideal for metabarcoding, with *Quick*-16S Plus NGS Library Prep Kits providing primer sets covering V1-V2, V1-V3, V3-V4, and V4 regions for optimal resolution and coverage across diverse sample types. Similarly, the *Quick*-ITS Plus NGS Library Prep Kit targets fungal research via the ITS2 region. These kits streamline library preparation through single-PCR, adapter-inclusive primers, SYBR dye for qPCR monitoring, and Zymo Research's Equalase enzyme system for normalized PCR product formation, reducing hands-on time from 4 hours to 30 minutes for preparing 96 sequencing-ready libraries.

Fastest 16S Workflow



Normalization Free



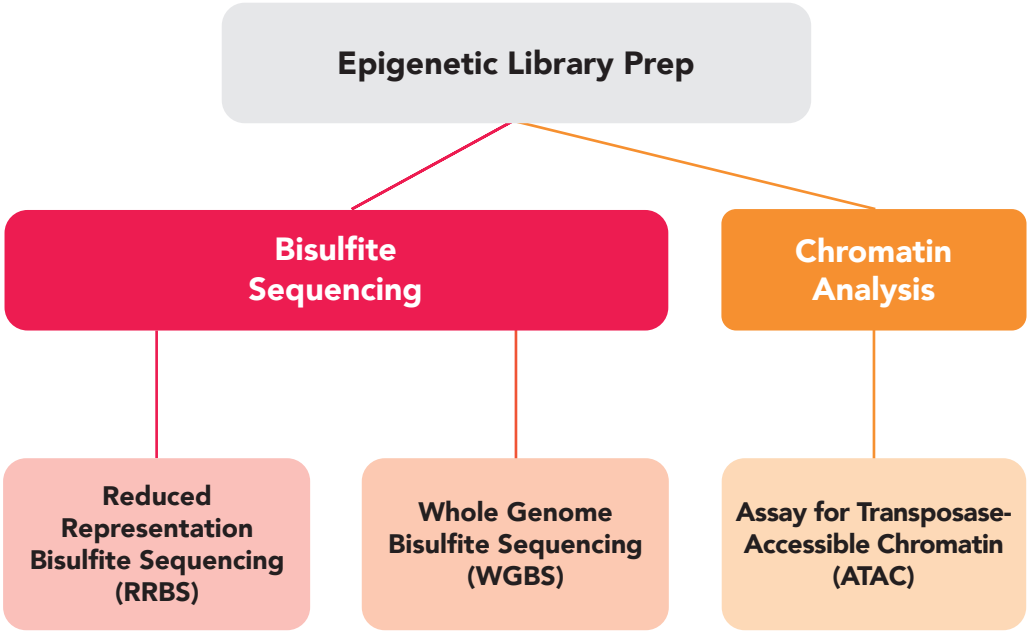
The *Quick*-16S™ Plus NGS Library Prep Kit (V3-V4) results in similar amounts of reads across different input amounts. 0.01-100 ng fecal, soil, and water DNA were used as inputs and libraries were pooled by equal volumes (2 µl each) without further normalization. The CV (coefficient of variation) is the ratio of the standard deviation to the mean with lower values corresponding to less dispersion around the mean.

Target Regions	V1-V2	V1-V3	V3-V4	V4	ITS2
Microbial Coverage	Bacteria & Archaea	Bacteria & Archaea	Bacteria & Archaea	Bacteria & Archaea	Fungi
Recommended Kit	*Quick*-16S Plus NGS Library Prep Kit (V1-V2) D6434-PS1)	*Quick*-16S Plus NGS Library Prep Kit (V1-V3) (D6440-PS1)	*Quick*-16S Plus NGS Library Prep Kit (V3-V4, UDI), (D6421)	*Quick*-16S Plus NGS Library Prep Kit (V4) (D6430, D6432)	*Quick*-ITS Plus NGS Library Prep Kit (D6424, D6426)
Compatible Illumina Sequencing Platforms	MiSeq, NextSeq	MiSeq, NextSeq	MiSeq, NextSeq	All Illumina Platforms	MiSeq

Epigenetic Analysis

Zymo Research offers a diverse range of Next-Gen Sequencing (NGS) library prep kits for bisulfite-sequencing and chromatin accessibility applications, facilitating the exploration of dynamic epigenetic signatures. Bisulfite conversion, the "gold standard" for 5-methylcytosine (5-mC) detection in DNA, deaminates cytosines to uracil unless methylated, allowing NGS to read methylated cytosines as "C" and converted cytosines as "T," enabling single-base resolution methylation analysis. Reduced representation bisulfite sequencing (RRBS) and whole genome bisulfite sequencing (WGBS) are popular NGS methods for methylome profiling. Similarly, chromatin accessibility, crucial for gene expression, is assessed using techniques like assay for transposase-accessible chromatin sequencing (ATAC-Seq).

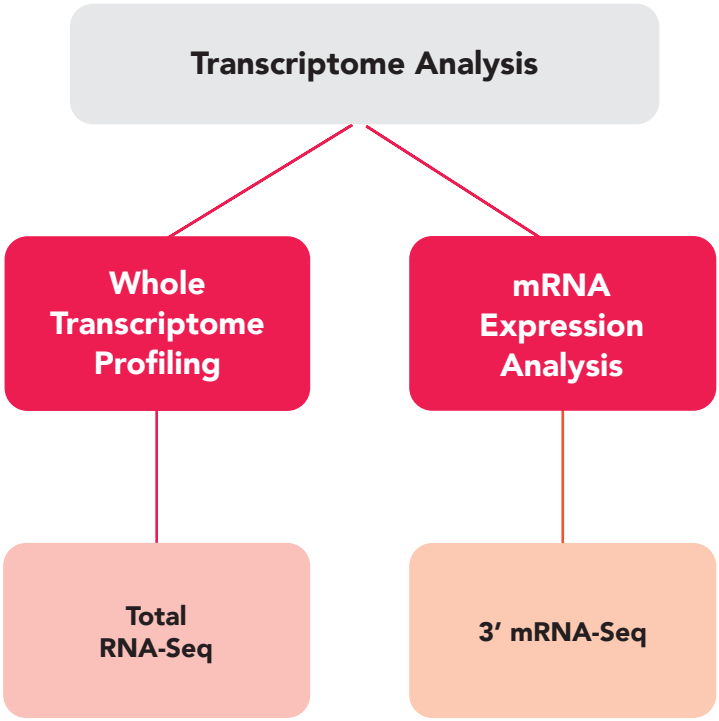
Zymo Research offers the Zymo-Seq family of kits tailored for various needs, including RRBS for CpG-rich regions and WGBS for comprehensive whole genome methylation analysis amenable for fragmented and ultra-low input DNA. The Zymo-Seq ATAC Library Kit is the optimal method to achieve improved ATAC performance with 7X less mitochondrial DNA contamination and highly correlated replicates across both fresh and frozen samples.



Applications	Recommended Kit
Reduced Representation Bisulfite Sequencing (RRBS)	Zymo-Seq RRBS™ Library Kit (D5460, D5461)
Whole Genome Bisulfite Sequencing (WGBS)	Zymo-Seq WGBS Library Kit (D5465) Zymo-Seq Cell Free DNA WGBS Library Kit (D5462, D5463) Pico Methyl-Seq™ Library Prep Kit (D5455, D5456)
Assay for Transposase-Accessible Chromatin (ATAC)	Zymo-Seq ATAC Library Kit (D5458)

RNA Transcriptome Analysis

Zymo Research offers RNA-Seq library kits tailored to diverse research needs, facilitating Next-Gen Sequencing (NGS)-based RNA analysis and transcriptomics research. Total RNA-Seq is a common method for profiling both coding and noncoding RNA, with the Zymo-Seq RiboFree® Total RNA Library Kit offering universal rRNA depletion technology, broadening applicability beyond commonly studied organisms. The universal rRNA depletion module is also available as an independent product, providing flexibility in research applications. For efficient mRNA analysis, 3′ mRNA-Seq is enabled by the SwitchFree™ technology in the Zymo-Seq SwitchFree™ 3′ mRNA Library Kit, optimizing workflow efficiency with Unique Molecular Identifiers (UMIs).



RNA-Seq Methods	Total RNA-Seq	3′ mRNA-Seq
RNA Type of Interest	• Coding RNA • Non-coding RNA	Coding RNA only
Suggested Applications	• Whole transcriptome analysis • Isoform identification or alternative splicing • Exon/intron boundaries	Differential gene expression (DGE) analysis focusing on protein coding genes
Recommended Kit	Zymo-Seq RiboFree® Total RNA Library Kit (R3000, R3003)	Zymo-Seq SwitchFree™ 3′ mRNA Library Kit (R3008, R3009)

Microbiomics

06

Recent advancements in DNA sequencing have drastically reduced the time and cost required to sequence an organism. In turn, this has fueled extensive research into microbial communities within both human and environmental ecosystems. Government agencies leading microbiome research express keen interest in leveraging microbiome studies to address various issues, including food production, human and ecosystem health improvement, renewable energy generation, and the development of microbiome-based products.

While NGS and increased funding have facilitated large-scale research, the lack of standard reference materials and controls in microbiomics has raised concerns about data accuracy and reproducibility. The absence of established methods and standards undermines data reproducibility, affecting research across labs, from small-scale to commercial service providers.

The ZymoBIOMICS® product line aims to mitigate bias throughout the pre-analytic workflow. It includes specialized collection devices to preserve samples, efficient DNA extraction methods for consistent lysis of microbes, and microbial standards to assess bias in the workflow. This product line seeks to establish standardized metrics for assessing microbiomics and metagenomics workflows and improving data reproducibility across laboratories.

Microbiomics
Made Simple™

Quick Product Guide

Standards, Controls & References

Cellular

ZymoBIOMICS® Microbial Community Standard

Assess bias and errors in NGS-based microbial composition profiling workflows.

ZymoBIOMICS® Spike-in Control I & II

Whole cell spike-in control to assess absolute cell number in microbiome samples.

ZymoBIOMICS® Gut Microbiome Standard

An accurately quantified microbial community mimicking the human gut microbiome.

ZymoBIOMICS® Microbial Community Standard II (Log Distribution)

Microbial standard with a log distribution used to assess microbiomics workflows.

ZymoBIOMICS® Oral Microbiome Standard

Mixture of 12 bacterial strains in staggered abundances to mimic a true oral microbiome.

DNA

ZymoBIOMICS® Microbial Community DNA Standard

Assess bias and errors in NGS-based microbial composition profiling workflows.

ZymoBIOMICS® HMW DNA Standard

A mixture of high molecular weight genomic DNA isolated from pure cultures of seven bacterial and one fungal strains.

ZymoBIOMICS® Microbial Community DNA Standard II (Log Distribution)

DNA standard with a log distribution used to assess the performance of microbiomic workflows.

Sample Collection

Fecal Samples

DNA/RNA Shield™ - Fecal Collection Tube

A 15 ml tube prefilled with DNA/RNA Shield™ equipped with a scoop attached to the screwcap for convenient sample collection.

Swab Samples

DNA/RNA Shield™ - Collection Tube with Swab

A sterilized screwcap tube prefilled with DNA/RNA Shield™ (1 or 2 ml) with flocked swab.

Microbial Samples

DNA/RNA Shield™ - Lysis Tube (Microbe)

Screwcap tube prefilled with DNA/RNA Shield™ and ultra-high density BashingBeads™ for homogenization.

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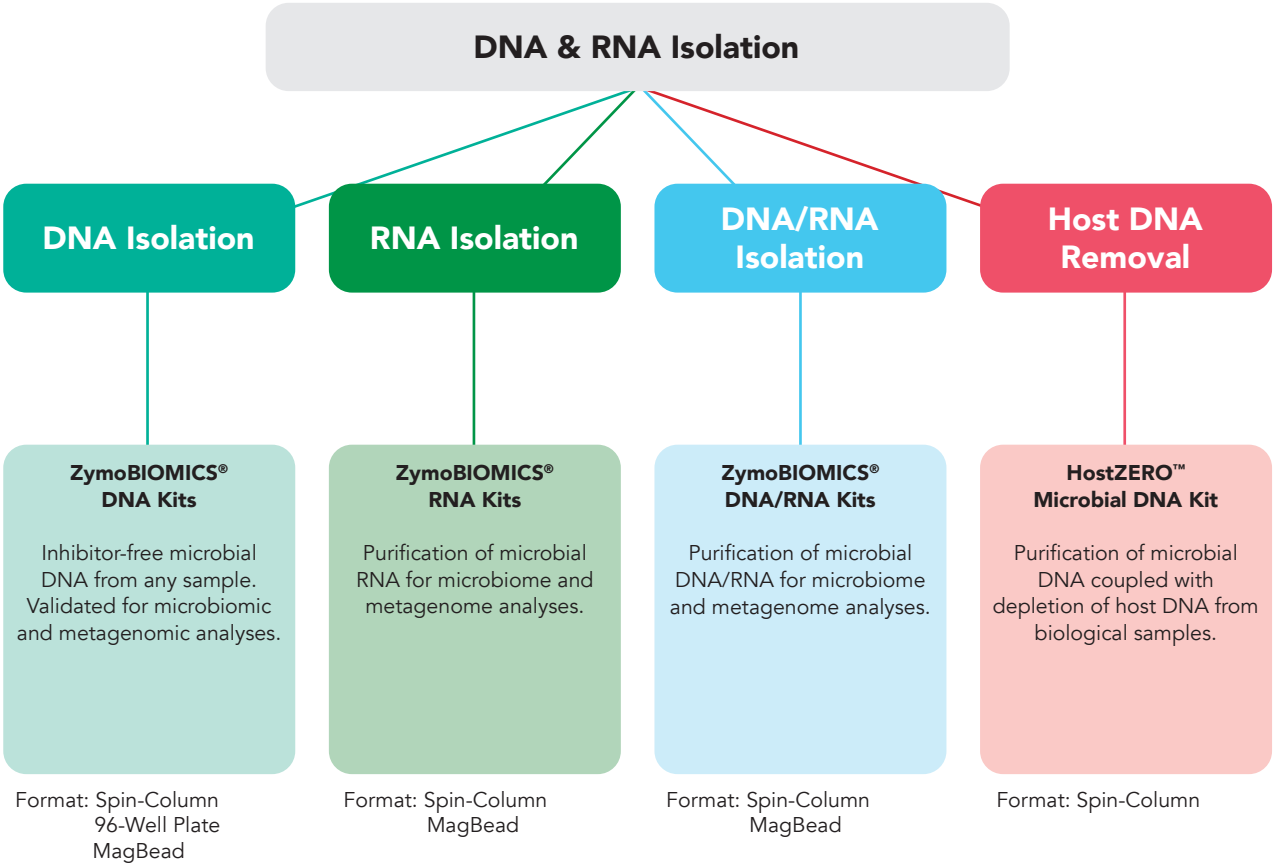
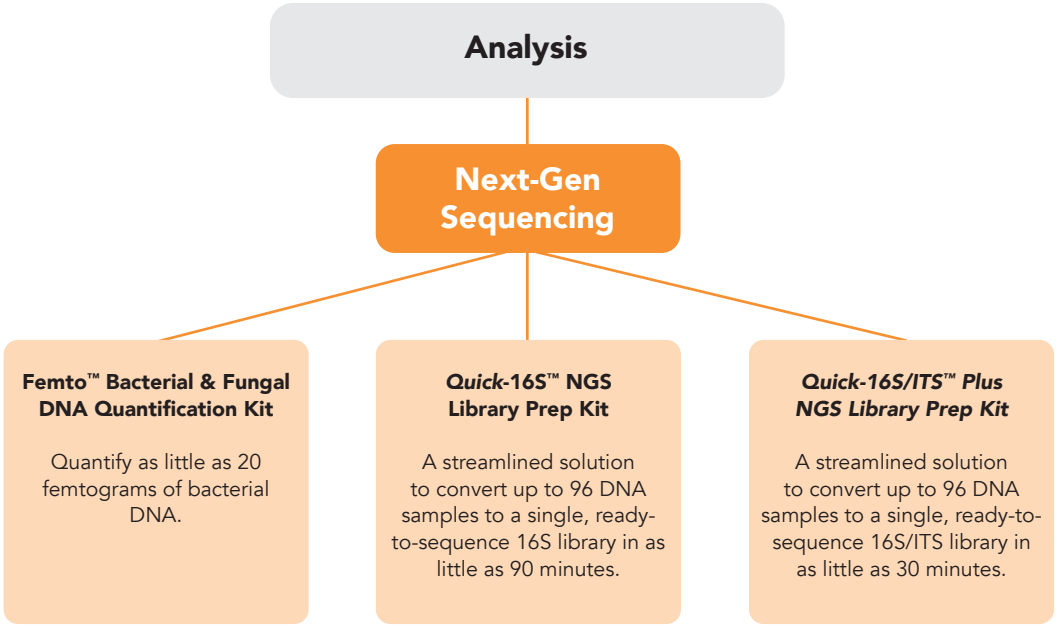
Quick Product Guide





The Solution to Accurate Microbiomics Research

Early quality control studies of microbiomics research suggest that the field is littered with bias, which has led to unintentionally inaccurate and irreproducible data (Stulberg et al., 2016). These inaccuracies stem from the complicated multi-step workflows starting at sample collection, all the way through bioinformatics analyses. Each step of a microbiomics workflow contains potential for enormous amounts of variation. As multi-lab and longitudinal microbiomic studies have become more common, there is an urgent need for microbial reference materials to establish validated methods for reproducible data. Bias must be systemically evaluated through entire workflows and eliminated (or substantially reduced) by addressing its root cause in each step of these workflows.

Zymo Research has strived to eliminate bias across the entire microbiomics workflow. The ZymoBIOMICS® product line achieves this objective through a complete offering of standardized tools and services; this includes microbial standards, sample collection and preservation devices, streamlined purification kits, and services, all of which are optimized and validated to ensure the most accurate microbial profiling.

Microbiome Standards

To improve the quality and reproducibility of microbiomics analyses, Zymo Research has endeavored to develop microbial reference materials. ZymoBIOMICS® Microbial Community Standard is the first commercially available standard for microbiomics and metagenomics studies. The microbial standard is a well-defined, accurately characterized mock community consisting of Gram-negative and Gram-positive bacteria and yeast, with varying sizes and cell wall composition. The wide range of organisms with different properties enables characterization, optimization, and validation of lysis methods such as bead beating. The standard can be used as a defined input to assess the performance of entire microbiomics and metagenomics workflows, therefore enabling workflows to be optimized and validated. A mock microbial DNA community standard allows researchers to focus on the optimization post DNA extraction.

Sample Collection and Storage

The start of any microbiome analysis begins with sample collection. Reliable collection and preservation are critical steps for achieving high-quality reproducible results. When a sample is stored or transported at ambient temperature, without a protective mechanism in place (e.g. preservation reagents or effective cold chain), microbes will have markedly varied growth and survival rates which leads to drastically altered community profiles. While freezing samples is an effective solution, access to freezers is inconvenient or unfeasible in many situations, and transporting samples that require refrigeration or freezing is costly. However, if left unprotected, nucleic acids can be degraded by active nucleases leading to under-representation of microbes present in the samples. Preservation reagents that stabilize nucleic acids solve this problem. Some preservation reagents also require reagent removal that can introduce bias by inadvertently causing uneven partitioning of the sample. DNA/RNA Shield™ satisfies the requirements for accurate community profiling, including preserving nucleic acids at ambient temperature, inactivating organisms, and enabling high-throughput, streamlined purification. Ambient temperature storage allows for cold-free transportation, resulting in reduced costs. DNA/RNA Shield™ inactivates organisms (bacteria, fungi, virus, etc.), including pathogens contained in a sample, eliminating safety concerns during transportation and sample processing. DNA/RNA Shield™ also does not require reagent removal, enabling high-throughput automation and mitigating biases associated with phase separations. DNA/RNA Shield™ takes a molecular snapshot of samples at the time of collection guaranteeing accurate microbial compositions, and is available in various prefilled sample collection devices (e.g. swab/tubes, scoop/tubes, bead beating tubes, etc.).

Nucleic Acid Extraction

Ineffective cell lysis during nucleic acid extraction methods greatly biases microbial profiles. Researchers have evaluated many different cell lysis mechanisms including mechanical, chemical, thermal, and enzymatic. Processes that involve chemical or thermal lysis often cause over-representation of easy-to-lyse organisms (e.g. Gram-negative bacteria) due to poor liberation of DNA from tough-to-lyse organisms (e.g. Gram-positive bacteria and yeast). Enzymatic lysis suffers from its inherent non-stochastic nature and is vulnerable to biases, especially from highly diverse sample types such as soil. Mechanical lysis methodologies (e.g. sonication, blending, liquid nitrogen/mortar and pestle, French pressing, and bead beating) are considered the best approach due to their stochastic nature, with bead beating accepted most widely in the community as the "gold standard." However, not all methods perform equally, and each can suffer from specific problems such as low yields, excessive nucleic acid shearing, and non-uniform lysis. Even bead beating methodologies that have not been fully optimized, characterized, and validated for microbiomic applications can be biased. Simply combining an array of cell lysis mechanisms to achieve unbiased lysis does not necessarily reduce bias, despite potentially improving yields.

When performing microbial composition profiling, combining more cell lysis mechanisms might only introduce additional types of bias into the process as opposed to reducing the bias overall.

For nucleic acid extraction, Zymo Research offers the only kits designed specifically for microbiomics and validated using a mock microbial community standard. ZymoBIOMICS® DNA and RNA Kits (pages 168-172) were developed to achieve uniform cell lysis from a wide range of organisms (e.g. Gram-negative/positive bacteria, fungi, protozoans, and algae) to ensure accurate microbial profiling; this is achieved by utilizing Zymo Research's unique bead beating matrix (featuring ultra-high density mixed beads) and novel chemistry that protects DNA and RNA against severe fragmentation during bead beating. The kits are also equipped with our unique *OneStep*™ PCR Inhibitor Removal Kit spin-column, allowing ultra-pure DNA and RNA extraction from a variety of sample types, including feces, saliva, swabs, soil, water, sediments, biofilms, etc. The extracted DNA/RNA is ready for any downstream applications, including 16S rRNA gene sequencing and shotgun metagenomic sequencing.

Library Prep

The library preparation process is also prone to bias and error. The 16S rRNA gene sequencing library preparation process can suffer from potentially significant bias due to the inherent weaknesses of its primary step, PCR. A common source of PCR-related bias includes GC content variation in templates and degeneracy in primers. Amplification of the 16S rRNA gene using broad coverage primers is further challenged by the high similarity of the targets. PCR chimeric sequences - which are a result of the recombination between similar targets/templates- are thought to be the worst contributors of error and bias in 16S library preparation (Gohl et al, 2016; Haas, et al, 2014). Library preparation for shotgun metagenomic sequencing can also be challenged by some PCR related bias and error. Besides PCR-related bias, shotgun library preparation can be inaccurate in other ways, such as biased DNA fragmentation.

Zymo Research released the *Quick*-16S™ NGS Library Prep Kit to resolve major challenges in 16S library preparation. The kit features real time PCR, rather than regular PCR, allowing users to control PCR chimera formation. The kit contains two novel primer sets that target 16S V1-V2 and V3-V4 regions, dramatically improving phylogenetic coverage. The kits workflow is highly streamlined, which significantly reduces hands-on time.

Bioburden

As the field of microbiomics continues to develop, another form of bias and error that has appeared is bioburden (nucleic acid contamination), which is introduced through complex and lengthy sample handling, reagents, and kits required to sequence DNA from a sample (Salter et al., 2014; Naccache et al., 2013). Because of the highly sensitive nature of NGS-based microbiome sequencing, contaminations introduced can be readily detected. Thus, bioburden can result in over-representation of the true microbial diversity of samples by introducing false positive microbial identifications. The impact of bioburden becomes magnified as sample biomass

decreases, complicating the balance of signal to background. Therefore, the level of bioburden dramatically impacts the detection limit of the technology. All ZymoBIOMICS® DNA Kits are rigorously tested and certified low-bioburden.

Bioinformatics

Popular bioinformatics solutions for 16S sequencing data analysis (such as QIIME and mothur) mostly rely on clustering sequences into Operational Taxonomic Units (OTUs). These processes utilize a variety of clustering algorithms, however, there is no consensus on the best method. The situation is even more challenging when analyzing shotgun metagenomic data, because of limited read length in NGS technologies. *De novo* assembly of complete genomes from metagenomes is facing challenges that have no concrete solutions. If the focus is on microbial identification and composition profiling, assembly-free methods (such as MetaPhlan2 and mOTU) that rely on direct comparison of sequencing reads with a reference database might serve better. There have been many assembly-free programs published in the literature that are available from commercial vendors. Their performance varies significantly in the resolution of taxonomy levels, sensitivity, and specificity.

For 16S data analysis, Zymo Research has established a pipeline that allows species-level resolution with regular Illumina® 16S sequencing data, using Dada2 to infer unique 16S sequences from the sequencing data. Species-level resolution is achieved by combining a novel taxonomy assignment method with a well-curated 16S database.

Microbiomics Made Simple

Mitigating Bias with Microbiome Standards and Controls

The Human Microbiome Project Phase 1 (2007-2012) sparked significant interest in microbiome research, particularly in the realm of the human gut microbiome. Due to the novelty of this field and the incomplete validation of wet-lab and dry-lab protocols, coupled with the intricate and bias-prone nature of Next-Gen Sequencing workflows, researchers grappled with the pervasive issue of data quality in publications. The challenge intensified when comparing data across laboratories, as highlighted in a notable 2014 Science News publication. This publication showcased substantial discrepancies in profiling results for the same stool sample processed by two renowned organizations (**Figure 1**).

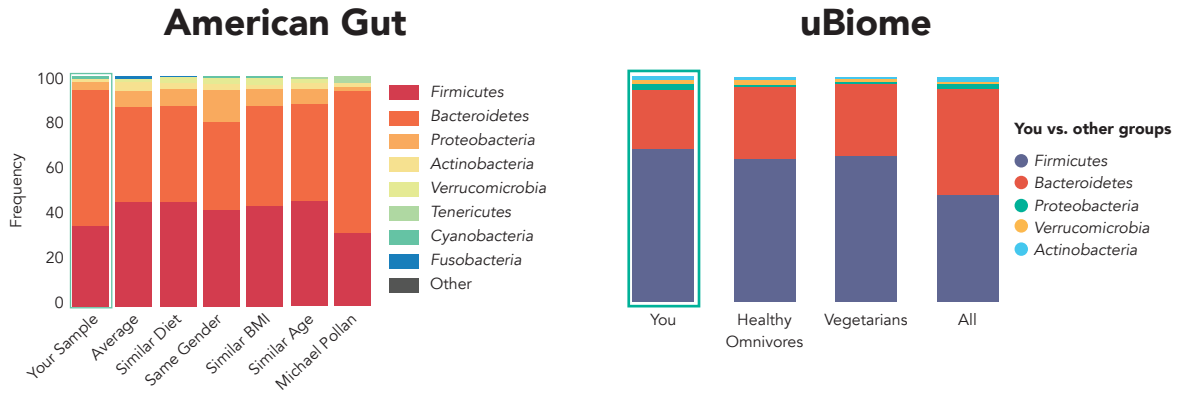


Figure 1. American Gut and uBiome report contradictory results from the same fecal sample, demonstrating the lack of reproducibility in microbiome research.

Recognizing the need for microbiome standards and controls to address bias in this emerging field, Zymo Research and other key players such as the National Institute of Standards and Technology (NIST) and the American Type Culture Collection (ATCC) took proactive steps. Beginning in 2014, we dedicated two years to the development of the first microbiome standard: the ZymoBIOMICS® Mock Microbial Community Standard. Zymo Research entered into competition with ATCC when introducing the product at a NIST workshop in 2016 and successfully launched the first commercial microbiome standard in 2017. This launch coincided with the introduction of the first microbial DNA extraction kit (ZymoBIOMICS® DNA Miniprep) validated for unbiased microbiome profiling, giving us a competitive edge. We have maintained this advantage, and today Zymo Research's microbiome standards have garnered approximately nine to ten times more citations than those of ATCC (**Figure 2**).

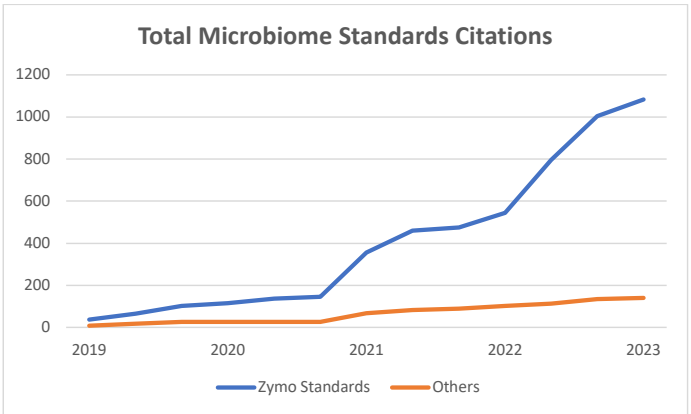


Figure 2. As of 2023, Zymo Research's microbiome standards have been cited 1,083 times, while all other competing standards have been cited a total of 140 times.

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This success was hard-won. Initially our microbiome standards faced mixed reception in the market. Resistance did not arise from inherent quality issues, but instead from the challenges of measuring and comparing bias in established workflows. The previous "gold standard" of workflows, the fecal microbiome profiling workflow employed by the Human Microbiome Project, was revealed to be among the most biased. The primary source of bias was identified in the PowerSoil® DNA Isolation Kit, which utilized 0.7 mm Garnet beads for mechanical lysis. Internal research demonstrated that these beads were too large for effective bacterial lysis. Measuring the potential impact of bias in widely used workflows is an important step in assuring the integrity of current and future microbiome studies.

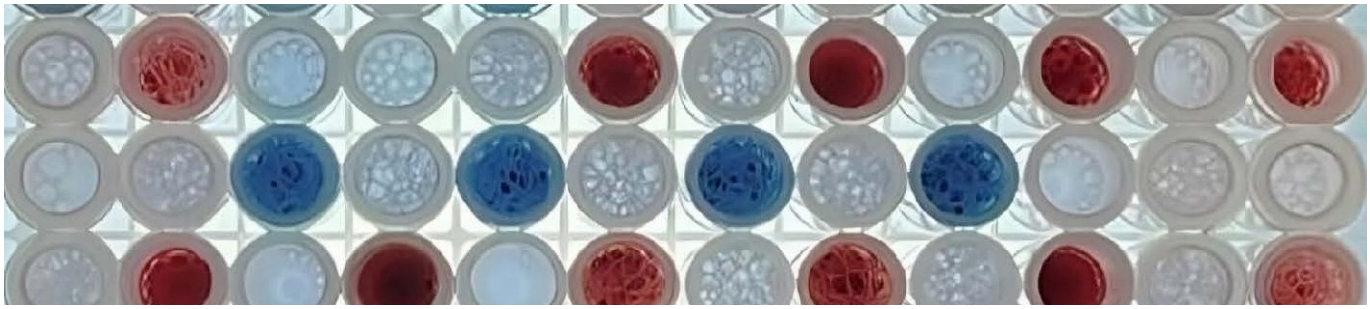
Assessing bias at scale remains a complex challenge. Zymo Research continues to extend support to researchers through various channels such as conference talks, blogs, emails, and publications, but more is required to support this rapidly growing field. To increase this effect, we created the Microbiome Standards and Controls Initiative (M-SCI). Under M-SCI, we have distributed thousands of microbiome standards to labs across the world for free. This initiative encouraged researchers to incorporate controls into their workflows, fostering a deeper understanding of bias (**Figure 3**).

Figure 3. Over 460 participating labs across 47 countries have joined in the M-SCI program.

M-SCI has been warmly received. In a recent microbiome standard workshop hosted by NIST, researchers from organizations across the United States actively engaged in discussions surrounding bias — a term that is no longer taboo. By continuing to create and foster bias mitigation strategies and create spaces for open discussion, Zymo Research hopes to help usher in the best future for the microbiome field.

Tech Tip

Avoiding Cross-Contamination in High-Throughput Lysis



In the field of microbiomics, the declining cost of Next-Gen Sequencing (NGS) has spurred the widespread adoption of NGS across various applications, including usage amongst certified service providers, direct-to-consumer applications, and clinical diagnostics. As the utilization of NGS continues to rise, there is also a growing demand for high-throughput extraction kits.

The use of high-throughput extraction kits introduces a significant risk of sample well-to-well cross-contamination and leakage in 96-well lysis racks. Both sample leakage and cross-contamination present unique challenges to a workflow such as biohazard risks, sample volume loss, and potential misidentification of microbial communities in subsequent analyses.

The ZymoBIOMICS® BashingBead™ Lysis Rack (0.5 & 0.1 mm) and ZR-96 BashingBead™ Lysis Rack (Barcoded) prevent well-to-well cross-contamination and sample leakage from individual wells. The ZymoBIOMICS® BashingBead™ Lysis Rack (0.5 & 0.1 mm) and ZR-96 BashingBead™ Lysis Rack (Barcoded) have been meticulously designed to endure both low and high-speed homogenization machines and extended lysis periods. These racks utilize heat sealing and threaded screw caps, respectively, and are designed to establish a secure connection to preserve sample integrity during large-scale microbial extractions.

Robust sealing connections, such as heat sealing with a foil seal or using threaded screw caps, have proven effective in preventing leakage and cross-contamination. Conversely, easily removable closures, such as compression mats or PCR-grade seals, exhibit leakage and cross-contamination under low-speed mechanical homogenization. The implications of leakage and well-to-well cross-contamination in 96-well racks can have substantial downstream repercussions.

To tackle issues with contamination and sample leakage, the utilization of the two Zymo Research Lysis Racks offers an effective solution. The ZR-96 BashingBead™ Lysis Rack (Barcoded) and ZymoBIOMICS® BashingBead™ Lysis Rack (0.5 & 0.1 mm) emerge as the premier choices for preventing leakage and cross-contamination, offering a reliable solution to enhance the integrity of microbial samples across diverse applications.

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Tech Tip

Enhancing Metagenomics with BashingBead™ Lysis Technology

The field of metagenomics has evolved significantly, with long-read sequencing offering pivotal advantages over traditional short-read sequencing methods. These advancements provide a deeper understanding of microbial communities across diverse environments.

However, long-read sequencing presents its own set of challenges. Apart from the general hurdles associated with metagenomic sequencing, such as minimizing lysis bias during microbial DNA extraction, the increased sequencing read length also necessitates the isolation of larger, higher-quality DNA fragments. Enzymatic lysis methods, although popular, may not always ensure accurate representation within mixed microbial communities. The inherent nature of enzyme-substrate interactions can lead to biases in the sequencing profiles, as some microbes are lysed more efficiently than others.

To address this bias, mechanical lysis through bead beating has been employed. While effective in breaking down microbial cell walls, bead beating often results in fragmented DNA, posing yet another challenge. The ZymoBIOMICS® DNA extraction kits have incorporated specific methodologies to address these challenges and produce high quality DNA for accurate microbial profiling on any sequencing platform. Central to their approach is the BashingBead™ lysis technology, designed to ensure unbiased lysis and retrieval of both Gram-positive and Gram-negative bacteria, as well as fungi.

The efficacy of the BashingBead™ technology is underscored by rigorous validation against the industry-leading ZymoBIOMICS® Microbial Community Standards. Furthermore, the ultra-high-density beads in these kits are shatter-resistant, significantly reducing DNA shearing and fragmentation.

The DNA fragments obtained from the ZymoBIOMICS® DNA extraction kits range from 8 to 15 kb, which aligns directly with the requirements for long-read metagenomics on PacBio® sequencing platforms, eliminating the need for additional size adjustments such as sonication.

Addressing the complexities associated with long-read metagenomics requires thoughtful methodologies. While challenges persist, the innovative approach of the BashingBead™ lysis technology in ZymoBIOMICS® kits ensures more accurate, efficient, and unbiased insights into complex microbial communities across diverse environments.

ZymoBIOMICS® Microbial Community Standard

- **Microbiome Standard:** Mock microbial community of well-defined composition.
- **Identify Bias:** Contains both tough-to-lyse and easy-to-lyse organisms.
- **Accurate Characterization:** Ideal for validation, optimization, and quality control of complete microbiome workflows.

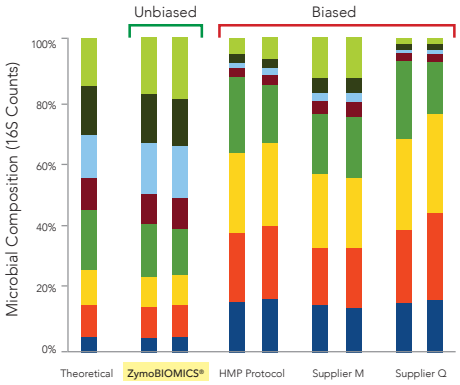
Description:

Microbial composition profiling techniques powered by Next-Generation Sequencing are becoming routine in microbiomics and metagenomics studies. However, these analytical techniques can suffer from significant bias from collection to analysis. The ZymoBIOMICS® Microbial Community Standard is designed to assess bias and errors in the extraction methods of a microbiomics workflow. It mimics a mixed microbial community of well-defined composition, containing three easy-to-lyse Gram-negative bacteria, five tough-to-lyse Gram-positive bacteria, and two tough-to-lyse yeasts. Acting as a defined input, the Microbial Community Standard can guide construction and optimization of entire workflows and can also be used as a routine quality control.

"This standard has allowed colleagues in my laboratory in early levels of training to safely be introduced to specific techniques, as well as other members with more experience to develop and test their own new protocols. I'd recommend the ZymoBIOMICS® Microbial Community Standard for any laboratory in need of a standardized mock community for molecular biology and bioinformatics applications."

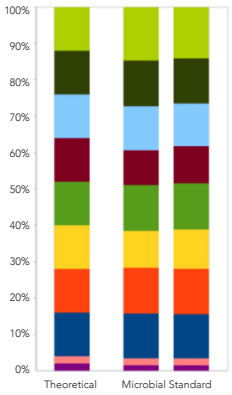
—André S, Duisburg-Essen University

Identify and Eliminate Bias



The ZymoBIOMICS® Microbial Community Standard was used to compare different DNA extraction protocols. DNA samples were profiled by 16S rRNA gene targeted sequencing.

Defined Microbial Community



Species	Avg. GC (%)	Gram Stain	gDNA Abun. (%)
Pseudomonas aeruginosa	66.2	-	12
Escherichia coli	56.8	-	12
Salmonella enterica	52.2	-	12
Lactobacillus fermentum	52.8	+	12
Enterococcus faecalis	37.5	+	12
Staphylococcus aureus	32.7	+	12
Listeria monocytogenes	38.0	+	12
Bacillus subtilis	43.8	+	12
Saccharomyces cerevisiae	38.4	Yeast	2
Cryptococcus neoformans	48.2	Yeast	2

Product	Cat No.	Size	Specifications	Uses
ZymoBIOMICS® Microbial Community Standard	D6300	10 preps	Source: A mixture of ten inactivated microorganisms (bacterial and fungal) Storage Solution: cells are suspended in DNA/RNA Shield™ (R1100-50) Impurity Level: < 0.01% foreign microbial DNA	Assess bias within collection, storage, and extraction protocol

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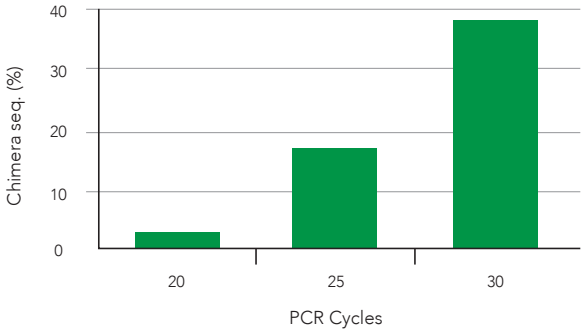
ZymoBIOMICS® Microbial Community DNA Standard

- **Microbiome DNA Standard:** Eight bacteria and two yeast genomes.
- **Identify Bias in Library Prep Methods:** DNA has a wide GC range of 15% - 85%.
- **Accurate Composition:** Ideal for validation, optimization, and quality control of microbiome workflows.

Description:

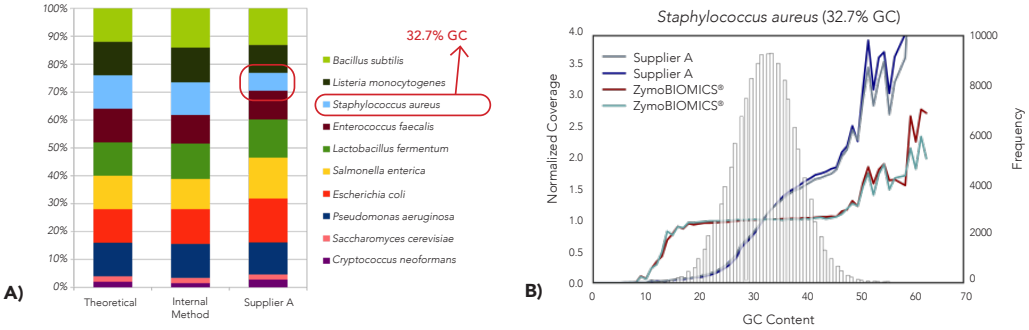
One of the major challenges in the emerging field of microbiomics is the bias and errors introduced in the complex workflows. Besides nucleic acid purification, bias also arises from sequencing library preparation and subsequent processes. The ZymoBIOMICS® Microbial Community DNA Standard is designed to assess bias, errors, and other artifacts after nucleic acid purification. The DNA standard is created by pooling DNA extracted from pure cultures; it has accurately defined composition, negligible impurities (<0.01%), and contains genomes of a wide range of GC content (15% - 85%). The DNA standard is designed to have the same microbial composition as the cellular version, the ZymoBIOMICS® Microbial Community Standard, so that the two can be more powerful when working in tandem.

Address & Reduce PCR Chimera



The occurrence of PCR chimera increases with the number of PCR cycles during 16S library preparation. The ZymoBIOMICS® Microbial Community DNA Standard can be used as a positive control to optimize the number of cycles needed in a prep.

Assess GC Bias



Assess GC bias in library preparations. A) Compared to the ZymoBIOMICS® services, Supplier A's shotgun metagenomic sequencing was biased due to GC content variation. **B)** Coverage of the 10 microbial genomes was normalized to evaluate the effects of GC content.

Product	Cat No.	Size	Specifications	Uses
ZymoBIOMICS® Microbial Community DNA Standard	D6305 D6306	200 ng 2,000 ng	Source: A mixture of genomic DNA from ten microbial strains Storage Solution: 10mM Tris-HCl and 0.1 mM EDTA, pH 8.0 Impurity Level: < 0.01% foreign microbial DNA	Assessing bias in library preparation for 16S and shotgun sequencing

ZymoBIOMICS® Gut Microbiome Standard

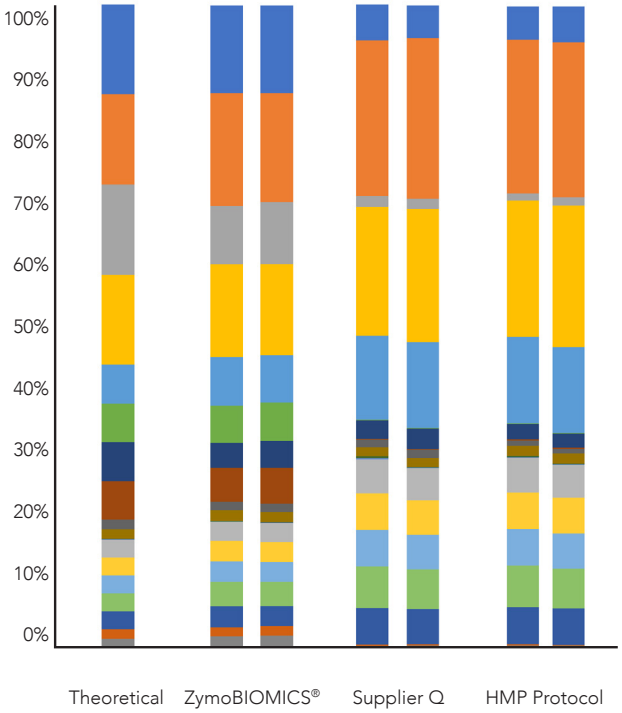
- **True to Life:** Comprised of 21 different strains to mimic the human gut microbiome.
- **Accurate Composition:** Allows for benchmarking and validation of NGS microbiome workflows.
- **Cross Kingdom Representation:** Includes Bacteria, Fungi, and Archaea.

Description:

The ZymoBIOMICS® Gut Microbiome Standard is a mixture of 18 bacterial strains, 2 fungal strains, and 1 archaeal strain in staggered abundances to mimic a true gut microbiome. The standard presents multiple challenges for NGS pipelines, such as tough-to-lyse Gram-positive bacteria (e.g. *Roseburia hominis*) to test lysis efficiency, genomes with a wide range of GC content to test sequencing coverage bias, low-abundance pathogenic organisms for detection limit assessment and 5 different strains of *E. coli* to test taxonomic resolution. These challenge points can be used to expose artifacts, errors, and bias in microbiomics or metagenomics workflows. Serving as a defined input, this standard can be used to guide construction and optimization of entire workflows or as a quality control tool for inter-lab studies.

"Very useful for troubleshooting different steps when setting up our shotgun metagenomic pipeline."
— Andrew P., Biomesense

Optimize Microbiome Analysis of Gut Samples



Species	Theoretical Abun. (%)
Faecalibacterium prausnitzii	14
Veillonella rogosae	14
Roseburia hominis	14
Bacteroides fragilis	14
Prevotella corporis	6
Bifidobacterium adolescentis	6
Fusobacterium nucleatum	6
Lactobacillus fermentum	6
Clostridioides difficile	1.5
Akkermansia muciniphila	1.5
Methanobrevibacter smithii	0.1
Salmonella enterica	0.01
Enterococcus faecalis	0.001
Clostridium perfringens	0.0001
Escherichia coli (JM109)	2.8
Escherichia coli (B-3008)	2.8
Escherichia coli (B-2207)	2.8
Escherichia coli (B-766)	2.8
Escherichia coli (B-1109)	2.8
Candida albicans	1.5
Saccharomyces cerevisiae	1.4

The ZymoBIOMICS® Gut Microbiome Standard consists of a mix of hard-to-lyse bacteria, easy-to-lyse bacteria, two yeasts and an archaea species in ratios mimicking the human gut microbiome. The standard was used to compare different DNA extraction protocols. The resulting DNA was profiled using metagenomic shotgun sequencing.

Product	Cat No.	Size	Specifications	Uses
ZymoBIOMICS® Gut Microbiome Standard	D6331	10 preps	Storage Solution: 2X DNA/RNA Shield™ (Cat. No. R1200-125). Impurity Level: < 0.01% foreign microbial DNA. Relative Abundance Deviation: <15%	Quantify microbial community mimicking the human gut microbiome

www.zymoresearch.com | info@zymoresearch.com | tel: 1-(949) 679-1190 | toll-free: 1-(888) 882-9682 | fax: 1-(949) 266-9452

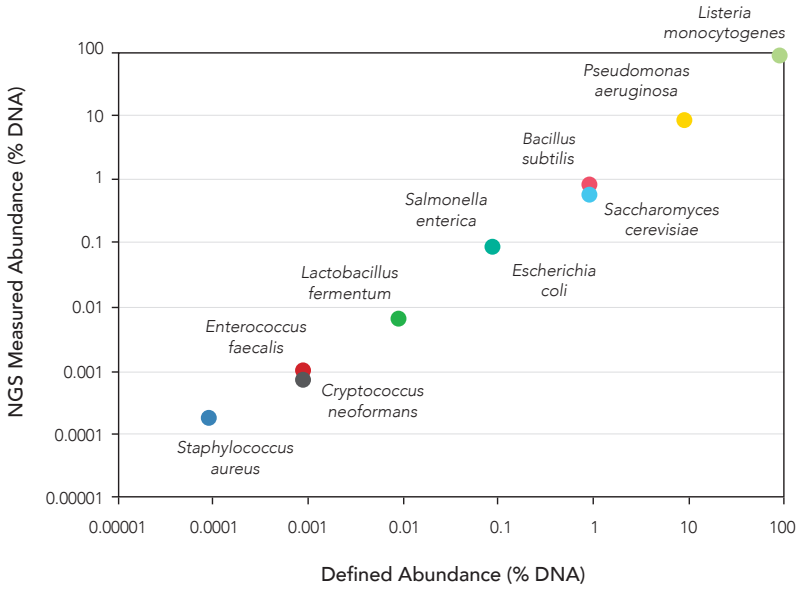
ZymoBIOMICS® Microbial Community Standard II (Log Distribution)

- **Assess Detection Limit:** Log distributed abundance enables reliable positive identification down to 100 microbes.
- **Accurate Composition:** Cross-validated with multiple measurements.
- **Microbiome QC:** Quality control for microbiome profiling and pathogen identification.

Description:

The ZymoBIOMICS® Microbial Community Standard II (Log Distribution) is a mock microbial community, including DNA, consisting of eight bacterial and two fungal strains used to assess the performance of microbiomics workflows. These standards are accurately characterized and contain negligible impurity (< 0.01%). Cells or DNA of the 10 microbes were mixed to create log-distributed abundance (see graph below), which allows the user to easily assess the detection limit of a microbiomics workflow.

Accurate Composition with Log Distribution



NGS analysis of the ZymoBIOMICS® Microbial Community Standard II (Log Distribution) agrees with the defined composition. DNA was extracted using the ZymoBIOMICS® DNA Miniprep kit. The library was prepared with an internal method and sequenced using an Illumina® MiSeq™. Abundance was inferred by mapping raw sequencing reads against reference genomes.

Product	Cat No.	Size	Specifications	Uses
ZymoBIOMICS® Microbial Community Standard II (Log Distribution)	D6310	10 preps	Source: Eight bacteria (3 Gram-negative and 5 Gram-positive) and 2 yeasts. Storage Solution: DNA/RNA Shield™ for microbial inactivation and stabilization. Impurity Level: < 0.01% foreign microbial DNA. Relative Abundance Deviation in Average: <30%	Assessing bias in composition measurement
ZymoBIOMICS® Microbial Community DNA Standard II (Log Distribution)	D6311	220 ng/20µl	Source: Genomic DNA of eight bacteria and two yeasts. Impurity Level: < 0.01% foreign microbial DNA. Relative Abundance Deviation in Average: <30%	Assessing accuracy of taxonomy identification

ZymoBIOMICS® Spike-in Control I (High Microbial Load)

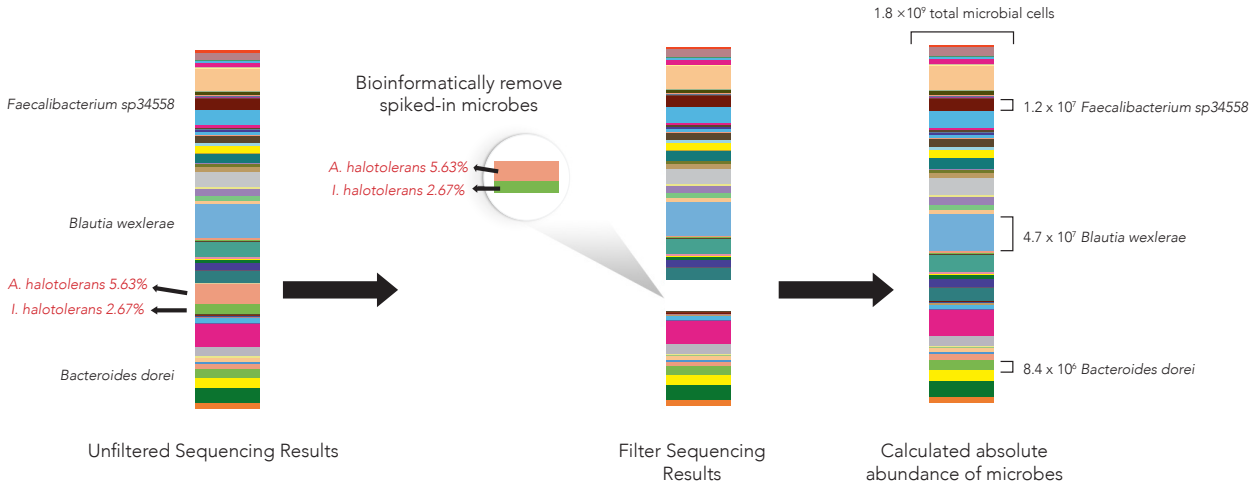
- **Absolute Quantification:** Enables cell number measurements using Next-Gen Sequencing.
- ***In situ* Quality Control:** Ensures each sample is quantified accurately.
- **Unique Composition:** Comprised of two microbes alien to the human microbiome.

Description:

ZymoBIOMICS® Spike-in Control I (High Microbial Load) consists of equal cell numbers of two bacteria strains, *Imtechella halotolerans* and *Allobacillus halotolerans*. When spiked into an unknown sample, this product will serve as an *in situ* positive control for DNA-sequencing-based (e.g. NGS-based) microbiome measurements. These two bacteria, *Imtechella halotolerans* (Gram-negative) and *Allobacillus halotolerans* (Gram-positive) represent different cell recalcitrance and can expose potential bias during DNA extraction. Moreover, with accurately quantified cell numbers, this standard enables absolute cell number quantification in microbiome measurements (as demonstrated below).

> *"The ZymoBIOMICS® Spike-in Control is a great product that allows us to go ahead with quantitative skin microbiome analysis. It is a smart product because with relatively short handling time, and relatively low costs we are obtaining a lot of information about the quality of our DNA extraction and the quantity of the input bacteria we are analyzing in every patient specimen. I'm so happy about it!"*
>
> **— Amedeo D. T., UM**

Quantify Absolute Abundance of Microbes



The ZymoBIOMICS® Spike-in Control I was added to a fecal sample. The sample was analyzed by 16S sequencing. The composition percentage of *Imtechella halotolerans* and *Allobacillus halotolerans* was then calculated. Using this percentage and the known input of cells spiked into the sample, the absolute abundance is calculated for the organisms originally present.

Product	Cat No.	Size	Specifications
ZymoBIOMICS® Spike-in Control I (High Microbial Load)	D6320 D6320-10	25 preps 250 preps	Biosafety: This product is not biohazardous as microbes have been fully inactivated. Impurity Level: < 0.01% foreign microbial DNA Sample Storage: -80°C Storage Solution: DNA/RNA Shield™

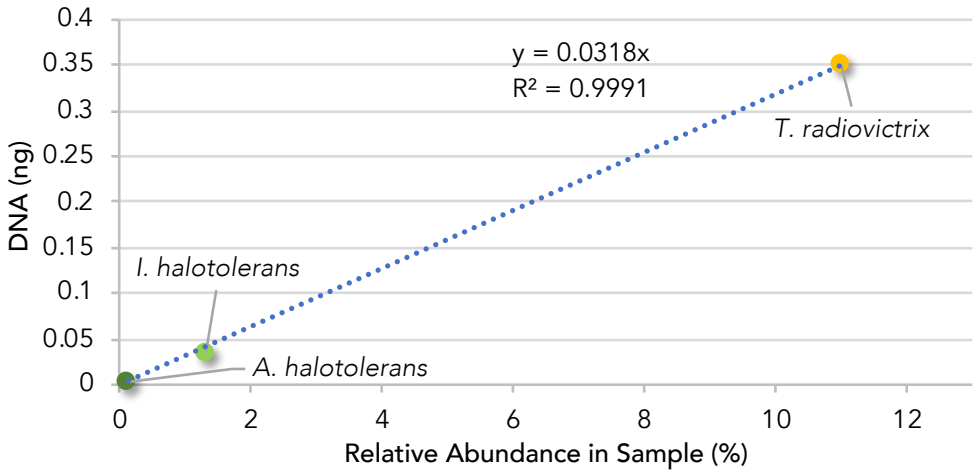
ZymoBIOMICS® Spike-in Control II (Low Microbial Load)

- **Absolute Quantification:** Enables cell number measurements from low-bacterial load samples using Next-Gen Sequencing.
- ***In situ* Quality Control:** Ensures each sample is quantified accurately.
- **Log Abundance Distribution:** Three microbes alien to the human microbiome in log-distribution from 10^3 to 10^5 cells.

Description:

ZymoBIOMICS® Spike-in Control II (Low Microbial Load) consists of three bacteria strains, *Truepera radiovictrix*, *Imtechella halotolerans*, and *Allobacillus halotolerans*. When spiked into a microbial sample, this product will serve as an *in situ* positive control for DNA-sequencing-based microbiome measurements. *Imtechella halotolerans* is Gram-negative and *Allobacillus halotolerans* is Gram-positive while, *Truepera radiovictrix* is resistant to lysozyme lysis and has very high GC content. These species represent different challenges in NGS-based analysis. Moreover, with accurately quantified cell number and a log abundance distribution, this standard enables absolute cell number quantification in cases such as pathogen load detection.

Spike-in a Standard Curve



Once spiked into a sample and analyzed by NGS, the log distribution of the three species creates a standard curve which is used to accurately calculate the absolute abundance of the sample's microbiome.

Product	Cat No.	Size	Specifications
ZymoBIOMICS® Spike-in Control II (Low Microbial Load)	D6321 D6321-10	25 preps 250 preps	Biosafety: This product is not biohazardous as microbes have been fully inactivated. Impurity Level: < 0.01% foreign microbial DNA Sample Storage: -80°C Storage Solution: DNA/RNA Shield™

ZymoBIOMICS® HMW DNA Standard

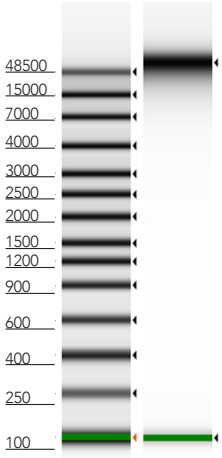
- **Long-Read Sequencing Ready:** Ideal to benchmark 3rd generation sequencing and metagenomic measurements (e.g. Oxford Nanopore & PacBio).
- **High Molecular Weight:** DNA standard is > 50 kb in size.
- **Accurate Composition:** Composition is cross-validated with multiple types of measurements.

Description:

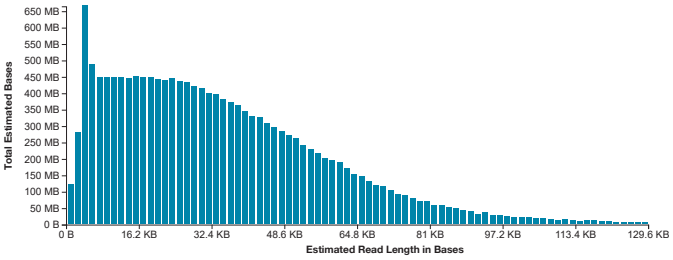
ZymoBIOMICS® HMW DNA Standard is a mixture of high molecular weight genomic DNA isolated from pure cultures of seven bacterial and one fungal strains. It has an accurately defined composition, negligible impurities (<0.01%) and contains genomes of a wide range of GC content (15%-85%). This can be used to assess and benchmark the performance of long-read/3rd generation sequencing for microbiomics and metagenomics analysis and can also be used as a routine quality control. Theoretical composition based on genomic DNA: *Pseudomonas aeruginosa* - 14%, *Escherichia coli* - 14%, *Salmonella enterica* - 14%, *Enterococcus faecalis* - 14%, *Staphylococcus aureus* - 14%, *Listeria monocytogenes* - 14%, *Bacillus subtilis* - 14%, *Saccharomyces cerevisiae* - 2%

Benchmark Long-Read Metagenomics

Long-Read Metagenomics Standard. The ZymoBIOMICS® HMW DNA Standard is composed of genomic DNA from seven bacteria and one yeast and is >50 kb in size, as confirmed by Agilent Tapestation®.



Species	Theoretical Composition (%)	
	Genomic DNA	Genome Copy
Pseudomonas aeruginosa	14	7.8
Escherichia coli	14	10.9
Salmonella enterica	14	11.2
Enterococcus faecalis	14	18.8
Staphylococcus aureus	14	19.6
Listeria monocytogenes	14	17.8
Bacillus subtilis	14	13.2
Saccharomyces cerevisiae	2	0.63



High-Quality Long-Read Data

High-Quality Long-Read Sequencing. The ZymoBIOMICS® HMW DNA Standard was sequenced using the Oxford Nanopore MinION™ and the Ligation Sequencing kit (LSK109) for library preparation. Read length histogram shows an approximate average of 24 kb with >125 kb recorded.

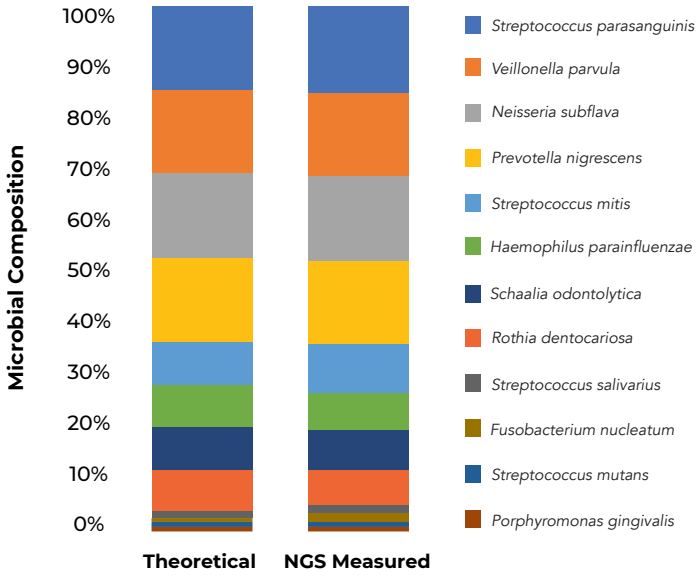
Product	Cat No.	Size	Specifications
ZymoBIOMICS® HMW DNA Standard	D6322	5000 ng	Impurity Level: <0.01% foreign microbial DNA Sample Storage: -20°C Source: Seven bacteria (3 Gram-negative and 4 Gram-positive) and 1 yeast. Storage Solution: 10 mM Tris-HCl and 0.1 mM EDTA, pH 8.0

ZymoBIOMICS® Oral Microbiome Standard

- **Accurate Representation:** Comprised of 12 different strains to mimic the human oral microbiome.
- **Precise Composition:** Allows for benchmarking and validation of NGS microbiome workflows.
- **Assess Bias in DNA Isolation:** Contains both Gram-positive and Gram-negative bacteria sorted in a staggered abundance to assess profiling bias and detection limits.

Description:

The ZymoBIOMICS® Oral Microbiome Standard is a mixture of 12 bacterial strains in staggered abundances to mimic a true oral microbiome.



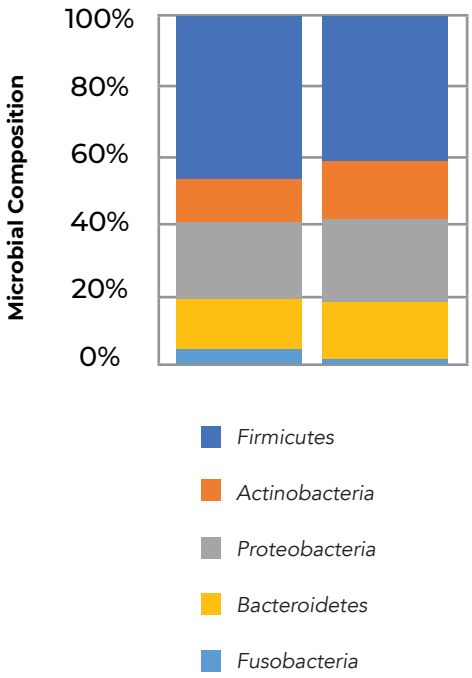


Figure 1. The ZymoBIOMICS™ Oral Microbiome Standard is accurately quantified to closely match the theoretical profile by shotgun metagenomic analysis.

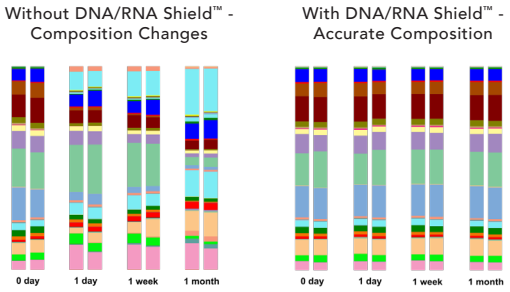
Product	Cat No.	Size	Specifications
ZymoBIOMICS® Oral Microbiome Standard	D6332	10 preps	Source: Twelve bacteria (six Gram-positive and six Gram-negative) found in the human oral cavity. Biosafety: This product is not biohazardous as microbes have been fully inactivated. Storage Solution: DNA/RNA Shield™ Total Cell Concentration: ~1.30 x 10^9 cells/ml Impurity Level: <0.01% foreign microbial DNA Relative Abundance Deviation in Average: <30% Microbial Composition: Figure 1 shows the theoretical microbial composition of the standard.

Technology Overview: DNA/RNA Shield™

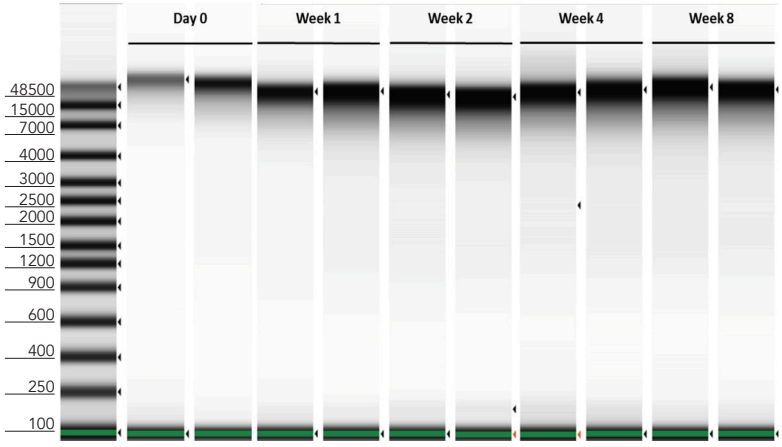
Take a molecular snapshot of your sample with DNA/RNA Shield™. This stabilization reagent breaks the cold chain and ensures nucleic acid stability during sample storage/transport at ambient temperatures. DNA/RNA Shield™ effectively lyses cells and inactivates nucleases and infectious agents, and it is compatible with various collection and storage devices (vacuum tubes, swabs (nasal, buccal, fecal), etc.).

DNA/RNA Shield™ Preserves Microbial Composition at Ambient Temperature

Microbial composition of stool is unchanged after one month at ambient temperature with DNA/RNA Shield™. Stool samples suspended in DNA/RNA Shield™ and stored at room temperature were compared to stool without preservative for one month. They were sampled at the indicated time points and processed with ZymoBIOMICS® DNA Miniprep Kit. The extracted DNA was then subjected to microbial composition profiling via 16S rRNA gene targeted sequencing. Samples stored with DNA/RNA Shield™ had a constant microbial composition while the samples stored without shifted dramatically.

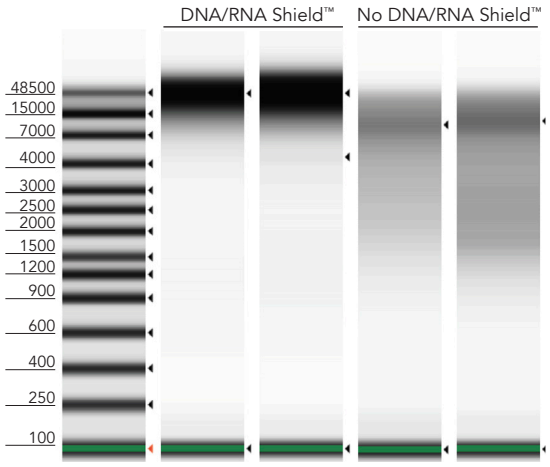


Prevent Sample Degredation

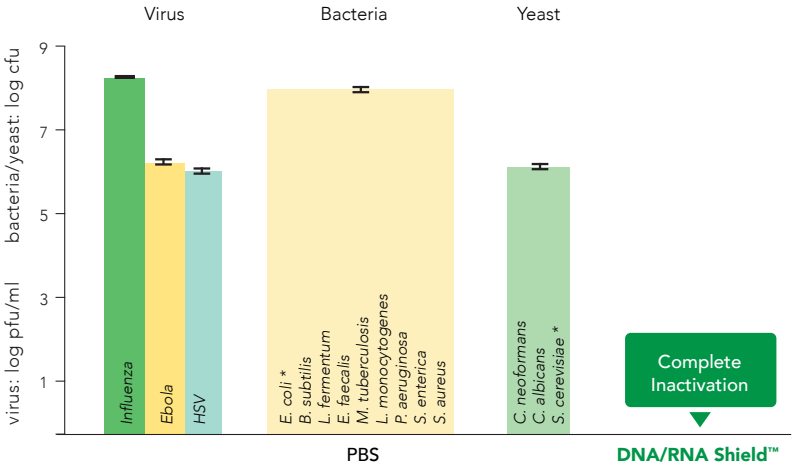


Human feces was stored in DNA/RNA Shield™ (R1100), with DNA extraction performed across multiple timepoints using the *Quick*-DNA™ MagBead Kit (n=2). DNA is of high molecular weight size (> 45 kb) and remains stable over a period of 8 weeks in DNA/RNA Shield™ in ambient temperature. Quality was assessed using Agilent 2200 Tapestation®.

Maximize Sequencing Read Lengths



ZymoBIOMICS™ Microbial Community Standard was pretreated with DNA/RNA Shield™ or PBS. Samples were then lysed by lysozyme. DNA was isolated and purified using ZymoBIOMICS™ 96 MagBead DNA kit. DNA size was analyzed using Agilent 2200 Tapestation®.



Microbial Inactivation

Viruses, bacteria and yeast are effectively inactivated by DNA/RNA Shield™. Samples containing the infectious agent (virus, bacteria, yeast) were treated for 5 minutes with DNA/RNA Shield™ or mock (PBS). Titer (PFU) was subsequently determined by plaque assay. Validated by: Influenza A - D. Poole and Prof. A. Mehle, Department of Medical Microbiology and Immunology, University of Wisconsin, Madison; Ebola (Kikwit) - L. Avena and Dr. A. Griffiths, Department of Virology and Immunology, Texas Biomedical Research Institute; HSV-1/2 - H. Oh, F. Diaz and Prof. D. Knipe, Virology Program, Harvard Medical School; *E. coli*, *L. fermentum*, *B. subtilis*, *S. cerevisiae* – Zymo Research Corporation).

*Disclaimer: This graph only displays results from *E. coli* inactivation. Each microbe was tested independently and were combined into one graph for brevity. Bacterial cultures were grown between 10^8 - 10^9 cells and yeast cultures were grown between 10^7 - 10^8 cells.

For more information about DNA/RNA Shield™ Bulk Reagent, **see page 38**

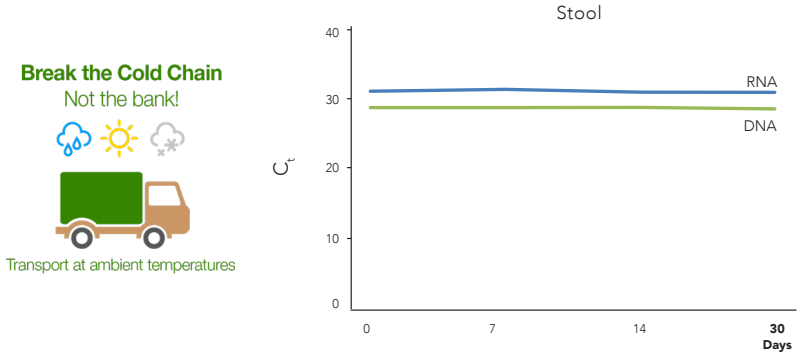
DNA/RNA Shield™ Collection Devices

- Provides an accurate "molecular snapshot" of the sample at the time of collection by preserving nucleic acids at ambient temperature and inactivating microbes.
- Nucleic acid preservation (at ambient temperature; cold-free)
- Pathogen inactivation (bacteria, fungus, parasites & viruses)
- Streamlined purification (no reagent removal, universally automation friendly)

Description:

DNA/RNA Shield™ Collection Devices ensure nucleic acid stability during sample storage and transport at ambient temperatures. There is no need for refrigeration during transport or reagent removal during subsequent nucleic acid purification. The collection devices are ideal for the unbiased collection and storage of microbes to allow for non-biased microbiomics analysis. These collection devices effectively lyse cells and inactivate nucleases and infectious agents (virus), taking a molecular snapshot of a sample at the time of collection.

Nucleic Acid Stabilization at Ambient Temperature



DNA and RNA in stool is effectively stabilized in DNA/RNA Shield™ at ambient temperature.
Graphs show: DNA and RNA controls from stool purified at the indicated time points and analyzed by RT-qPCR.

Product	Cat No.	Size	Specifications	Uses
DNA/RNA Shield™ Lysis Tube (Microbe)	R1103	50 pack	Tube Size: 2 ml Contents: Mixed size BashingBeads™	Sample stabilization at ambient temperatures; Infectious agent inactivation; Ready for transport; Uniformly lyses all microbes; Directly compatible with ZymoBIOMICS® DNA or RNA Miniprep Kit workflow
DNA/RNA Shield™ Lysis Tube (Microbe) with Swab	R1104	50 tubes/ 50 swabs		
DNA/RNA Shield™ Collection Tube w/ Swab	R1106 R1107 R1107-E* R1108 R1109 R1109-E*	10 pack (1 ml fill) 50 pack (1 ml fill) 50 pack (1 ml fill) 10 pack (2 ml fill) 50 pack (2 ml fill) 50 pack (2 ml fill)	Tube Size: 12 x 80 mm Contents: Sterile swab	Sample stabilization at ambient temperatures; Infectious agent inactivation; Ready for transport; Directly compatible with ZymoBIOMICS® DNA or RNA Miniprep Kit workflow
DNA/RNA Shield™ Fecal Collection Tube	R1101 R1101-E*	10 pack	Tube Size: 20 x 76 mm Contents: Collection spoon attached to screwcap	

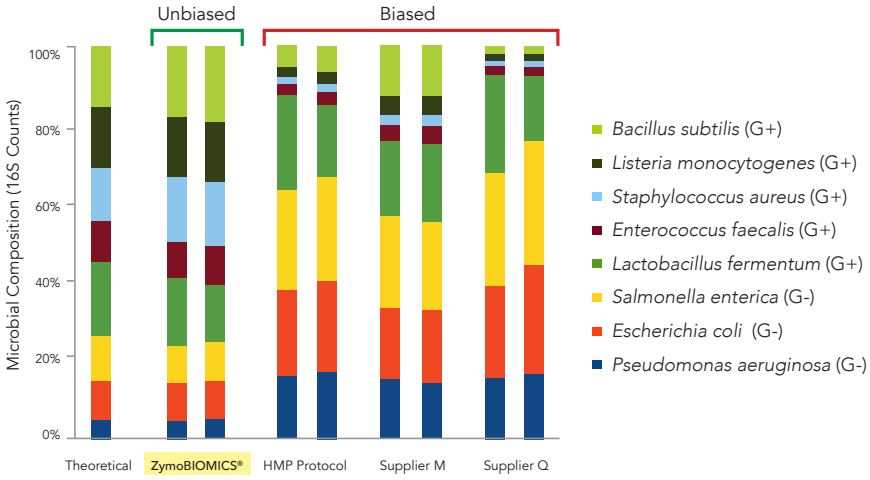
*CE IVD

ZymoBIOMICS® DNA Kits

- **Microbiomics-Grade DNA Extraction:** Unbiased cellular lysis for accurate microbiome measurements and certified low-bioburden.
- **Ultra-Pure:** Inhibitor-free DNA from any sample that is ready for qPCR, NGS, etc.
- **Simple Workflow:** No precipitations or lengthy incubations.

Description:

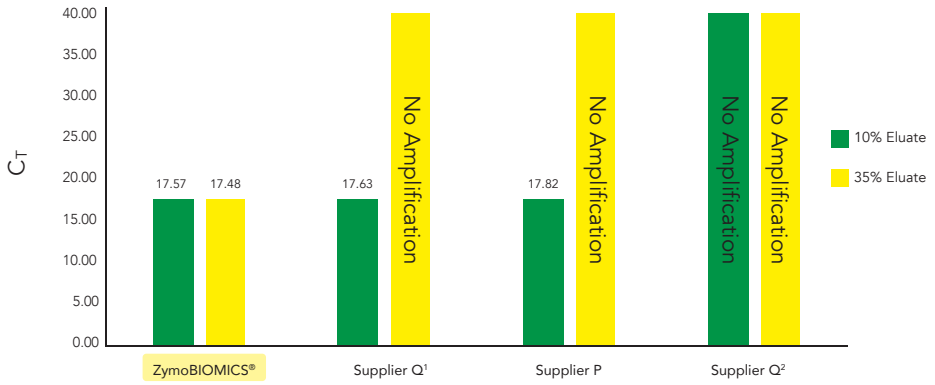
The ZymoBIOMICS® DNA Kits are designed for purifying DNA from a variety of sample inputs that are immediately ready for microbiome or metagenome analyses. The ZymoBIOMICS® lysis system eliminates bias associated with unequal lysis efficiencies of different organisms (e.g. Gram-negative/positive bacteria, fungi, protozoans, and algae) making it ideal for microbial community profiling. Uniform mechanical lysis of tough microbes is achieved by bead beating with the innovative ultra-high density BashingBeads™. The kit is equipped with our *OneStep*™ PCR Inhibitor Removal technology, enabling PCR reaction from inhibitor-rich environmental samples. Purified DNA is ideal for all downstream applications including PCR, arrays, 16S rRNA gene sequencing, and shotgun sequencing. DNA size is 8 - 15 kb.



Microbiomics-Grade Unbiased DNA Extraction

The ZymoBIOMICS® DNA Miniprep Kit extracts DNA without bias towards any cell type. Four different extraction methods were assessed using the ZymoBIOMICS® Microbial Community Standard and 16S sequencing.

Ultra-pure DNA from Inhibitor-Rich Samples



The ZymoBIOMICS® DNA Miniprep Kit provides inhibitor-free DNA even when challenged with extremely inhibitor-rich samples. Real-time PCR was used to evaluate eluates recovered using the ZymoBIOMICS® DNA Miniprep Kit, and kits from Suppliers Q1, P, and Q2. Reaction volumes consisted of either 10% or 35% of the eluate from each kit to detect the presence of PCR inhibitors. Each reaction contained 25 ng of *Brettanomyces* DNA. No amplification indicated PCR inhibition from inefficient inhibitor removal.

Streamlined Workflow

Accurate lysis using ZR BashingBead™ Lysis Tubes

Superior yields and purity with Zymo-Spin™ technology

PCR inhibitor removal eliminates polyphenolics, humic/fulvic acid, and melanin

"I started using this product to extract DNA from vermicompost (high humic acid) samples. I ran test extractions of 100-300mg (wet) samples using DNA/RNA Shield™ as a lysis reagent. All samples showed great 260/280 (~1.9) ratios and amplified very well. Overall, the kit was easier and faster to use than PowerSoil kits."

— Zackary J., Aggrego Data

"This extraction kit provided an easy solution to my issues extracting DNA from complex samples with PCR inhibitors. The DNA produced is of excellent yield and quality, and I've used it with long-read sequencing to completely assemble multiple genomes."

— Max S., Harvard University

Product	Cat No.	Size	Specifications	Uses
ZymoBIOMICS® DNA Miniprep Kit	D4300 D4300T	50 preps 5 preps	Format: Spin-Column Binding Capacity: 25 µg Elution Volume: 50 µl Processing Time: 20 minutes	Accurately isolates DNA of microbial communities from any sample type (feces, soil, water, biofilms, swabs, body fluids, etc.)
ZymoBIOMICS® DNA Miniprep Kit (Lysis Matrix Not Included)	D4304	50 preps		
ZymoBIOMICS® DNA Microprep Kit	D4301	50 preps	Format: Spin-Column Binding Capacity: 5 µg Elution Volume: 10 µl Processing Time: 20 minute	
ZymoBIOMICS® 96 DNA Kit (includes ZymoBIOMICS® BashingBead™ Lysis Rack)	D4303	2 x 96 preps	Format: 96-Well Plate Binding Capacity: 5 µg Elution Volume: 20 µl Processing Time: 45 minutes	
ZymoBIOMICS® 96 DNA Kit (includes ZR BashingBead™ Lysis Tubes)	D4309	2 x 96 preps		
ZymoBIOMICS® 96 DNA Kit (Lysis Matrix Not Included)	D4307	2 x 96 preps		

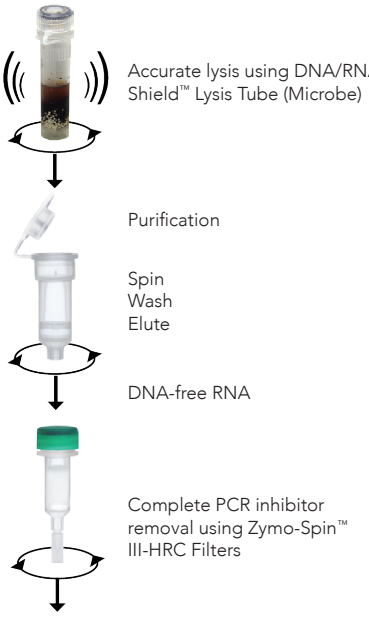
ZymoBIOMICS® RNA Miniprep Kit

- **Unbiased Lysis:** Efficient and unbiased lysis of microbes including Gram-positive/negative bacteria, fungi, protozoans, and viruses from any sample (feces, soil, plant, water, biofilms, swabs, saliva, body fluids, etc.)
- **Ultra-Pure:** Total RNA (including small/micro RNAs) is inhibitor-free and ready for qPCR and microbiome measurements using Next-Gen Sequencing.
- **High Sensitivity:** Increased detection limit of very low abundance organisms.

Description:

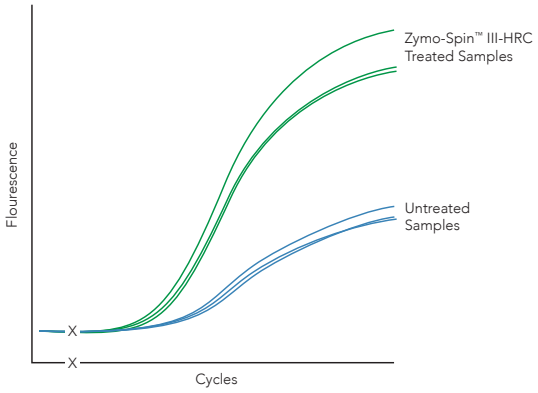
The ZymoBIOMICS® RNA Miniprep Kit is designed for purifying RNA from a wide array of sample inputs that is ready for microbiome or metagenome analyses. The ZymoBIOMICS® lysis system eliminates bias associated with unequal lysis efficiencies of different organisms (e.g. Gram-negative/positive bacteria, fungi, protozoans, and algae). The procedure uses Zymo-Spin™ Column technology that results in high-quality total RNA (including small RNAs 17-200 nt) that is free of PCR inhibitors and is ready for RT-PCR, hybridization, sequencing, etc.

Streamlined Workflow



Ultra-pure Total RNA

Ultra-pure RNA from Inhibitor-rich Samples



Total RNA isolated from human stool with or without inclusion of the Zymo-Spin™ III-HRC Spin Filter during the ZymoBIOMICS® RNA Miniprep Kit protocol. Earlier amplification cycles indicate complete removal of PCR inhibitors.

Product	Cat No.	Size	Specifications	Uses
ZymoBIOMICS® RNA Miniprep Kit	R2001	50 preps	Format: Spin-Column Binding Capacity: 100 µg Elution Volume: ≥ 50 µl RNA Size: ≥ 17 nucleotides	Accurately isolates RNA of microbial communities from any sample type (feces, soil, water, biofilms, swabs, body fluids, etc.)

ZymoBIOMICS® 96 MagBead DNA Kits

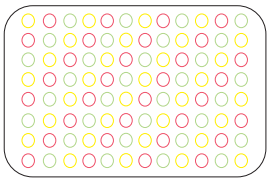
- High-throughput purification of high-quality, inhibitor-free DNA from any sample including feces, soil, water, biofilms, swabs, saliva, and body fluids.
- The ZymoBIOMICS® innovative lysis system enables efficient and unbiased lysis of microbes including Gram-positive/negative bacteria, fungi, protozoans, algae, etc.
- The automation friendly workflow enables nearly any sample to be processed in as little as 90 minutes for 96 preps.

Description:

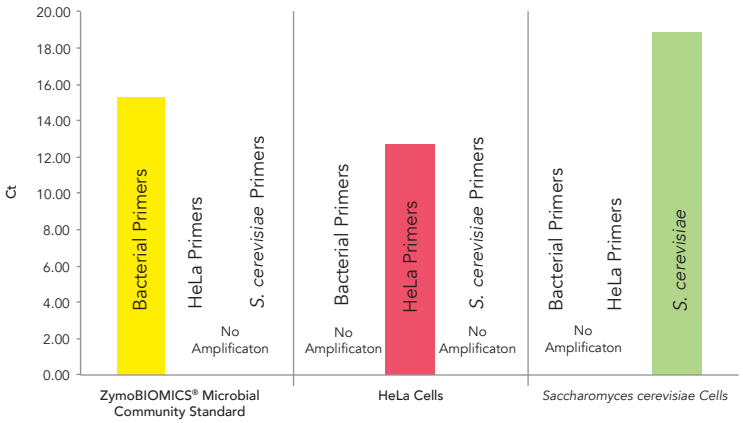
The ZymoBIOMICS® DNA Kits are microbial DNA purification kits designed for purifying DNA from a variety of sample inputs that are immediately ready for microbiome or metagenome analyses. The ZymoBIOMICS® lysis system eliminates bias associated with unequal lysis efficiencies of different organisms (e.g. Gram-negative/positive bacteria, fungus, protozoans, and algae), making it ideal for microbial community profiling. Uniform mechanical lysis of all microbes is achieved by bead beating with the innovative ultra-high density BashingBeads™. This kit is equipped with our *OneStep®* PCR Inhibitor Removal technology, enabling PCR amplification from DNA derived from inhibitor-rich environmental samples. Purified DNA is ideal for all downstream applications including PCR, arrays, 16S rRNA gene sequencing, and shotgun sequencing. DNA size is 8 - 15 kb.

No Cross-Contamination

The ZymoBIOMICS® 96 MagBead DNA Kit provides cross-contamination free samples across a standard 96-well plate purification performed on a liquid handler. Samples were evaluated using quantitative PCR with primer sets targeted at the bacterial 16S gene, the human LINE gene, and the fungal ITS gene. PCR was performed in technical duplicates.



ZymoBIOMICS® Microbial Community Standard
HeLa Cells
Saccharomyces cerevisiae



No Precipitation or Centrifugation Required

Bias-free Lysis → Quick Bind, Wash, Elute Workflow → Superior Yields and Integrity Ultra-Pure DNA

Product	Cat No.	Size	Specifications	Uses
ZymoBIOMICS® 96 MagBead DNA Kit (Lysis Rack)	D4302 D4302-E*	2 x 96 preps	Format: 96-Well Plate Binding Capacity: 10 µg Elution Volume: ≥ 37.5 µl Processing Time: 90 minute	Accurate high-throughput DNA isolation of microbial communities from any sample type (feces, soil, water, biofilms, swabs, body fluids, etc.)
ZymoBIOMICS® 96 MagBead DNA Kit (No Lysis Matrix)	D4306 D4306-E*	2 x 96 preps		
ZymoBIOMICS® 96 MagBead DNA Kit (Lysis Tubes)	D4308 D4308-E*	2 x 96 preps		
Load N' Go™ ZymoBIOMICS® DNA MagBead Kit	D4311	96 preps	Format: 96-Well Plate Binding Capacity: 5 µg DNA per prep Elution Volume: 50 µl Processing Time: 1 hr	Accurate high-throughput DNA isolation of microbial communities from any sample type (feces, soil, water, biofilms, swabs, body fluids, etc.)

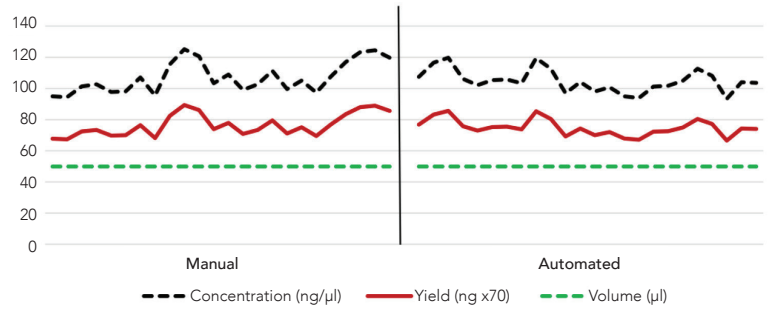
*CE IVD

ZymoBIOMICS® MagBead RNA Kits

- **Unbiased Lysis:** Efficient and unbiased lysis of microbes including Gram-positive/negative bacteria, fungi, protozoans, and viruses from any sample including feces, soil, plant, water, biofilms, swabs, saliva, body fluids, etc.
- **Ultra-Pure:** High-quality total RNA (including small/microRNAs) is inhibitor-free and ready for RT-PCR and microbiome measurements using Next-Gen Sequencing.
- **High-Sensitivity:** Increased detection limit of very low abundance organisms.

Description:

The ZymoBIOMICS® MagBead RNA kit provides a high-throughput, magnetic bead based purification of total RNA (including small/microRNAs) from any sample source (e.g., microbes including Gram-positive/negative bacteria, fungi, protozoans, viruses, feces, soil, plant, water, biofilms, swabs, saliva, body fluids and etc.). The provided DNA/RNA Shield™ inactivates infectious agents and is ideal for sample storage at ambient temperatures. Total RNA is eluted into ≥ 50 µl of ZymoBIOMICS® DNase/RNase-Free Water and is ready for any downstream application including Next-Gen Sequencing, RT-qPCR, etc.

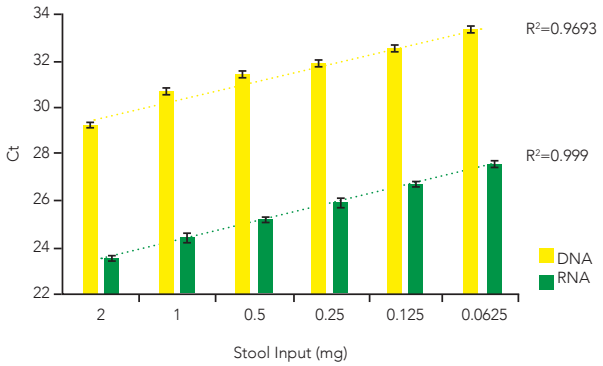


Reproducible Sample Processing

Concentration, yield, and elution volume across replicate samples extracted with the ZR BashingBead™ Lysis Tubes and ZymoBIOMICS® MagBead RNA kit are reproducible and consistent. Total nucleic acids were purified from human stool (~40 mg/well).

Automatable Extraction from Low Biomass Samples

Human stool DNA (yellow) and total RNA (green) is extracted from low biomass input using the ZymoBIOMICS® MagBead DNA/RNA kit.



Product	Cat No.	Size	Specifications	Uses
ZymoBIOMICS® MagBead RNA Kit	R2137 R2138	96 preps 4 x 96 preps	Format: 96-Well Plate Binding Capacity: 15 µg Size Limits: Total RNA including small/microRNAs ≥17 nt	Accurately isolates RNA of microbial communities from any sample type (feces, soil, water, biofilms, swabs, body fluids, etc.)
ZymoBIOMICS® MagBead DNA/RNA Kit	R2135 R2136	96 preps 4 x 96 preps	Format: 96-Well Plate Binding Capacity: 15 µg Size Limits: Capable of recovering DNA and total RNA ≥17 nt	

www.zymoresearch.com | info@zymoresearch.com | tel: 1-(949) 679-1190 | toll-free: 1-(888) 882-9682 | fax: 1-(949) 266-9452

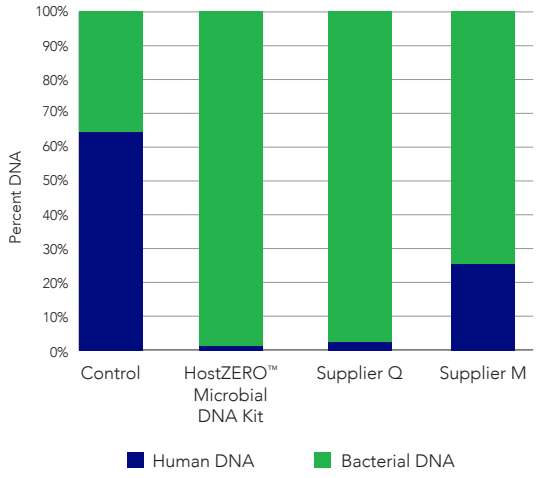
HostZERO™ Microbial DNA Kit

- **Depletes Host DNA:** ≥ 90% depletion in applicable sample types.
- **Preserves Microbial DNA:** ≥ 85% recovery of microbial DNA and minimal impact on microbiome profile.
- **Simple and Fast:** Only 30 minutes of hands-on time.

Description:

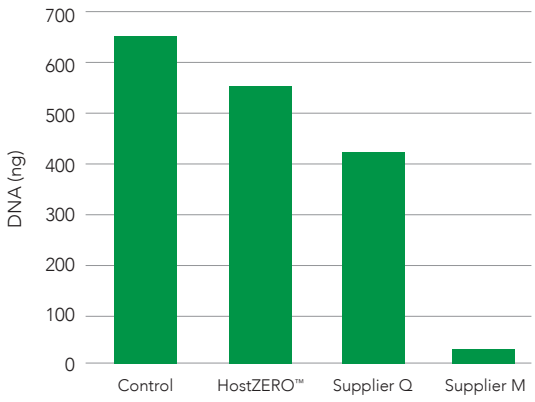
The HostZERO™ Microbial DNA Kit is designed to overcome the challenge of contaminating host nucleic acids in microbial samples. The kit uses a novel method to reduce the amount of contaminating host DNA by selectively lysing the eukaryotic cells and degrading this DNA prior to total DNA purification. Paired with Zymo Research's non-biased purification technology, the HostZERO™ Microbial DNA Kit allows for the exclusive capture of DNA from living microbial cells in a biological sample.

Best Depletion of Host DNA



The HostZERO™ Microbial DNA Kit depletes host DNA. The same human saliva sample was processed using the HostZERO™ Microbial DNA Kit or kits from Suppliers Q and M. Triplicate samples of purified DNA were evaluated by real-time PCR. The composition of the DNA is shown in terms of relative bacterial and human DNA abundance. The control sample was processed with the ZymoBIOMICS® DNA Microprep Kit, which extracts total DNA from the sample without host DNA depletion.

Highest Recovery of Bacterial DNA



Bacterial DNA is efficiently recovered with HostZERO™ technology. The same human saliva sample was processed using the HostZERO™ Microbial DNA Kit or kits from Suppliers Q and M. Triplicate samples of purified DNA were evaluated by Real-time PCR. The control sample was processed with the ZymoBIOMICS® DNA Microprep Kit, which extracts total DNA from the sample without host DNA depletion.

Product	Cat No.	Size	Specifications	Uses
HostZERO™ Microbial DNA Kit	D4310	50 preps	Format: Spin-Column Binding Capacity: 5 µg Elution Volume: 20 µl Host Depletion: ≥ 90%	Accurately isolates DNA of microbial communities while removing host DNA from applicable sample types

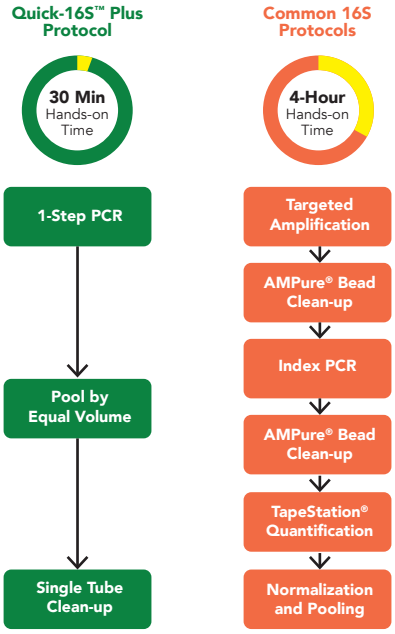
Quick-16S/ITS™ Plus NGS Library Prep Kits

- **Ultra-Fast:** With 30 minutes of hands-on time for 96 samples.
- **Normalization-Free:** Just pool by equal volume.
- **Simple & Easy:** Only one step PCR.
- **High-Throughput:** 100% automation ready.

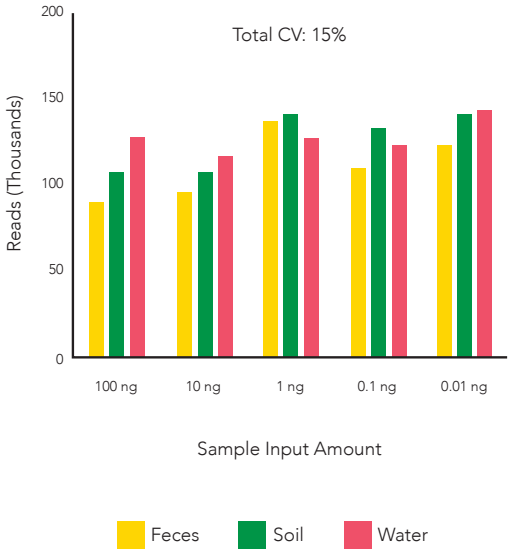
Description:

The *Quick*-16S/ITS™ Plus NGS Library Prep Kits are the fastest and simplest NGS library preps targeting the 16S rRNA gene/ITS region for high-throughput sequencing. The automation-friendly protocol utilizes a premixed amplification plate and a single qPCR/PCR for combined targeted amplification and barcode addition using specially designed primers. After pooling by equal volume, a single clean-up of the final library is performed, rather than massive AMPure® bead-based clean-ups. Additional library quantification analysis such as TapeStation® analysis or gel electrophoresis are not necessary. With these features, the workflow dramatically reduces the hands-on time of library preparation to only 30 minutes.

Fastest 16S Workflow



Normalization Free



The *Quick*-16S™ Plus NGS Library Prep Kit (V3-V4, UDI) results in similar amounts of reads across different input amounts. 0.01-100 ng fecal, soil, and water DNA were used as inputs. Libraries were pooled by equal volumes (2 µl each) without further normalization and sequenced using MiSeq® Reagent Kit v3 (600-cycle). The CV (coefficient of variation) is the ratio of the standard deviation to the mean with lower values corresponding to less dispension around the mean.

Product	Cat No.	Size
Quick-16S™ Plus NGS Library Prep Kit (V3-V4, UDI)	D6421	96 rxns
Quick-ITS™ Plus NGS Library Prep Kit (ITS2)	D6425	96 rxns
Quick-16S™ Plus NGS Library Prep Kit (V4)	D6430	96 rxns
Quick-16S™ Plus NGS Library Prep Kit (V1-V2)	D6434	96 rxns
Quick-16S™ Plus NGS Library Prep Kit (V1-V3)	D6440	96 rxns

Quick-16S™ NGS Library Prep Kit

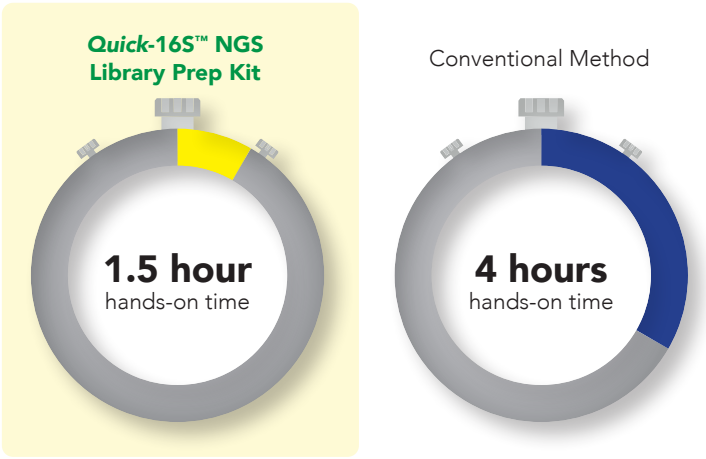
- **Fast & Simple:** Only 1.5 hours of hands-on time.
- **Accurate:** Real-time PCR limits PCR chimera formation by up to 10 times.
- **Increased Coverage:** Novel primers increase phylogenetic coverage of bacteria and archaea, enabling species-level resolution for human microbiome profiling.

Description:

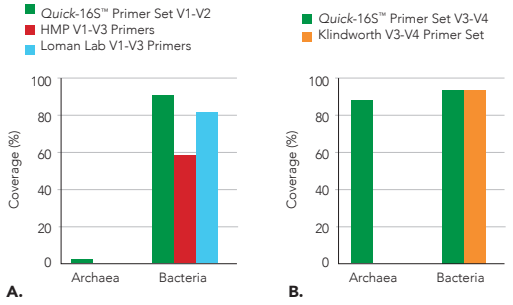
The *Quick*-16S™ NGS Library Prep Kit with included *Quick*-16S™ Primer Sets enable users to convert up to 96 DNA samples to a single, ready-to-sequence 16S library without the need for additional reagents. A streamlined protocol simplifies primer management and eliminates numerous cleanups and quantifications. The best phylogenetic coverage is made possible by innovative new primers that allow users to choose which region of the 16S genome to target.

Fastest 16S Library Prep

The *Quick*-16S™ NGS Library Prep Kit is >2.5 times faster than the conventional 16S library prep method. The *Quick*-16S™ Kit simplifies the 16S library prep workflow by quantifying libraries using qPCR, instead of TapeStation® analyses, and by using a single-tube library cleanup.



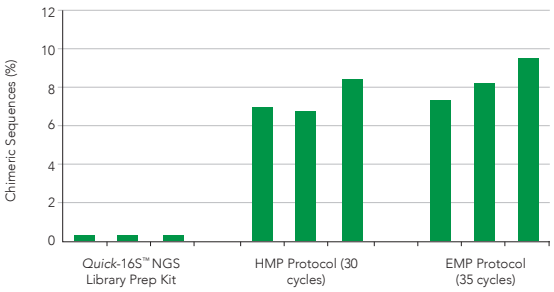
Best Phylogenetic Coverage



A. The *Quick*-16S™ Primer Set V1-V2 includes coverage of common human-associated microbes, including *Bifidobacterium*, *Propionibacterium*, and *Chlamydia*, which are missed in common V1-V2 or V1-V3 primers.

B. The *Quick*-16S™ Primer Set V3-V4 provides up to 87% coverage for archaea, organisms commonly found in the human gut. However, the common V3-V4 primers provide 0% coverage for archaea.

Minimize PCR Chimera Formation



The *Quick*-16S™ NGS Library Prep Kit minimizes PCR chimera formation compared to two common protocols: Human Microbiome Project (HMP) and Earth Microbiome Project (EMP). Equivalent amounts of the same fecal DNA sample were used as input. Chimeric sequences were predicted with Uchime (https://www.drive5.com/uchime).

Product	Cat No.	Size	Specifications	Uses
Quick-16S™ NGS Library Prep Kit	D6400	96 rxns	Input: 10-40 ng of purified DNA Hands-on Time: 90 min Target Regions: 16S V1-V2 and 16S V3-V4 Chimera Formation: ≤ 2% Compatible Systems: Illumina® MiSeq®	Converts up to 96 DNA samples to a single, ready-to-sequence 16S library with improved 16S coverage and simple processing

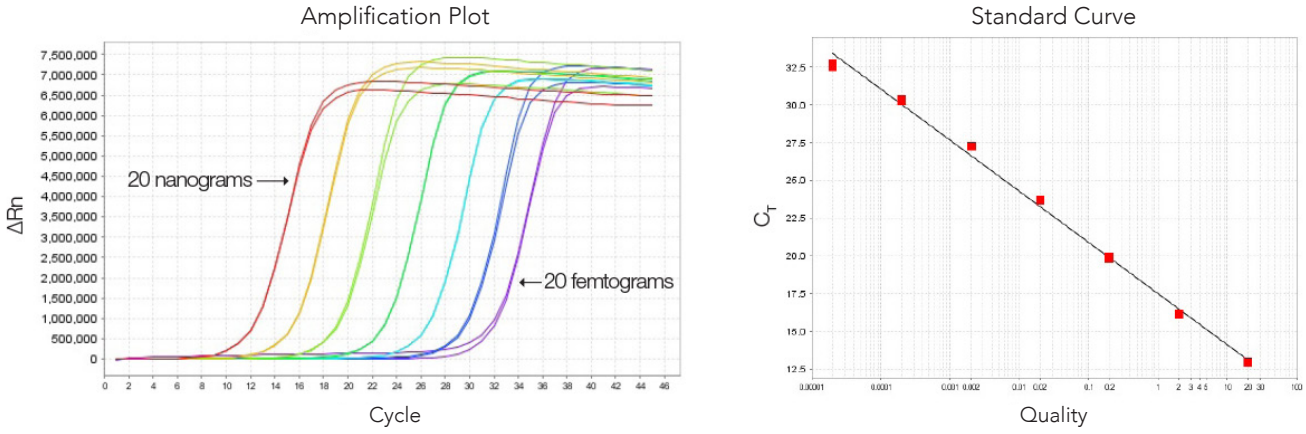
Femto™ DNA Quantification Kits

- **Femtogram Sensitivity:** Quantify as little as 20 femtograms of DNA.
- **Reliable Quantification:** High-specificity and sensitivity for DNA.
- **Fast and Simple:** Add samples to the PreMix and quantify.

Description:

The Femto™ DNA Quantification Kits can detect and quantify as little as 20 fg of DNA in 1 µl of purified biological liquids with high specificity and sensitivity. DNA can be reliably quantified in a background of non-bacterial/fungal DNA, making it ideal for downstream applications that require accurate DNA input amounts such as quantifying DNA template for Next-Generation Sequencing library preparation and metagenomic analysis.

Reliable Quantification



Reliable standards for the quantification of fungal/bacterial DNA: Fungal/bacterial DNA Standards (measured in duplicates) comprise a 10-fold dilution series ranging from 20 ng to 20 fg.

Product	Cat No.	Size	Uses
Femto™ Bacterial DNA Quantification Kit	E2006	100 rxns	Detection Dye: SYTO® 9 DNA Input: 20 fg - 20 ng Standards Included
Femto™ Fungal DNA Quantification Kit	E2007	100 rxns	

Microbiome Sequencing Services

- Zymo Research offers the most comprehensive services for short and long-read 16S rRNA, ITS, 18S, and Shotgun sequencing from any sample type.
- ZymoBIOMICS® Services are validated using the ZymoBIOMICS® Microbial Community Standards to ensure accurate and publication-quality data.
- Services include low-bioburden processing and DNA/RNA isolation, using the ZymoBIOMICS® product line, for the most accurate taxonomic profiling.

illumina CSPro CERTIFIED SERVICE PROVIDER

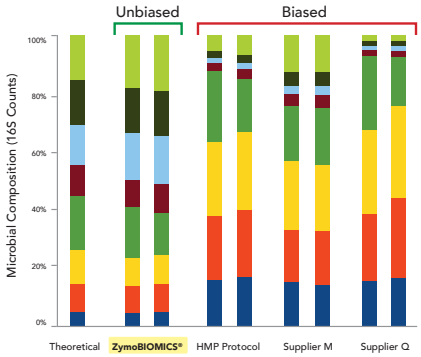
PacBio PACBIO CERTIFIED SERVICE PROVIDER

Description:

Next-Generation Sequencing services for discovery, identification, and characterization of microbial communities. All Microbiome Sequencing Services feature state-of-the-art sample prep technologies, validation using the ZymoBIOMICS® Microbial Community Standards, Illumina® and PacBio® Sequencing Technologies, cutting-edge bioinformatics, and competitive pricing. Each project is fully customizable; simply send in your samples and you will receive publication-ready data.

A Comprehensive Solution for Microbiomics and Metagenomics

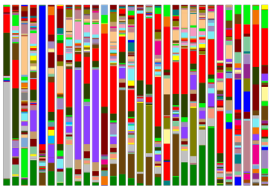
Validated, Accurate Workflows from Collection to Analysis



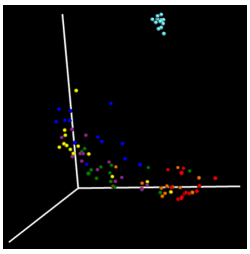
Microbiome Sequencing Services are validated using the ZymoBIOMICS® Microbial Community Standards for unbiased, accurate community profiling.

- *Bacillus subtilis* (G+)
- *Lactobacillus fermentum* (G+)
- *Listeria monocytogenes* (G+)
- *Salmonella enterica* (G-)
- *Staphylococcus aureus* (G+)
- *Escherichia coli* (G-)
- *Enterococcus faecalis* (G+)
- *Pseudomonas aeruginosa* (G-)

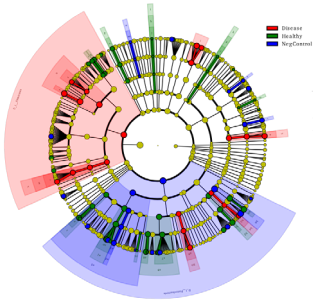
Comprehensive, Customizable Bioinformatics & Data Analysis



Composition Barplots



Beta-Diversity



LEfSe Cladogram

For more information on microbiome analysis services, **visit page 322.**

Inquire today at **https://www.zymoresearch.com/pages/microbiome-analysis-services**

Epigenetics

07

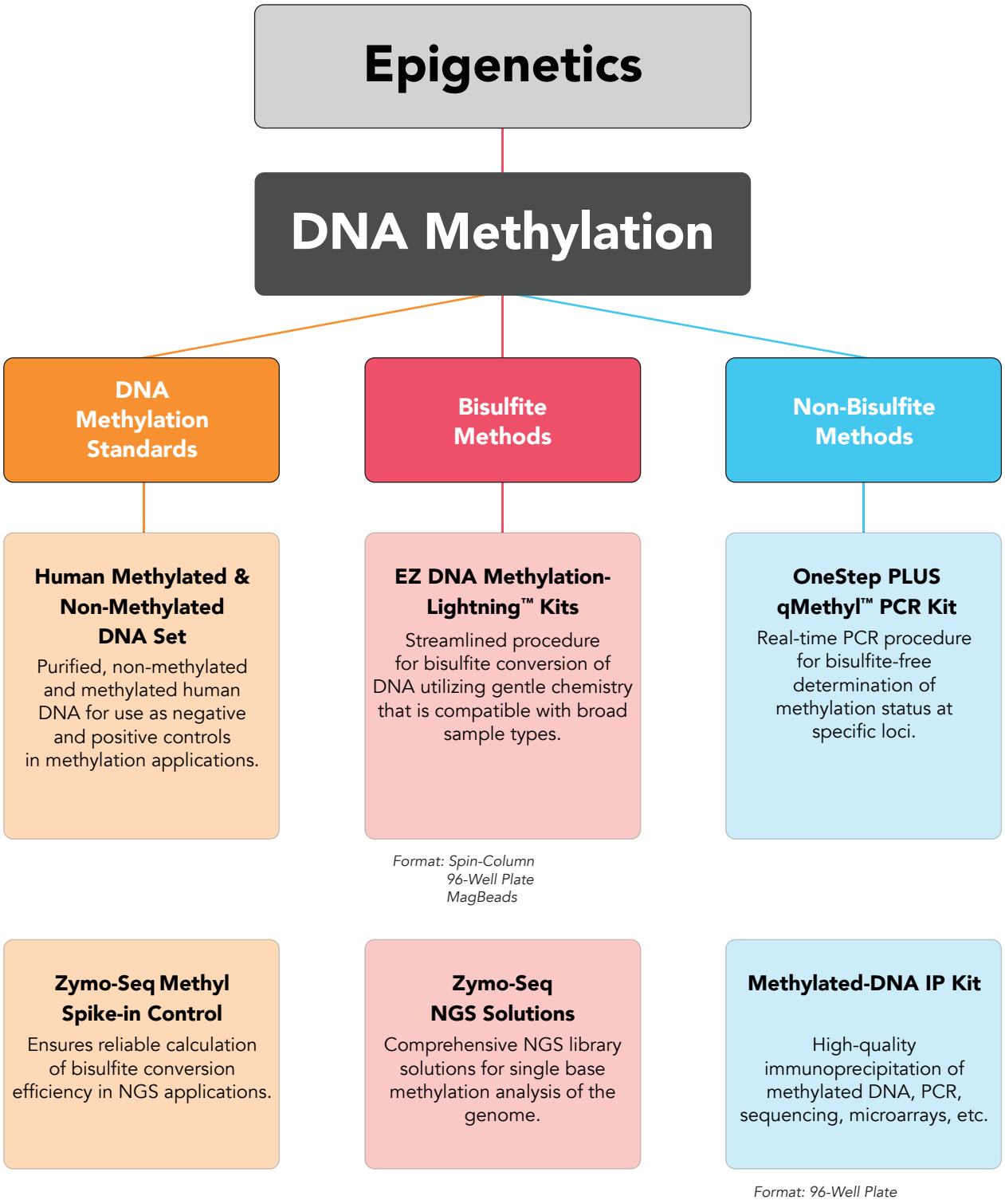
Epigenetics, from the Greek “epi” meaning “on top of” or “over,” delves into regulatory mechanisms beyond the primary sequence of DNA. Established over seventy years ago, it has transformed our understanding of development, differentiation, and disease mechanisms.

As “The Epigenetics Company”, Zymo Research is the leader in products and services for epigenetics-focused research. Our DNA methylation technologies, including EZ DNA Methylation™ kits and controls, are the gold standard for clinical studies. Zymo Research offers next-generation sequencing (NGS) solutions that set new standards for both speed and accuracy in methylation and chromatin profiling.

We offer advanced chemistries, automated and certified workflows, and expert data support for rapid and reliable analyses. Zymo Research provides epigenetic programs for exploring genetic/epigenetic regulation in embryology, aging, cancer, and beyond.

THE Epigenetics COMPANY™

Quick Product Guide



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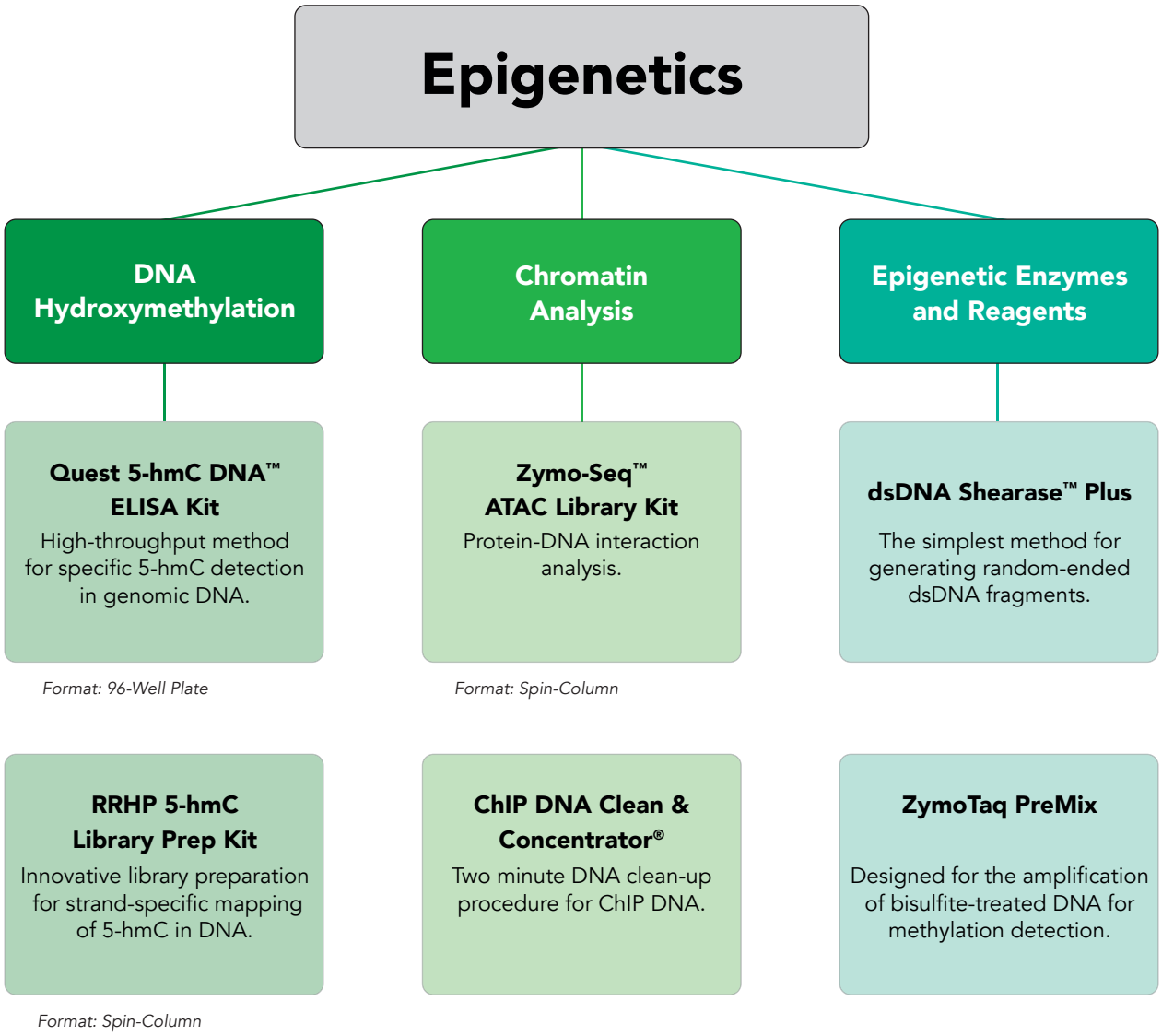
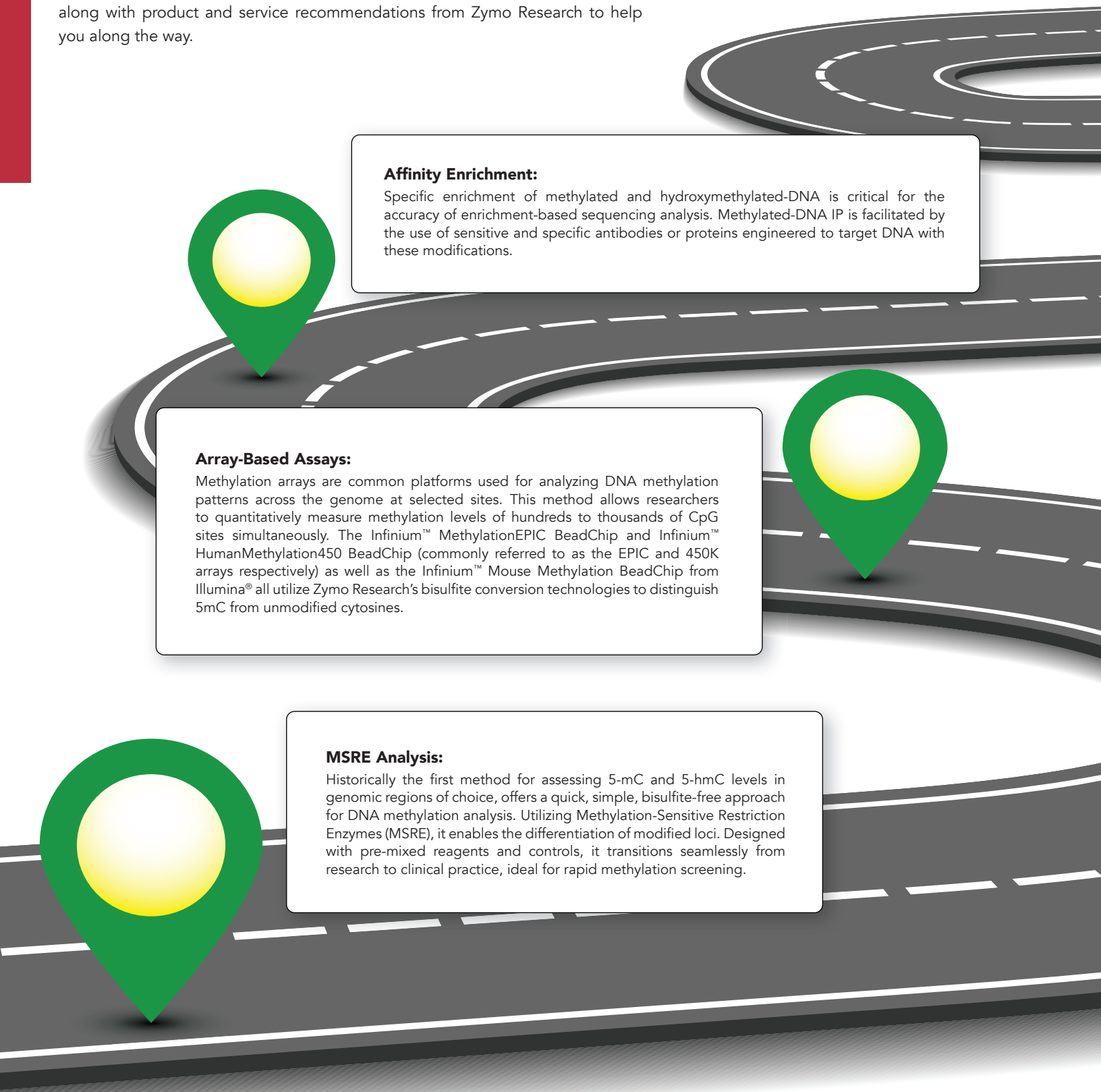
Quick Product Guide



A Roadmap for Navigating the Epigenetic Landscape

Epigenetic analysis doesn't have to be complicated. The scientists at Zymo Research have developed this navigation tool to assist both new and experienced researchers in tackling epigenetic analysis with ease. Below you will find an overview of the most commonly used techniques for studying DNA methylation, along with product and service recommendations from Zymo Research to help you along the way.



Affinity Enrichment:

Specific enrichment of methylated and hydroxymethylated-DNA is critical for the accuracy of enrichment-based sequencing analysis. Methylated-DNA IP is facilitated by the use of sensitive and specific antibodies or proteins engineered to target DNA with these modifications.

Array-Based Assays:

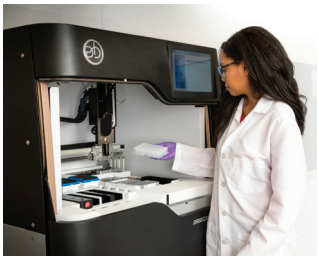
Methylation arrays are common platforms used for analyzing DNA methylation patterns across the genome at selected sites. This method allows researchers to quantitatively measure methylation levels of hundreds to thousands of CpG sites simultaneously. The Infinium™ MethylationEPIC BeadChip and Infinium™ HumanMethylation450 BeadChip (commonly referred to as the EPIC and 450K arrays respectively) as well as the Infinium™ Mouse Methylation BeadChip from Illumina® all utilize Zymo Research's bisulfite conversion technologies to distinguish 5mC from unmodified cytosines.

MSRE Analysis:

Historically the first method for assessing 5-mC and 5-hmC levels in genomic regions of choice, offers a quick, simple, bisulfite-free approach for DNA methylation analysis. Utilizing Methylation-Sensitive Restriction Enzymes (MSRE), it enables the differentiation of modified loci. Designed with pre-mixed reagents and controls, it transitions seamlessly from research to clinical practice, ideal for rapid methylation screening.

Third-Generation Sequencing for 5-mC Detection:

Third-generation sequencing technologies analyze methylation patterns over extensive regions of the genome directly and without bisulfite conversion. This method provides high-resolution insights into the epigenetic modifications across large genomic landscapes, allowing for the detection of methylation patterns in full-length gene sequences, repetitive elements, and complex genomic structures.



Bisulfite Treatment:

Bisulfite treatment is considered the "gold standard" for the analysis of DNA methylation with supreme efficiency, reproducibility and simplicity. Bisulfite treatment converts unmodified cytosine to uracil while methylated cytosines are protected from this conversion. Downstream analyses include methylation-specific PCR (MSP), bisulfite-specific PCR (BSP), sequencing, hybridization, pyrosequencing and NGS.

Sequencing-Based Assays:

NGS-based methods have emerged as the primary and most comprehensive means of DNA methylation analysis recently. NGS-based methods produce results with high coverages across an entire genome and are compatible with most species. Bisulfite sequencing is thus gaining tremendous popularity among researchers for DNA methylation profiling, indicated by the increasing number of related publications over the years. DNA samples must be both bisulfite converted and prepared into libraries to allow for the differentiation of methylated from unmethylated cytosines present. During sequencing, the methylated cytosines that were protected during the bisulfite treatment will be recognized as "C" in the NGS sequencing data. Unmethylated cytosines that were converted will be recognized as "T" in the data. Using NGS, DNA methylation can be investigated at single-nucleotide resolution for further data analysis.

Thus far, researchers have implemented a myriad of bisulfite sequencing methods to uncover DNA methylation information for diverse biological questions. The most extensively used NGS methods include reduced representation bisulfite sequencing (RRBS), whole-genome bisulfite sequencing (WGBS), and targeted bisulfite sequencing. RRBS achieves DNA methylation profiling at single-nucleotide resolution in CpG-rich regions of the genome, making it ideal for pilot studies. WGBS interrogates the entirety of the genome which allows for a comprehensive analysis of DNA methylation throughout. Targeted bisulfite sequencing involves custom profiling of specific regions that are of interest for the project. Zymo Research's portfolio includes both kits and services for each of these sequencing types.

Zymo-Seq™ Cell Free DNA WGBS Library Kit

Highlights:

- **Optimized for Small Fragment Input:** Ideal for small and degraded DNA isolated from samples sources such as DNA and FFPE.
- **Accurate Methylation Calling:** Accurate methylation calling with direct ligation.
- **Simple, Streamlined Workflow:** Prepare robust methyl-seq libraries in 3 steps.

Description:

The Zymo-Seq Cell Free DNA WGBS Library Kit streamlines whole genome bisulfite sequencing (WGBS) library prep from small, degraded and cell-free DNA (cfDNA). This all-in-one kit efficiently produces high-quality methyl-seq libraries in three steps: gentle bisulfite conversion, direct adapter ligation with splinted adapters, and index PCR. The treatment effectively converts unmodified cytosines into uracil. Splinted adapters enable direct ligation onto any DNA fragment size, allowing sequencing of fragments often discarded in conventional methods. This approach eliminates second strand synthesis, end repair, and dA tailing, reducing bias and preserving native methylation integrity. The resulting adapter-ligated DNA is indexed and PCR-amplified with Zymo-Seq UDIs, yielding Illumina-ready libraries.

Optimized and Simple Workflow

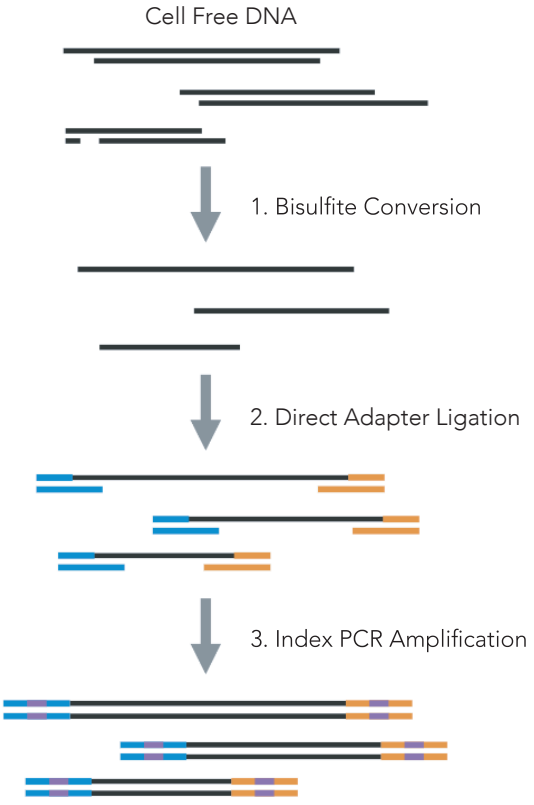
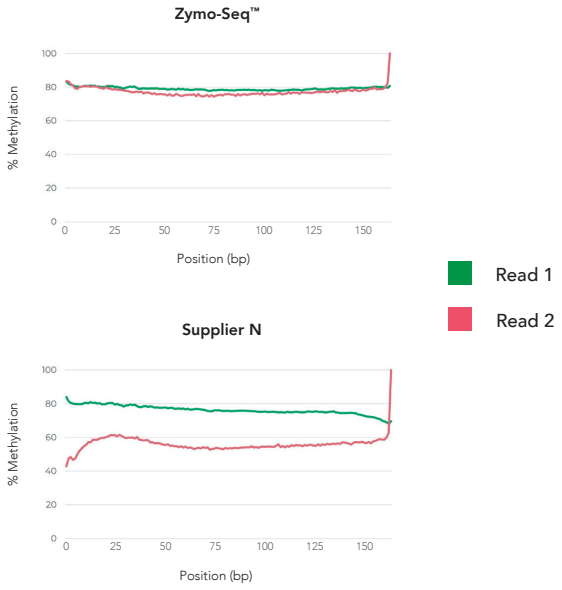


Figure 1. Overview of the Zymo-Seq Cell Free DNA WGBS Library Kit protocol. The simple three-step protocol allows users to effortlessly prepare WGBS libraries from cfDNA with no compromise on quality.

Accurate Methylation Calling Across the Entire Road



Zymo-Seq™ Cell Free DNA Library Kits minimize library preparation bias commonly found in conventional methods. Unbiased libraries will have consistent methylation levels across the entire read length. Other commercial protocols that include an end-repair step incorporate artificial nucleotides to blunt damaged DNA termini, resulting in significant methylation bias on the 3' end of the DNA fragments. The Zymo-Seq™ Cell Free DNA WGBS Library Kit directly ligates the adapters, eliminating the need for end-repair and thus preserving the integrity of native methylation present on the fragment termini. The Zymo-Seq™ Cell Free DNA Library Kit shows consistent CpG methylation across both Read 1 and Read 2, whereas Supplier N shows significant bias. The M-Bias plots shown above were generated by plotting the average CpG methylation levels across each position of the mapped read.

Product	Cat. No.	Size
Zymo-Seq™ Cell Free DNA WGBS Library Kit	D5462 D5463	24 preps 96 preps

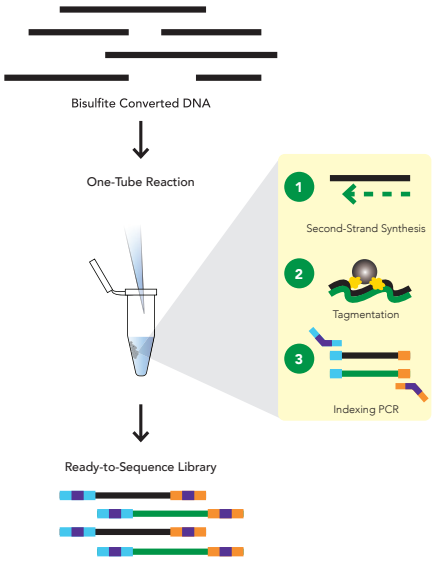
Zymo-Seq WGBS Library Kit

Highlights:

- **Bisulfite Library Preparation in One Tube**
- **Streamlined Workflow:** From genomic DNA to ready-to-sequence library in 4 hours.
- **Consistent Genome Coverage:** Unbiased, single-base methylation profiling of cytosines throughout the entire genome.

Description:

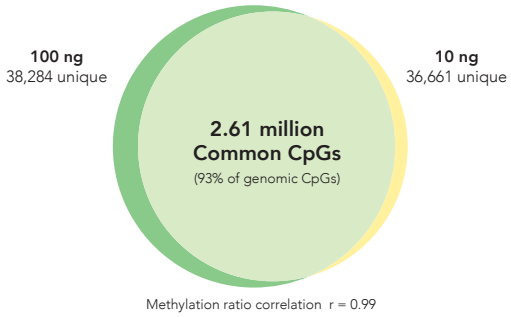
Zymo-Seq WGBS Library Kit is the only kit available for whole genome bisulfite (WGBS) library preparation in a single tube. Zymo-Seq WGBS Library Kit incorporates tagmentation technology to eliminate the tedious fragmentation, enzymatic, and clean-up steps required by conventional, ligation-based library preparation methods. This streamlined workflow minimizes hands-on time, making it an ideal choice for higher throughput applications.



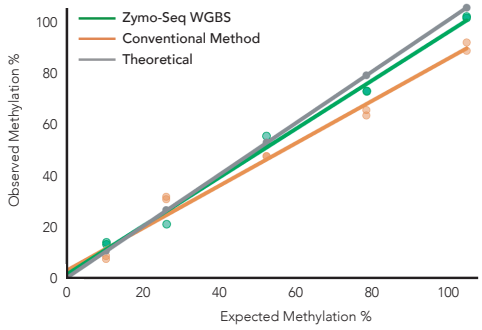
Zymo-Seq WGBS Library Kit Workflow

Enzymatic reactions are consolidated in a single tube to minimize hands-on time. Intact genomic DNA is first bisulfite converted, which then undergoes second strand synthesis (1). Tagmentation is added directly to the reaction to tag adapters onto the double-stranded DNA (2). Indexing primers and PCR mixture are added to amplify the WGBS library (3). Purified libraries are ready for sequencing on Illumina instruments.

Reproducible Coverage and Methylation Detection



Coverage is preserved using as little as 10 ng DNA input. Over 93% of genomic CpG sites overlapped (10X depth cutoff) between Zymo-Seq libraries prepared using 100 ng and 10 ng of Arabidopsis genomic DNA. The two libraries had less than a 10% methylation difference in over 90% of shared CpG sites, demonstrating consistency between different inputs.



Unbiased methylation callings are produced using Zymo-Seq WGBS Library Kit. Spike-ins with known methylation ratios (0%, 10%, 25%, 50%, 75%, and 100%) were added to 100 ng of genomic DNA prior to processing with the Zymo-Seq WGBS Library Kit or using the conventional methodology. The observed methylation % for Zymo-Seq libraries closely matched theoretical methylation levels (R2 = 0.997).

Product	Cat. No.	Size
Zymo-Seq WGBS Library Kit	D5465	24 preps

Zymo-Seq™ RRBS Library Kit

Highlights:

- **Simple Workflow:** Prepare Reduced Representation Bisulfite Sequencing (RRBS) libraries in as little as 2 hours of hands-on time.
- **Low Input:** The only RRBS kit that produces NGS libraries from ≥ 10 ng of genomic DNA.
- **Accurate and Reproducible:** Unbiased methylation calling and reproducible CpG coverage.

Zymo-Seq™ RRBS Library Kit Has A Simple Workflow

Input genomic DNA

↓

5 minutes — MspI digestion

↓

20 minutes — Adapter ligation and gap filling

↓

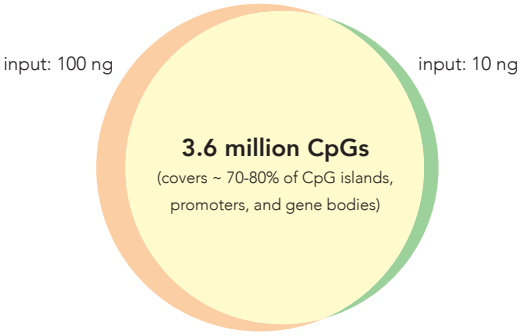
40 minutes — Bisulfite conversion

↓

20 minutes — Index primer amplification

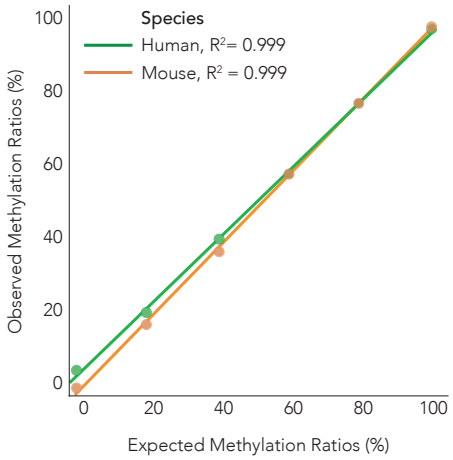
↓

Sequencing on any Illumina platform



*Methylation Ratio Correlation Pearson's r=0.97

Zymo-Seq™ RRBS Library Kit Measures Accurate Methylation Ratios



Libraries were prepared using the Zymo-Seq™ RRBS Library Kit from 100 ng of human or mouse gDNA with known methylation ratios (0%, 20%, 40%, 60%, 80%,100%). The observed methylation ratios closely matched the expected ratios, demonstrating unbiased results acrossall samples.

Zymo-Seq™ RRBS Library Kit Delivers Reproducible Results Regardless of Input Amount

Over 3.6 million CpG sites (≥ 5X read coverage) were sequenced from libraries generated using the Zymo-Seq™ RRBS Library Kit, even when starting with only 10 ng of human genomic DNA. These sites cover a majority of functional regions in the human genome including CpG islands, promoters, and gene bodies.

Product	Cat. No.	Size
Zymo-Seq™ RBBS Library Kit	D5460 D5461	24 preps 48 preps

Pico Methyl-Seq™ Library Prep Kit

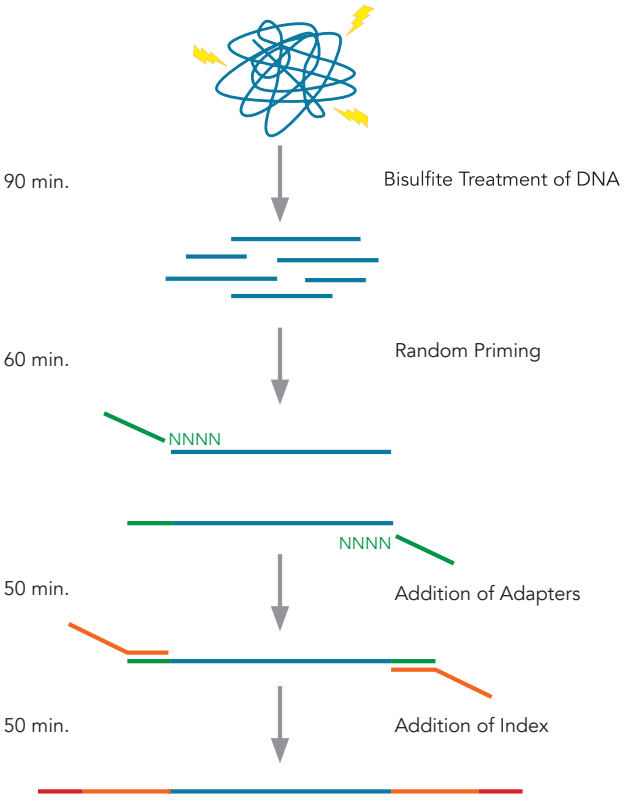
Highlights:

- **All-inclusive:** Complete solution for bisulfite conversion followed by Whole Genome Bisulfite Sequencing (WGBS) library preparation.
- **Low Input:** Accommodates ultra-low DNA input (down to 10 pg) and is compatible with FFPE samples.
- **Simple:** Ligation- and gel-free workflow can be completed in a few hours.

Description:

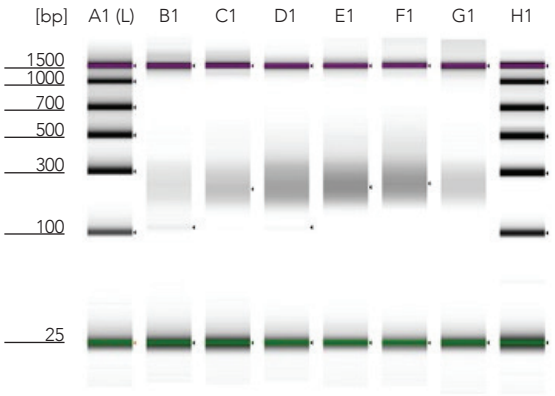
The Pico Methyl-Seq™ Library Prep Kit provides a streamlined workflow for making WGBS libraries. Input DNA is randomly fragmented during the initial bisulfite treatment step followed by three rounds of amplification with uniquely designed primers. The procedure can accommodate as little as 10 pg input DNA (including that derived from FFPE samples), making it ideal for methylation analysis of precious, limited, and target-enriched samples.

Streamlined, Innovative Workflow



Pico Methyl-Seq™ libraries ready for sequencing.

High-quality Library Preparation



Agilent 2200 TapeStation® D1K gel of libraries prepared (from B1-G1) using 10 pg, 20 pg, 100 pg, 1 ng, 10 ng, and 100 ng, respectively.

Product	Cat. No.	Size
Pico Methyl-Seq™ Library Prep Kit	D5455 D5456	10 preps 25 preps

Zymo-Seq ATAC Library Kit

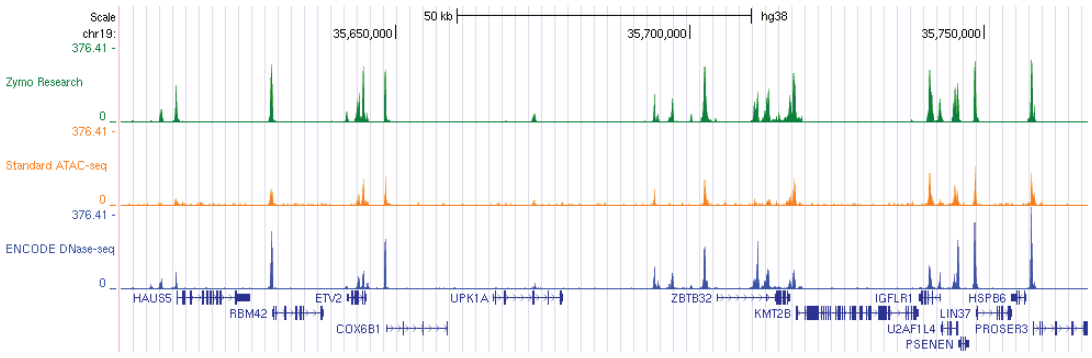
Highlights:

- **Ready to Use:** Preassembled buffers allow for lightning-fast library preparation in as little as 4 hours without compromising quality.
- **Improved Performance:** Prepare libraries with 7x less mitochondrial contamination, saving reads and increasing sequencing depth.
- **Outstanding Consistency:** Produce highly correlated replicates from both fresh and frozen samples.

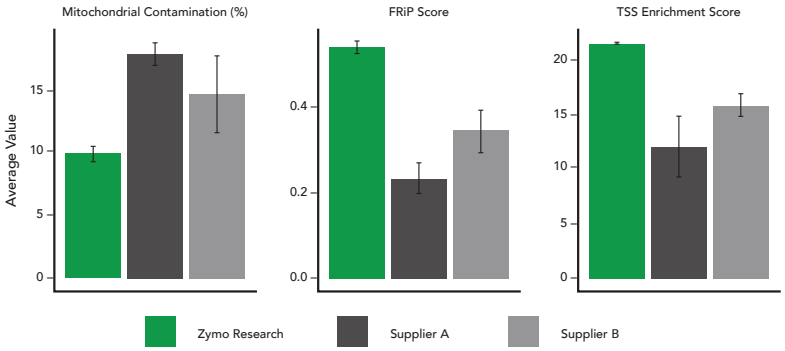
Description:

The Zymo-Seq ATAC Library Kit offers a streamlined Assay for Transposase Accessible Chromatin with Sequencing (ATAC-Seq) library preparation for mammalian cells and tissues. This all-in-one kit simplifies the process, enabling ATAC-Seq libraries from as few as 50,000 cells in just 4 hours with minimal hands-on time. First gentle cell lysis separates nuclei for collection while discarding contaminating mitochondrial DNA. The transposase, preloaded with Illumina adaptors, rapidly fragments and tags open chromatin regions in a single reaction. The resulting tagmented DNA is then indexed and PCR-amplified using the UDI Tag Primer Set, producing high-quality libraries ready for Illumina instrument sequencing.

Highest Quality Libraries



Browser tracks depicting GM12878 ATAC-seq assay using the Zymo-Seq ATAC Library Kit. Peaks overlap at the same sites identified by DNase-seq in the ENCODE project as well as the standard ATAC-seq protocol showing both quality and consistency.



Best Quality Measures

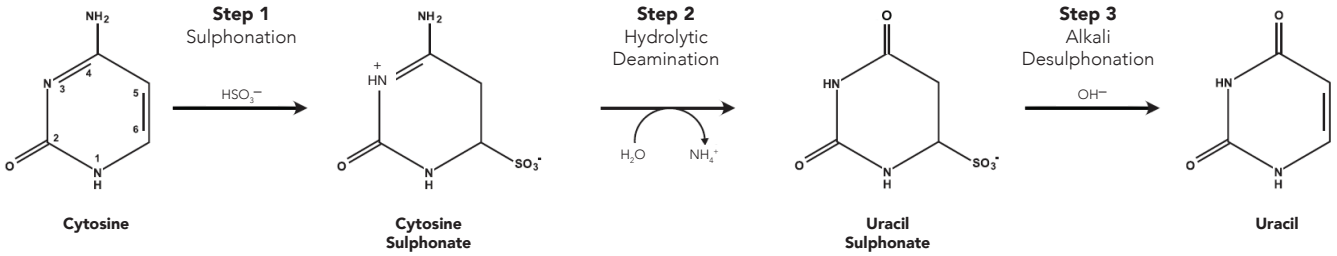
Zymo-Seq ATAC Library Kit stands ahead of its peers in common ATAC-seq quality measures, with the lowest mitochondrial read contamination, highest FRiP scores, and highest TSS enrichment scores.

Product	Cat. No.	Size
Zymo-Seq ATAC Library Kit	D5458	12 preps

Technology Overview: Bisulfite Treatment

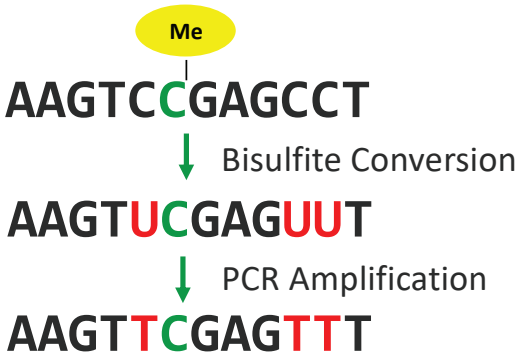
- **The Most Cited Bisulfite Reagents for Clinical Applications**
- **Conversion Workflows in as Little as 1.5 Hours with Conversion Efficiency > 99%**
- **For *in vitro* diagnostic, CE-IVD Certification**
- **Automation Ready**
- **Optimized Conditions for Many Clinical Sample Types, Including Cell-Free DNA, FFPE, Blood**

Widely considered to be the "gold standard" for the analysis of DNA methylation, bisulfite treatment works by converting unmodified cytosines to uracils in a chemical reaction. Methylated cytosines remain protected from the conversion, allowing for downstream analysis to distinguish between these epigenetic modifications present. Sequence analysis post-treatment provides site-specific information on DNA modifications across the genome. This site specificity can be accomplished by PCR, hybridization, methylation-specific PCR, NGS, and more.

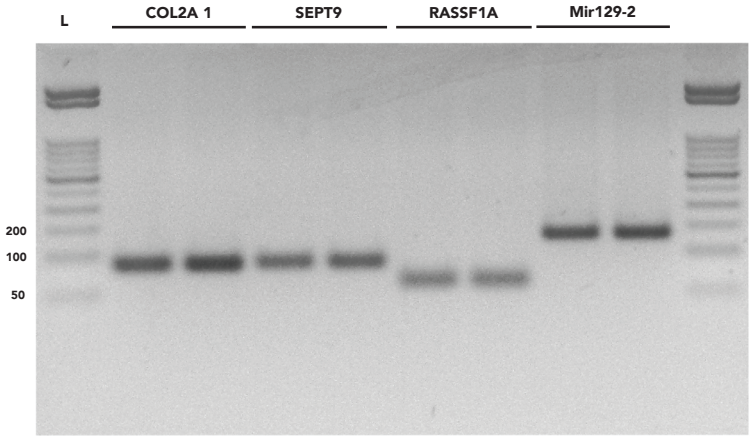


Bilsufite Technology from Zymo Research

The EZ DNA Methylation™ family of kits from Zymo Research remain the most reliable as well as the most cited technologies available for bisulfite conversion and recommended by most downstream DNA methylation analysis platforms. These kits have always pushed the limits of epigenetic innovation, from being the first methylation kit to offer on-column desulphonation to reducing conversion time down to as little as 1.5 hours. The latest EZ DNA Methylation™- Lightning kits have been specifically engineered for improved performance for fragmented clinical samples, such as cell free DNA and FFPE. MagBead based bisulfite kits offer ready to use scripts for most automated liquid handlers to achieve hight-throughput sample processing.



PCR-Ready Bisulfite DNA from FFPE



DNA isolated from a non-small-cell lung cancer (NSCLC) FFPE block was bisulfite converted using the EZ DNA Methylation-Lightning Kit, then CR amplified with methylation-specific primers for cancer biomarkers SEPT9, RASSF1A, Mir129-2, and control primer COL2A1. L=50bp marker

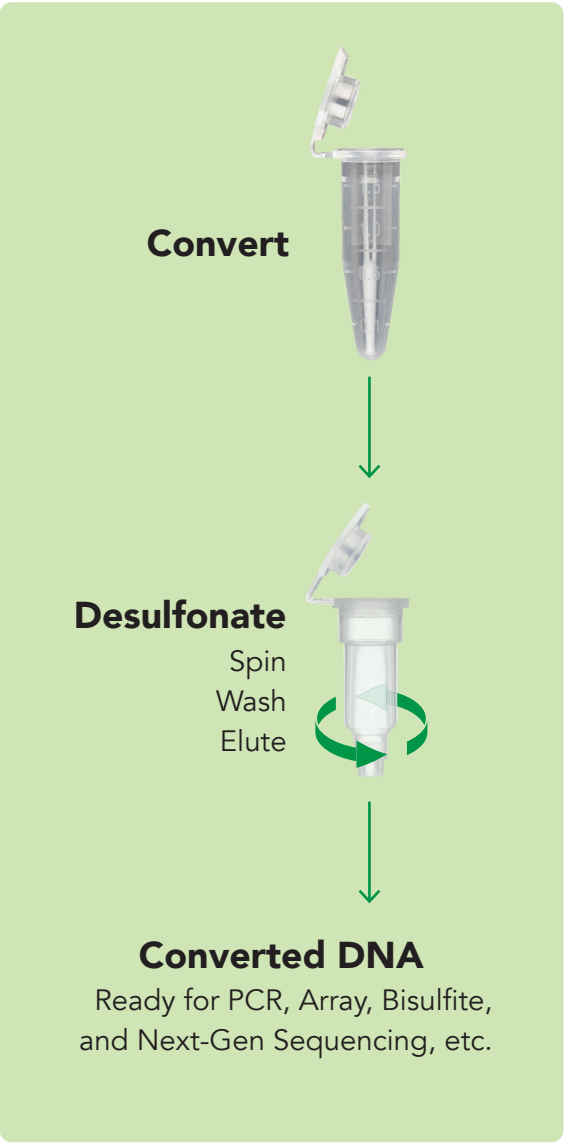
The Evolution of Zymo Research's EZ DNA Methylation™ Kits

Zymo Research's bisulfite technology emerged from the necessity for a reliable method to study DNA methylation. Developed to accurately detect methylation status in DNA, the bisulfite chemistry converts unmethylated cytosines to uracil while preserving methylated cytosines. This treatment, enables researchers to differentiate between methylated and non-methylated cytosines through subsequent sequencing or analysis.

A standout feature of Zymo Research's technology is its pioneering use of a spin column-based desulphonation/purification step. This innovative approach served to make the workflow both efficient and convenient. Additionally, it reduced the risk of sample loss and contamination, making it the preferred choice for epigenetic researchers.

Widely accepted as the gold standard in DNA methylation analysis, the EZ DNA Methylation line of bisulfite kits are distinguished by their high conversion efficiency, reliability, and reproducibility. Rigorous testing and optimization ensure consistent and accurate detection of DNA methylation patterns.

Continuously evolving based on user feedback and technological advancements, the EZ DNA Methylation-Lightning™ Kits are the pinnacle for investigating DNA methylation and deciphering epigenetic regulation in health and disease.



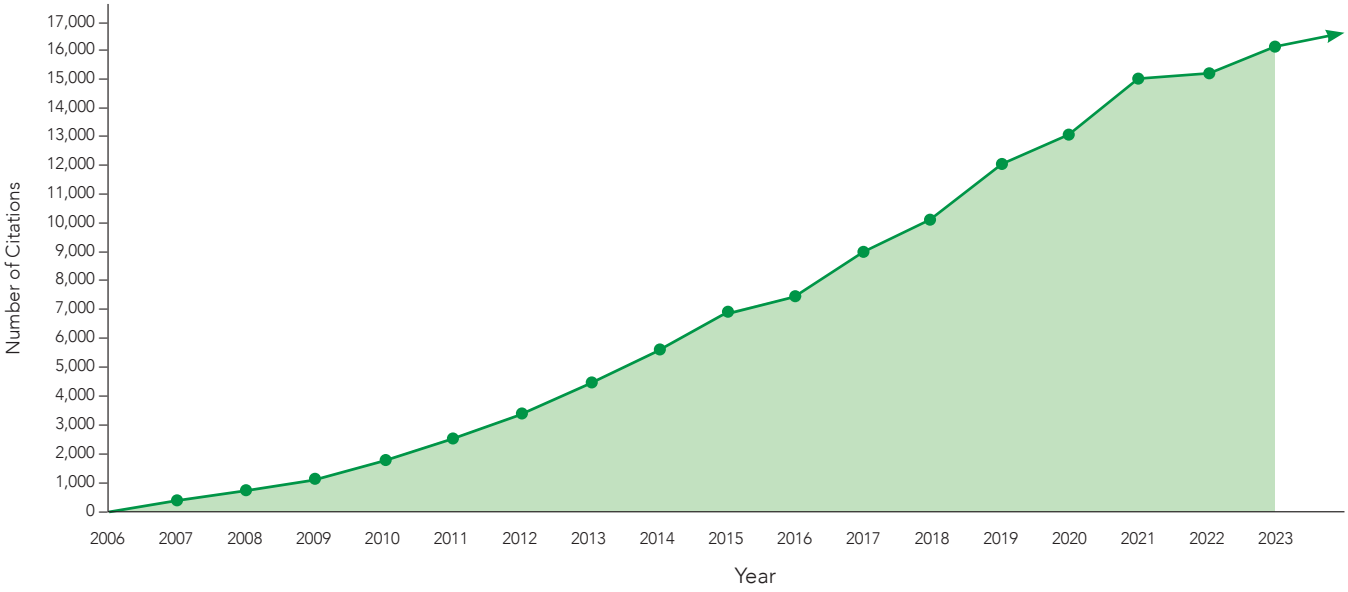
Product Selection Guide: EZ DNA Methylation™

All bisulfite conversion kits are available in spin-column, 96-well, and MagBead formats. These innovative bisulfite conversion kits feature streamlined workflows, ≥ 99% conversion rates, automation friendly options, and low elution volumes for concentrated, bisulfite-converted DNA. All MagBead versions are automation ready with free scripts available!

	EZ DNA Methylation-Lightning™*	EZ DNA Methylation-Direct™	EZ DNA Methylation-Gold™	EZ DNA Methylation™
	Rapid workflow, most gentle chemistry	Use directly with cells and tissues	Classic bisulfite conversion	Classic bisulfite conversion
Which kit is right for me?	Best for new users and Illumina Array users	Best for working with cells/tissue as direct input, and validated third party kits	Best for legacy users and users working with validated third-party kits	Best for legacy users and Illumina Array users
Conversion Efficiency	> 99.5%	> 99.5%	> 99%	> 99%
Input	100 pg – 2 µg of DNA	DNA (≥ 50 pg), cells (≥ 10), blood, tissue, FFPE	500 pg – 2 µg of DNA	500 pg – 2 µg of DNA
Processing Time	1.5 hr	4 hr	3 hr	12-16 hr
Validated For	Illumina MethylationEPIC Array (MagBead format) (D5046, D5047, D5049)	IDT xGen Adaptase module for Single-Cell Methyl-Seq	Agilent SureSelect MethylSeq, IDT xGen™ Methylation-Sequencing	Illumina MethylationEPIC Array (All formats) (D5001, D5002, D5004)

*CE IVD

The Most-Cited Technologies for DNA Methylation Analysis & Detection



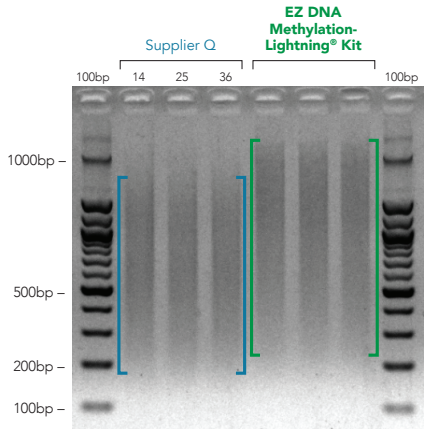
EZ DNA Methylation-Lightning™ Kits

Highlights:

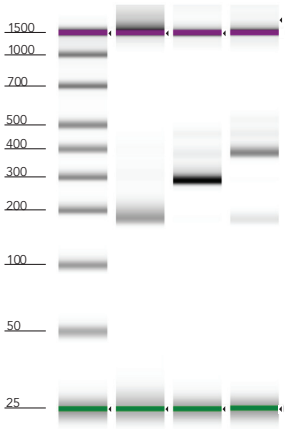
- **Streamlined Process:** Ready-to-use conversion reagent is added directly to DNA. Purified bisulfite converted DNA in <1.5 hours.
- **High-Quality:** Bisulfite-converted DNA has > 99.5% conversion efficiency with reduced fragmentation.
- **NGS-Ready:** Low DNA input requirement makes it ideal for preparing whole genome or targeted enrichment bisulfite libraries for methylation analysis.

Description:

The EZ DNA Methylation-Lightning™ Kits feature the fastest bisulfite conversion methodology resulting in fully converted DNA with reduced fragmentation and more efficient PCR amplification. The bisulfite converted DNA is ideal for consistent, high-quality DNA methylation analyses such as PCR, MSP, array, bisulfite and NGS. The Lightning technology is optimized for a broad range of samples including fragmented or degraded inputs.



The EZ DNA Methylation-Lightning™ Kit yields more intact DNA after bisulfite conversion than the comparable kit from Supplier Q.



Recovery of Small Fragments

Bisulfite converted libraries of small 100, 200, and 300 bp DNA fragments were successfully recovered and amplified by PCR. Libraries were analyzed using the Agilent 4200 TapeStation® system.

Product	Cat. No.	Size	Specifications	Uses
EZ DNA Methylation-Lightning™ Kit SK	D5030T D5030/D5030-E* D5031/D5031-E*	10 Rxns. 50 Rxns. 200 Rxns.	Input: 100 pg to 2 µg of purified DNA Conversion Efficiency: > 99.5% Format: Spin Column Elution Volume: ≥ 10 µl DNA Recovery: > 80% Bisulfite Conversion Time: 1.5 hours	Rapid bisulfite treatment; Rapid column/plate/bead desulphonation
EZ-96 DNA Methylation-Lightning™ Kit (Shallow-Well)	D5032	2 x 96 Rxns.	Input: 100 pg to 2 µg of purified DNA Conversion Efficiency: > 99.5% Format: 96-Well Elution Volume (shallow-well): ≥ 30 µl Elution Volume (deep-well): ≥ 15 µl DNA Recovery: > 70% Bisulfite Conversion Time: 1.5 hours	
EZ-96 DNA Methylation-Lightning™ Kit (Deep-Well)	D5033	2 x 96 Rxns.		
EZ-96 DNA Methylation-Lightning™ MagPrep Kit	D5046/D5046-E* D5047/D5047-E*	4 x 96 Rxns. 8 x 96 Rxns.	Input: 100 pg to 2 µg of purified DNA Conversion Efficiency: > 99.5% Format: Magnetic Beads Elution Volume: ≥ 25 µl DNA Recovery: > 70% Bisulfite Conversion Time: 1.5 hours	
EZ-96 DNA Methylation-Lightning™ Automation Kit	D5049	96 preps	Input: 100 pg to 2 µg of purified DNA Conversion Efficiency: > 99.5%Format: Magnetic Beads Elution Volume: 25µl DNA Recovery: > 80% Bisulfite Conversion Time: 1.5 hours	Rapid bisulfite treatment for automated workflows

SK - Sample Kit Available *CE IVD

EZ DNA Methylation-Direct™ Kits

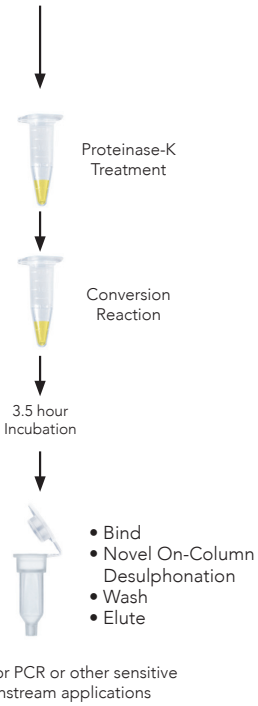
Highlights:

- **No Purification Necessary:** Complete bisulfite conversion of DNA directly from blood, soft tissue, cells, FFPE, and LCM samples.
- **Low-Input:** Compatible with small sample inputs, as few as 10 cells or 50 pg DNA.
- **High-Quality DNA**: Converted DNA is ready for PCR and NGS.

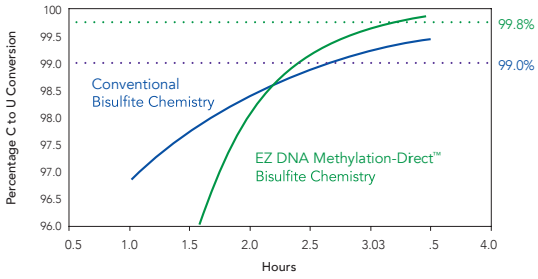
Description:

The EZ DNA Methylation-Direct™ Kit is a further refinement of our popular EZ DNA Methylation™ and EZ DNA Methylation-Gold™ kits. The EZ DNA Methylation-Direct™ Kit features reliable and complete bisulfite conversion of DNA directly from blood, tissue, and cells without the prerequisite for DNA purification. The increased sensitivity of these kits make it possible to amplify bisulfite-converted DNA from as few as 10 cells or 50 pg DNA. Many single-cell applications and DNA methylation methods have been developed based on EZ DNA Methylation-Direct™ chemistry.

Cells, Blood, Tissue, FFPE, etc.



EZ DNA Methylation-Direct™ Bisulfite Chemistry Significantly Improves C to U Conversion Kinetics



EZ DNA Methylation-Direct™ Kit bisulfite chemistry significantly improves C to U conversion kinetics. DNA was converted using either EZ DNA Methylation-Direct™ or conventional bisulfite chemistries. Recovered DNA was amplified by PCR, then cloned. Sequences from individual clones were analyzed and quantitated. This data shows that EZ DNA Methylation-Direct™ bisulfite chemistry improves the rate and extent (> 99.8%) of C to U conversion of DNA compared to conventional bisulfite chemistry.

Product	Cat. No.	Size	Specifications	Uses
EZ DNA Methylation-Direct™ Kit	D5020 D5021	50 Rxns. 200 Rxns.	Input: DNA, Cells, Blood, Tissue, FFPE (as few as 10 cells or 50 pg) Conversion Efficiency: > 99.5% Format: Spin-Column Elution Volume: ≥ 10 µl DNA Recovery: > 80% Bisulfite Conversion Time: 4 hours	Sample DNA digestion; Bisulfite treatment; Rapid column/plate/ bead desulphonation
EZ-96 DNA Methylation-Direct™ Kit (Shallow-Well)	D5022	2 x 96 Rxns.	Input: DNA, Cells, Blood, Tissue, FFPE (as few as 10 cells or 50 pg) Conversion Efficiency: > 99.5% Format: 96-Well Elution Volume (shallow-well): ≥ 30 µl Elution Volume (deep-well): ≥ 15 µl DNA Recovery: > 70% Bisulfite Conversion Time: 4 hours	
EZ-96 DNA Methylation-Direct™ Kit (Deep-Well)	D5023	2 x 96 Rxns.		
EZ-96 DNA Methylation-Direct™ MagPrep Kit	D5044 D5045	4 x 96 Rxns. 8 x 96 Rxns.	Input: DNA, Cells, Blood, Tissue, FFPE (as few as 10 cells or 50 pg) Conversion Efficiency: > 99.5% Format: Magnetic Beads Elution Volume: ≥ 25 µl DNA Recovery: > 70% Bisulfite Conversion Time: 4 hours	

EZ DNA Methylation™ Kits

Description:

The EZ DNA Methylation™ is the original bisulfite conversion kit from Zymo Research featuring a simplified procedure that streamlines bisulfite treatment of DNA. It is based on the three-step reaction that takes place between cytosine and sodium bisulfite where cytosine is converted into uracil. Innovative desulphonation technologies eliminate otherwise cumbersome precipitations. Designed to reduce template degradation, this kit minimizes DNA loss during treatment and cleanup, while ensuring complete conversion of the DNA. Purified, converted DNA is ideal for PCR amplification for downstream analyses including endonuclease digestion, sequencing, microarrays, etc. These kits are recommended and validated with Illumina's and Infinium® Assays.

Product	Cat. No.	Size	Specifications	Uses
EZ DNA Methylation™ Kit	D5001 D5002	50 Rxns. 200 Rxns.	Input: 500 pg - 2 µg of purified DNA Conversion Efficiency: > 99% Format: Spin-Column Elution Volume: ≥ 10 µl DNA Recovery: > 80% Bisulfite Conversion Time: 12-16 hours	Bisulfite treatment; Rapid column/plate/ bead desulphonation
EZ-96 DNA Methylation™ Kit (Shallow-Well)	D5003	2 x 96 Rxns.	Input: 500 pg - 2 µg of purified DNA Conversion Efficiency: > 99% Format: 96-Well Elution Volume (Shallow-Well): ≥ 30 µl Elution Volume (Deep-Well): ≥ 15 µl DNA Recovery: > 70% Bisulfite Conversion Time: 12-16 hours	
EZ-96 DNA Methylation™ Kit (Deep-Well)	D5004	2 x 96 Rxns.		
EZ-96 DNA Methylation™ MagPrep Kit	D5040 D5041	4 x 96 Rxns. 8 x 96 Rxns.	Input: 500 pg - 2 µg of purified DNA Conversion Efficiency: > 99% Format: Magnetic Beads Elution Volume: ≥ 25 µl DNA Recovery: > 70% Bisulfite Conversion Time: 12-16 hours	

EZ DNA Methylation-Gold™ Kits

Description:

The EZ DNA Methylation-Gold™ Kit is a refinement of our popular EZ DNA Methylation™ Kit. The EZ DNA Methylation-Gold™ Kit consolidates DNA denaturation and bisulfite conversion processes into one step, resulting in a much faster bisulfite conversion. Also, the kits have been streamlined for high-yield recovery of DNA following bisulfite treatment. Recovered bisulfite-converted DNA is ideal for PCR amplification for downstream analyses including endonuclease digestion, sequencing, microarrays, etc.

Product	Cat. No.	Size	Specifications	Uses
EZ DNA Methylation-Gold™ Kit	D5005 D5006	50 Rxns. 200 Rxns.	Input: 500 pg - 2 µg of purified DNA Conversion Efficiency: > 99% Format: Spin Column Elution Volume: ≥ 10 µl DNA Recovery: > 75% Bisulfite Conversion Time: 3 hours	Bisulfite treatment; Rapid column/plate/ bead desulphonation
EZ-96 DNA Methylation-Gold™ Kit (Shallow-Well)	D5007	2 x 96 Rxns.	Input: 500 pg - 2 µg of purified DNA Conversion Efficiency: > 99% Format: 96-Well Elution Volume: ≥ 15 µl DNA Recovery: > 75% Bisulfite Conversion Time: 3 hours	
EZ-96 DNA Methylation-Gold™ Kit (Deep-Well)	D5008	2 x 96 Rxns.		
EZ-96 DNA Methylation-Gold™ MagPrep Kit	D5042 D5043	4 x 96 Rxns. 8 x 96 Rxns.	Input: 500 pg - 2 µg of purified DNA Conversion Efficiency: > 99% Format: Magnetic Beads Elution Volume: ≥ 25 µl DNA Recovery: > 75% Bisulfite Conversion Time: 3 hours	

EZ DNA Methylation™ MagPrep Series

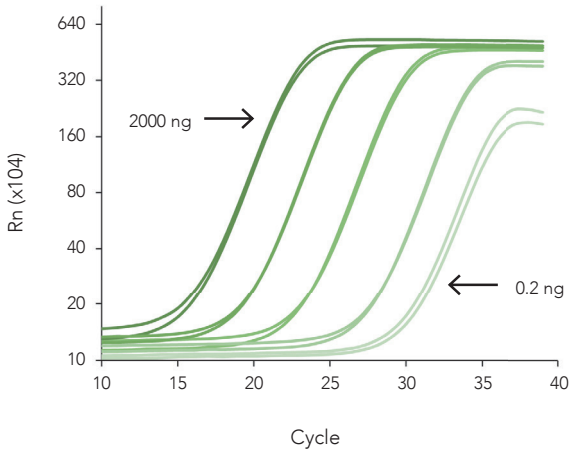
Highlights:

- **Scalable:** Streamlined workflow adaptable for manual or automated processing.
- **Reliable:** Incorporates citation-leading bisulfite chemistries with low-elution bead-based purification to recover > 50 pg of DNA for methylation analysis.
- **NGS-ready:** Purified bisulfite converted DNA is ideal for library preparation, methylation-sensitive PCR assays, microarrays, etc.

Description:

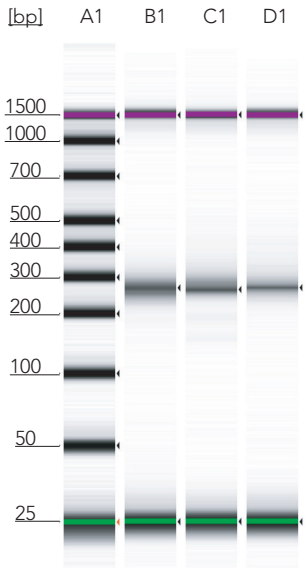
The EZ DNA Methylation™ MagPrep pairs our citation-leading bisulfite chemistries with magnetic bead-based purification for high-throughput and automated methylation analysis. The DNA undergoes bisulfite treatment to convert all cytosine into uracil. Desulphonation and clean-up of the converted DNA is performed while bound to the MagBinding Beads. The kit is designed to reduce template degradation and minimize DNA loss during treatment and clean-up, while ensuring complete conversion of the DNA. Purified, converted DNA is ideal for downstream analyses including NGS, PCR amplification, endonuclease digestion, microarrays, etc.

Linear Recovery of Bisulfite DNA



The EZ-96 DNA Methylation-Lightning™ MagPrep is compatible with a range of DNA inputs and has a linear recovery (R2 = 0.9977). A 10-fold dilution series of human genomic DNA, ranging from 2000 ng to 0.2 ng, was bisulfite converted, and recovery was assessed by qPCR targeting the DAPK1 region (n = 2).

Consistent Library Preparation



Three pools of targeted bisulfite sequencing libraries were analyzed on the Agilent 2200 Tapestation® HSD1000. Each pool contains over 35 samples that were individually bisulfite converted using the DNA Methylation-Lightning™ MagPrep followed by library preparation.

Product	Cat. No.	Size
EZ-96 DNA Methylation™ MagPrep	D5040 D5041	4 x 96 Rxns. 8 x 96 Rxns.
EZ-96 DNA Methylation-Gold™ MagPrep	D5042 D5043	4 x 96 Rxns. 8 x 96 Rxns.
EZ-96 DNA Methylation-Direct™ MagPrep	D5044 D5045	4 x 96 Rxns. 8 x 96 Rxns
EZ-96 DNA Methylation-Lightning™ MagPrep	D5046/D5046-E* D5047/D5047-E*	4 x 96 Rxns. 8 x 96 Rxns.

*CE IVD

EZ DNA Methylation-Startup™ Kit

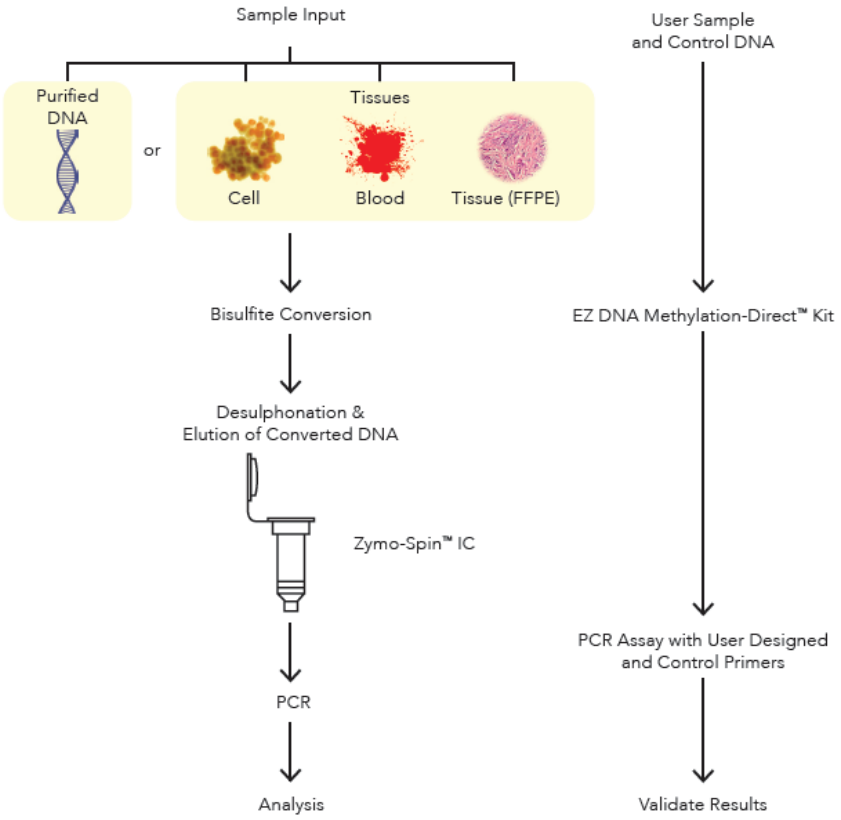
Highlights:

- **A complete solution for bisulfite conversion:** Contains reagents for bisulfite conversion, DNA purification, methylated human DNA standard with control primers, and a robust hot-start PCR polymerase specifically formulated for bisulfite converted DNA.
- **Simple:** Designed for the first time user requiring a consolidated product to control for bisulfite conversion.

Description:

The EZ DNA Methylation-Startup™ Kit provides the necessary technologies required for complete bisulfite conversion of DNA for PCR and methylation analysis. This kit includes bisulfite conversion reagents that allow for use with purified DNA or direct sampling of blood, cells, and fresh or FFPE tissues without the prerequisite for upstream DNA purification (see EZ DNA Methylation-Direct™ Kit, p. 193). A Universal Methylated Human DNA Standard (p. 208) is provided together with a special primer set for PCR to assess conversion efficiency. Finally, a unique Zymo*Taq*™ DNA Polymerase (p. 212) is included for robust amplification of bisulfite-treated DNA.

Workflow of the EZ DNA Methylation-Startup™ Kit



Product	Cat. No.	Size	Specifications	Uses
EZ DNA Methylation-Startup™ Kit	D5024	50 Rxns.	Input: DNA, Cells, Blood, Tissue, FFPE Conversion Efficiency: > 99.5% Format: Spin-Column Elution Volume: ≥ 10 µl DNA Recovery: > 80% Bisulfite Conversion Time: 4 hours Kit Includes: Conversion kit, primers, and qPCR mix	Bisulfite treatment; Rapid column desulphonation; Amplified bisulfite-converted DNA

OneStep PLUS qMethyl™ PCR Kit

Highlights:

- Single step, bisulfite-free DNA methylation analysis.
- Includes reagents and controls for quantitative detection and reliable performance.
- Ideal for rapid screening of single and multi-locus DNA methylation.

Description:

The OneStep PLUS qMethyl™ PCR Kit is intended for the quantification of DNA methylation at custom-selected genomic regions. The same DNA sample is analyzed in parallel with the Test PreMix and the Reference PreMix. The Test PreMix contains enzymes that selectively degrade (digest) unmethylated DNA while leaving methylated DNA intact. Only methylated DNA will be amplified in the "Test Reaction". The Reference PreMix does not contain those enzymes, therefore both methylated and unmethylated DNA are amplified in the "Reference Reaction". The difference in Cycle threshold (Ct) values between the Reference and Test reactions is used to calculate the percentage of DNA methylation at the selected genomic region.

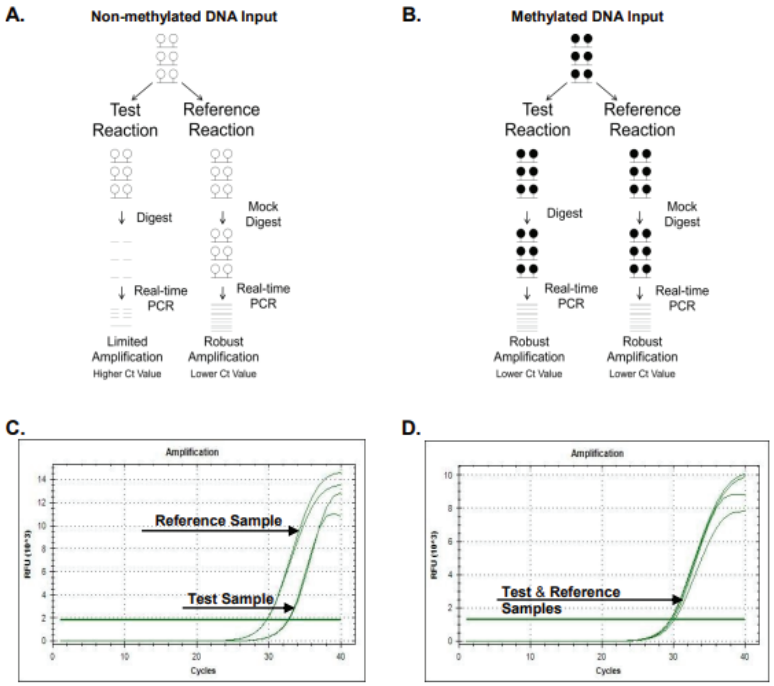


Figure 1. A and B are the schematic representation of OneStep PLUS qMethyl™ PCR test for non-methylated DNA and methylated DNA, respectively. Unmethylated and methylated CpG sites are represented by white and black circles, respectively. In both schemes the DNA is tested in two reactions: a Test Reaction, in which unmethylated DNA is digested, and a Reference Reaction, in which no digestion occurs. Quantitative PCR is carried out immediately after the digestion step. C and D are examples of amplification curves obtained from Human Non-Methylated & Methylated DNA Standards, respectively. The higher Ct values for the Test Reaction compared to the Reference reaction in figure C indicates that the unmethylated DNA fraction has been degraded during the digestion step.

Product	Cat. No.	Size	Specifications	Uses
OneStep PLUS qMethyl™ PCR Kit	D5312	96 Rxns.	Input: Optimal DNA input is 20 ng in 5 µl. Range validated 5 ng – 1 µg (in 5 µl) Detection Dye: Cyto 9. Assay is flexible with other dyes and TaqMan probes. Compatible Thermal Cyclers: Bio-rad CFX-96™, CFX Opus 96™, QuantStudio qPCR Systems, Roche LightCycler 480®, or similar. Processing Time: Optimal 14 hours.	Bisulfite-free DNA methylation analysis; Rapid screening of multiple loci or single locus across multiple samples

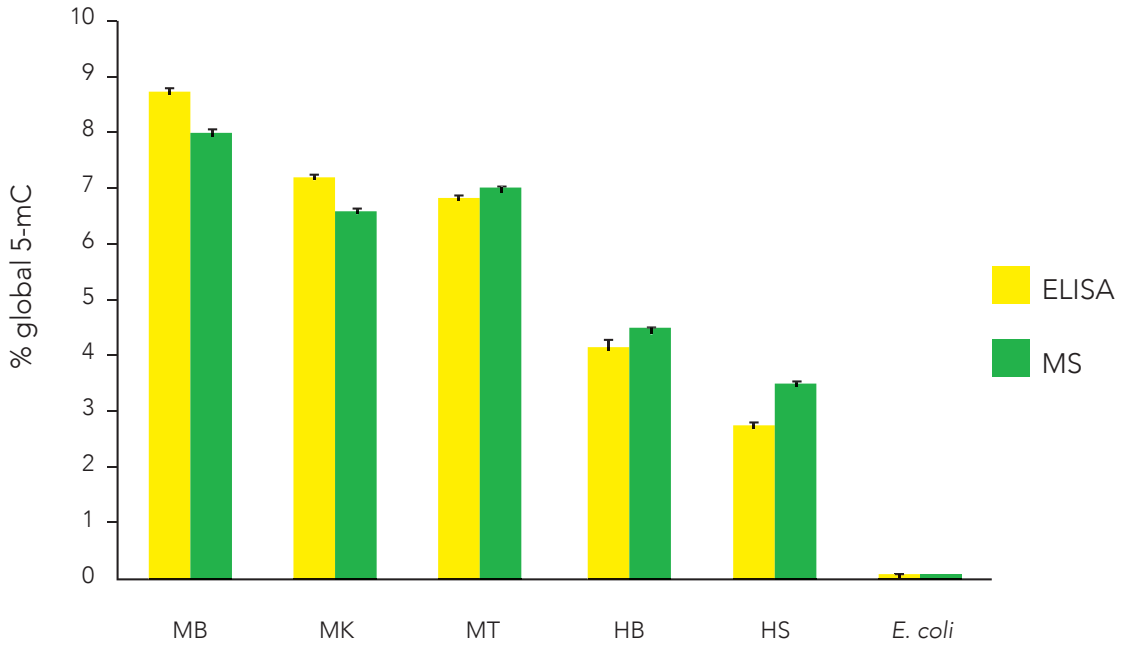
5-mC DNA ELISA Kit

Highlights:

- **Accurate Quantification:** Sensitive and specific quantification of global 5-methylcytosine (5-mC) DNA from a variety of samples.
- **High-Throughput:** 96-well format is ideal for processing just a few samples to a large number of samples.
- **Simple:** The streamlined workflow can be completed in less than 3 hours.

Description:

The 5-mC DNA ELISA Kit empowers researchers to accurately quantitate 5-mC for any DNA sample in less than 3 hours. The kit features an Anti-5-mC Monoclonal Antibody that is both sensitive and specific for 5-mC. The assay is compatible with a wide range of input DNA from vertebrate, plant, and microbial sources as well as fragmented DNA. All samples can be accurately quantified from a standard curve generated with specially designed controls included with this kit.



The 5-mC DNA ELISA Kit can quantify 5-mC in numerous DNA samples with close correlation to LC-MS. 100 ng of genomic DNA from mouse brain (MB), mouse kidney (MK), mouse thymus (MT), human brain (HB), human spleen (HS), and *E. coli* ER2925 were used to coat wells, in triplicate. Percent 5-mC was calculated using the logarithmic equation of the line from the standard curve that was constructed with the Negative Control and the Positive Control. The percent 5-mC calculated in DNA samples using the 5-mC DNA ELISA Kit (ELISA) strongly correlates to mass spectrometry (MS) data of 5-mC found in the respective gDNA sample.

Product	Cat. No.	Size	Specifications	Uses
5-mC DNA ELISA Kit	D5325 D5326	1 x 96 Rxns. 2 x 96 Rxns.	DNA Input: 10 - 200 ng Detection: ≥ 0.5% 5-mC per 100 ng Assay Time: 3 - 4 hours	Global 5-mC detection and quantitation

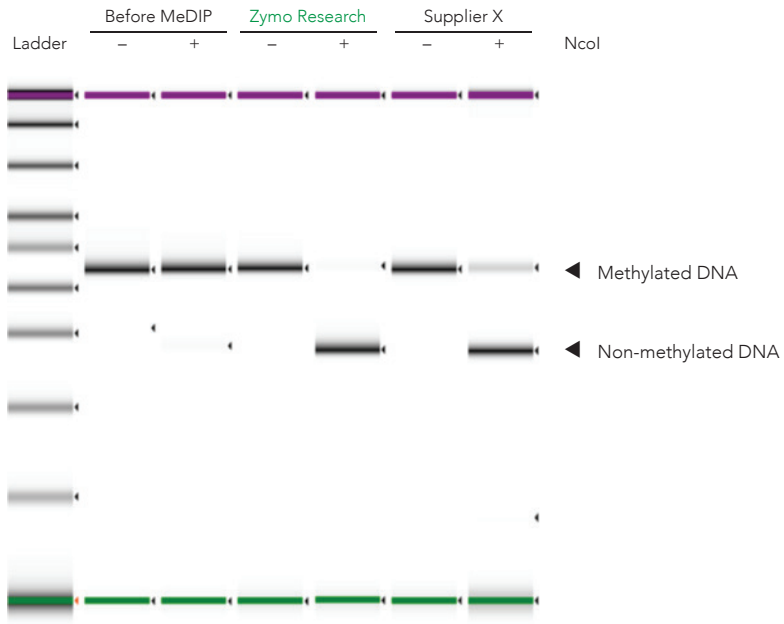
Methylated-DNA IP Kit

Highlights:

- **Reliable:** Robust enrichment & imm unoprecipitation of 5-mC containing DNA.
- **Streamlined:** Includes a highly specific anti-5-methylcytosine monoclonal antibody for defined, reproducible results.
- **High-Quality:** Eluted, ultra-pure DNA is ideal for use in subsequent molecular based analyses (e.g., assembling genomic libraries and determining genome-wide methylation status).

Description:

The Methylated-DNA IP Kit is designed for enrichment of 5-mC-containing DNA from any pool of fragmented genomic DNA for use in genome-wide methylation analysis. It features a highly specific Anti-5-Methylcytosine Monoclonal Antibody for the immunoprecipitation of methylated DNA in only a few hours. This kit is capable of achieving over one hundred-fold enrichment of methylated DNA vs. non-methylated DNA. Recovered DNA is suitable for many downstream applications to analyze genome-wide DNA methylation including PCR, bisulfite treatment, whole-genome amplification, ultra-deep sequencing, and microarray. Control DNA and primers are included to monitor the success of the assay.



Methylated DNA is efficiently enriched using the 5-Methylcytosine antibody. Control DNA comprised of a mixture of methylated and non-methylated was immunoprecipitated using mouse Anti-5-Methylcytosine antibody from Zymo Research or Supplier X. The methylated DNA contains point a mutation that introduces an NcoI restriction site. After immunoprecipitation of the mixture, the region of DNA containing the restriction site was amplified by PCR, digested with NcoI, and visualized using the Agilent 2200 Tapestation®. Non-methylated DNA remains un-cut, whereas the methylated DNA is cut by NcoI. The image above demonstrates specific enrichment of methylated versus non-methylated DNA by the Anti-5-Methylcytosine from Zymo compared to Supplier X.

Product	Cat. No.	Size	Specifications	Uses
Methylated-DNA IP Kit	D5101	10 Rxns.	Format: Magnetic Beads Optimal DNA Input: 50 - 500 ng Elution Volume: 10 µl Enrichment Factor: > 100 fold Processing Time: 4 hours	Immunoprecipitation of methylated DNA; PCR; Sequencing

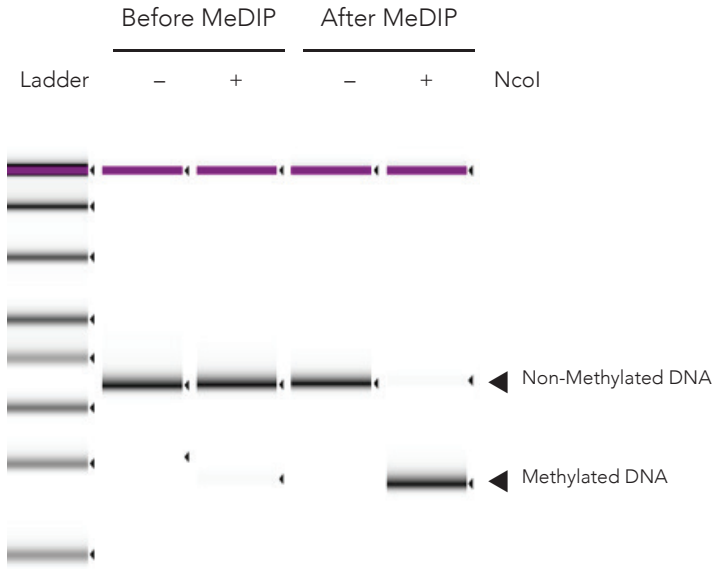
Anti-5-Methylcytosine Monoclonal Antibody (Clone 7D21)

Highlights:

- **Sensitive:** Specifically binds to 5-methylcytosine in ssDNA context.
- **Specific:** No detectable cross reactivity with non-methylated cytosine.
- **Versatile:** Can be used in ELISA, IP, and IF applications.

Description:

The mouse Anti-5-Methylcytosine Monoclonal Antibody (Clone 7D21) is exceptional at differentiating between methylated and non-methylated cytosines in DNA. The antibody binds to 5-mC in single-stranded DNA, with no detectable cross-reactivity to non-methylated cytosines. This product is ideal for immuno-based assays such as methylated DNA Immunoprecipitation (MeDIP), ELISA and dot blot.



Efficient enrichment of methylated DNA using Methylated-DNA IP Kit. Sample comprised of a mixture of methylated and non-methylated DNA (1:4 ratio) was immunoprecipitated following the Methylated-DNA IP Kit protocol. Digestion of amplicons with NcoI produced two 175 bp fragments for methylated DNA control or one 350 bp fragment for non-methylated control. The results show an efficient enrichment of methylated DNA vs. non-methylated DNA in immunoprecipitated DNA (After MeDIP) compared to non-precipitated (Before MeDIP) samples. The products were visualized using D1000 Tape on TapeStation 2200 (Agilent, Santa Clara, CA).

Product	Cat. No.	Size	Specifications	Uses
Anti-5-Methylcytosine Monoclonal Antibody (Clone 7D21)	A3002-15 A3002-30 A3002-50 A3002-200	15 µl 30 µl 50 µl 200 µl	Isotype: IgG1 Concentration: 5 µg/µl Buffer: PBS (pH 7.4) 0.05% Sodium Azide Short Term Storage: 4°C Longe Term Storage: -80°C	Immunoprecipitation of methylated DNA; ELISA; Immunoblotting; Immunofluorescence

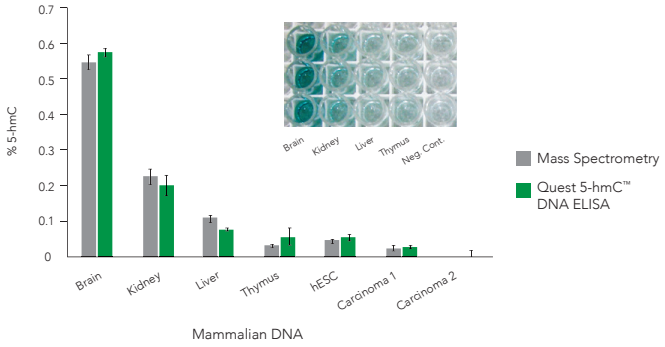
Quest 5-hmC™ DNA ELISA Kit

Highlights:

- **Accurate Quantification:** Sensitive and specific quantification of 5-hydroxymethylcytosine (5-hmC) DNA from a variety of samples.
- **High-Throughput:** 96-well format is ideal for processing just a few samples to a large number of samples.
- **Simple:** The streamlined workflows can be completed in 4 hours or less.

Description:

Ideal for sensitive and specific quantitation, the Quest 5-hmC™ DNA ELISA Kit is and can be used to accurately detect 5-hmC DNA in a variety of samples. The kit is compatible with a wide range of input DNA, including intact genomic DNA as well as enzyme-digested and mechanically sheared fragments. The control DNA set included with this kit has been calibrated to accurately quantify the percent 5-hmC in sample DNA by use of a standard curve. The fast, streamlined workflow is ideal when analyzing and screening large numbers of samples.



Specific Quantitation of 5-hmC

The Quest 5-hmC™ DNA ELISA Kit can be used to detect 5-hmC in numerous DNA samples with high specificity as evidenced by comparison with LC-MS. 5-hmC pAb (100 ng/well) was used to quantitate the amount 5-hmC in 100 ng of single- stranded DNA. % 5-hmC was calculated from a standard curve generated using the Control DNA Set. The figure shows a correlation between the % 5-hmC in DNA samples calculated using the Quest 5-hmC™ DNA ELISA Kit and mass spectrometry.

Anti-5-Hydroxymethylcytosine Polyclonal Antibody

Highlights:

- High sensitivity to low levels of 5-hydroxymethylcytosine DNA.
- No detectable cross reactivity with cytosine and 5-methylcytosine.

Description:

The rabbit Anti-5-Hydroxymethylcytosine Polyclonal Antibody can robustly distinguish between hydroxymethylated DNA and methylated or unmodified DNA with limited to no cross-reactivity. The antibody has been validated in ELISA and immunoprecipitation-based enrichment assays, and is suitable for use in other applications including immunohistochemical labeling and chromatographic blotting.

Product	Cat. No.	Size	Specifications	Uses
Quest 5-hmC™ DNA ELISA Kit	D5425 D5426	1 x 96 Rxns. 2 x 96 Rxns	DNA Input: 25 - 200 ng Detection: ≥ 0.02% 5-hmC per 100 ng Assay Time: 3 - 4 hours	Global 5-mC detection and quantitation
Anti-5-Hydroxymethylcytosine Polyclonal Antibody	A4001-25 A4001-50 A4001-200	25 µg/25 µl 50 µg/50 µl 200 µg/200 µl	Source: Rabbit Isotype: IgG1 Concentration: 1 mg/ml Buffer: PBS at pH 7.5 Storage: -20°C	Immunoprecipitation for 5-hmC DNA; ELISA; Immunoblotting; Immunoflourescence

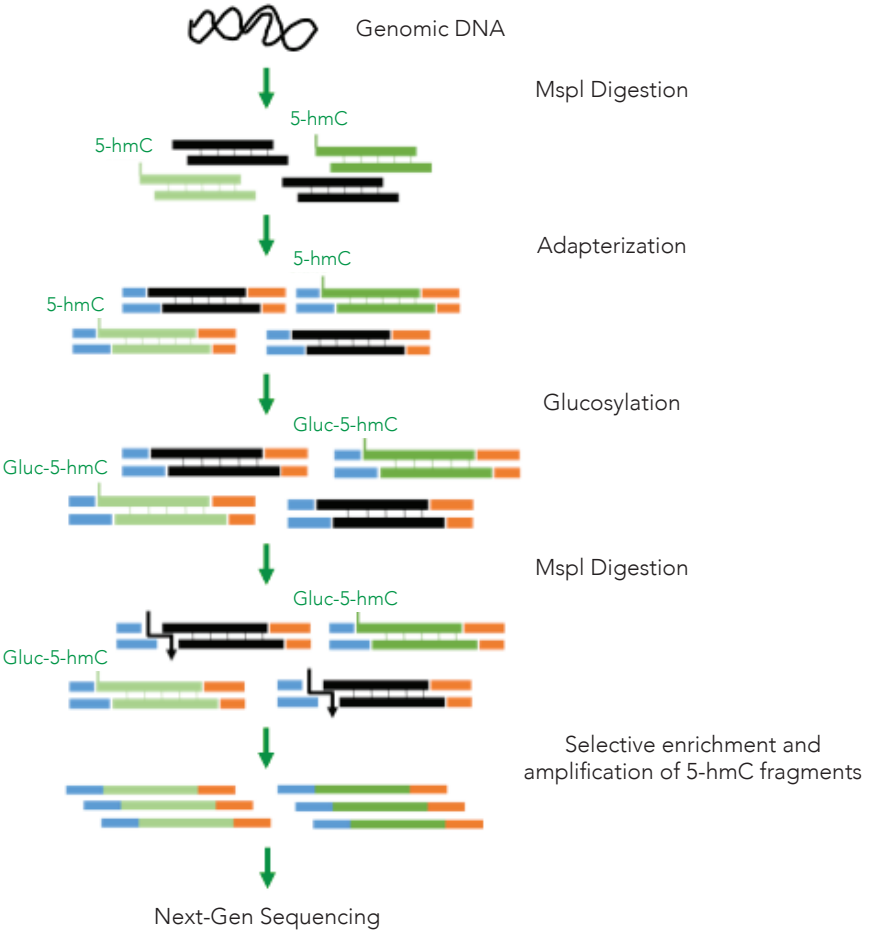
RRHP™ 5-hmC Library Prep Kit

Highlights:

- Innovative library preparation for strand-specific mapping of 5-hmC in DNA.
- Streamlined workflow accommodates low (≥ 100ng) DNA inputs.
- Libraries are ready for NGS (Illumina-compatible).

Description:

The RRHP™ 5-hmC Library Prep Kit is an all-inclusive solution for analysis of genome-wide 5-hydroxymethylcytosine (5-hmC) positions at single-base resolution. The Reduced Representation Hydroxymethylation Profiling (RRHP) method is based on blocking MspI digestion by glucosylating 5-hmC within MspI recognition sites. Fragments lacking glucosylated 5-hmC at the adapter-ligation junction will be cleaved and not amplified by PCR. Therefore, only fragments containing 5-hmC will be successfully amplified and analyzed by NGS. Fragments with higher 5-hmC levels will be correlated with higher frequency of sequencing reads. RRHP™ bypasses the need for bisulfite conversion, which allow for DNA inputs as low as 100ng, lower sequencing depth, and straight-forward bioinformatics processing.

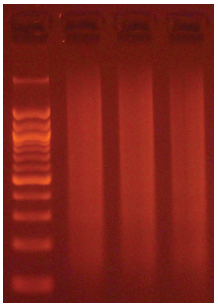


Product	Cat. No.	Size	Specifications	Uses
RRHP™ 5-hmC Library Prep Kit	D5450 D5451	12 preps 25 preps	DNA Input: 100 ng - 1 µg Sequencing Platform Compatibility: Illumina® TruSeq® Chemistries, HiSeq® and MiSeq® platforms	5-hmC DNA detection

Bisulfite Conversion Resources

Learn More About Bisulfite Conversion

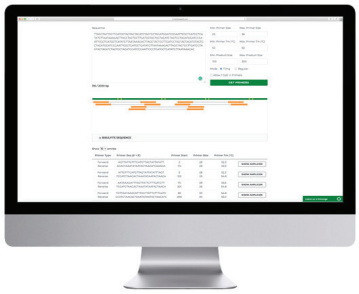
- Visualizing Bisulfite-Converted DNA
- Quantification of Bisulfite-Converted DNA
- PCR of Bisulfite Converted DNA



Scan to Learn More
https://www.zymoresearch.com/pages/bisulfite-beginner-guide

Bisulfite Primer Seeker

This program streamlines the tedious process of bisulfite primer design. This program will help you design primers in particularly CG-rich sequences and will provide you with multiple options for amplicons that span different regions within your sequence.



Scan to Use the Free Bisulfite Primer Design Tool
https://www.zymoresearch.com/pages/bisulfite-primer-seeker

A Comprehensive Guide for Illumina Methylation Array

- Troubleshooting & best practice guidelines
- Bisulfite kit selection guide from Illumina
- Automated bisulfite conversion for Infinium™ Methylation BeadChips

Table 1: Bisulfite conversion experimental summary

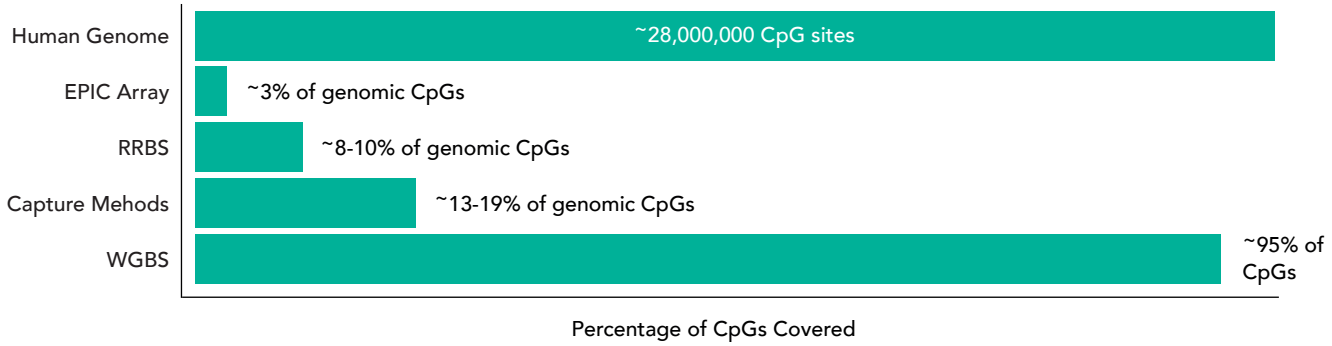
Kit (Catalog No.)	BeadChip Format (bead pools used)	Probes	Preparation	Probes passing detection (%)*	No. of Samples	Cell Line
EZ DNA Methylation™ (D5004)	8x1 HD (MethylationEPIC 1, 2, 3)	451,687	Manual	99.89 ± 0.01	16	Raji, MCF7
EZ DNA Methylation-Lightning™ MagPrep (D5046)	8x1 HD (MethylationEPIC 1, 2, 3)	451,687	Manual	99.91 ± 0.04	15	Raji, MCF7
EZ DNA Methylation™ (D5004)	8x1 HD (MethylationEPIC, 1, 2, 3, 4, 5, 6)	865,918	Manual	99.84 ± 0.05	20	HeLa, Jurkat, Raji, MCF7
EZ DNA Methylation-Lightning™ MagPrep (D5046)	8x1 HD (MethylationEPIC, 1, 2, 3, 4, 5, 6)	865,918	Automated	99.46 ± 0.38	24	HeLa, Jurkat, Raji, MCF7
EZ DNA Methylation™ (D5004)	24x1 HTS (MethylationEPIC 1, 2, 3, 4)	615,320	Manual	99.61 ± 0.18	48	HeLa, Jurkat, Raji, MCF7
EZ DNA Methylation-Lightning™ MagPrep (D5046)	24x1 HTS (MethylationEPIC 1, 2, 3, 4)	615,320	Automated	99.20 ± 0.38	30	HeLa, Jurkat, Raji, MCF7

a. Detection at p-value < 0.01

Bisulfite Conversion Resources (continued)

A Quick Guide for DNA Methylation Profiling with NGS-based Methods

Whole-Genome Bisulfite Sequencing (WGBS) Expands the Frontiers of Genomic Medicine



Scan to View
https://www.zymoresearch.com/pages/what-is-dna-methylation

Scan to Read the App Note:
High-accuracy Next-Gen Sequencing with the NovaSeq™ Series

Choose Your Epigenetic Standards

Industry-leading DNA methylation standards for seamless quantification. Assess your DNA methylation workflow today!

DNA methylation standards can be used for optimizing a variety of methylation assays or can serve as positive and negative controls to validate established workflows. Standards are also ideal substitutes for precious DNA or problematic sample types when troubleshooting or testing experimental conditions. DNA methylation standards have utility in various applications including bisulfite sequencing using NGS technologies, methylation-specific PCR (MSP), and methylation-sensitive restriction enzyme (MSRE) assays. Integrating established controls is also key for clinical workflows and during all assay calibrations.

Choose from a range of DNA standards that can be used for optimization or quality control of various methylation assays.

Catalog No.	Product	0% and 100% Methylation Controls	Bisulfite PCR	Methylation-Specific PCR	NGS Library Optimization	*In Situ* Control	Methylation Assay Calibration
D5011	Universal Methylated Human DNA Standard		X		X		
D5012	Universal Methylated Mouse DNA Standard		X		X		
D5013	Human Methylated & Non-Methylated (WGA) DNA Set	X	X	X			
D5014	Human Methylated & Non-methylated DNA set	X	X	X	X		X
D5015	Bisulfite-Converted Universal Methylated Human DNA Standard		X				
D5016	*E. Coli* Non-Methylated Genomic DNA		X		X	X	X
D5017	Methylated & Non-methylated pUC19 DNA Set	X	X			X	X
D5018	Human Matched DNA Set		X		X		X
D5019	Mouse 5-hmC & 5-mC DNA Set		X		X		X
D5405	5-Methylcytosine & 5-Hydroxymethylcytosine DNA Standard Set	X				X	
D5500	Zymo-Seq Methyl Spike-in Control	X			X	X	X

Scan to Learn More About Controls for Methylation Assays
https://www.zymoresearch.com/blogs/blog/controls-for-dna-methylation-assays

Human Methylated & Non-Methylated DNA Set

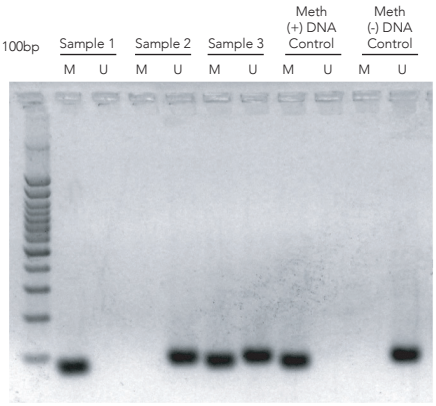
Highlights:

- **Ideal Positive and Negative Controls:** DNA standards, purified from HCT116 DKO cell line, for use as positive and negative controls in methylation-detection applications including bisulfite PCR (BSP) and methylation-specific PCR (MSP) experiments.
- **Standard Curve Generation:** Completely methylated and non-methylated DNA can be mixed together in various proportions to generate a standard curve for suitable quantitation of DNA methylation in experimental samples.
- **Convenient:** Provided with control primers to amplify a fragment of DNA after bisulfite conversion.

Description:

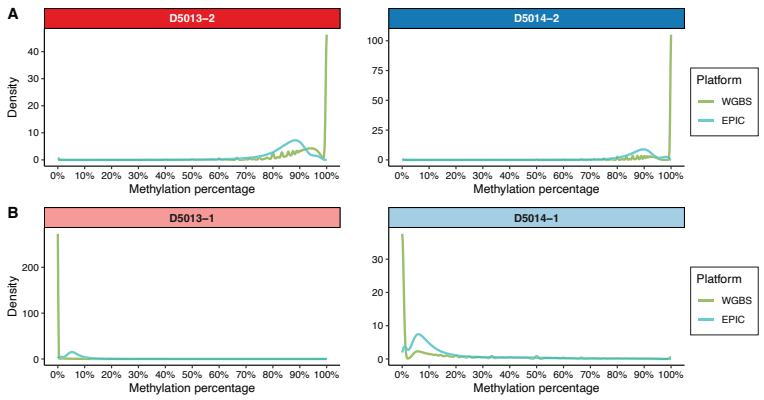
The Human Methylated & Non-Methylated DNA Set consists of two control DNAs (a CpG methylated human DNA standard and a non-methylated human DNA standard). These DNA standards come in both genomic (D5014) and whole-genome amplified (D5013) versions, with a set of specifically designed primers that can be used in conjunction with the EZ DNA Methylation™ family kits (page 192-196). These DNA sets can be included as a positive and negative control to assess the efficiency of bisulfite-mediated conversion of DNA.

The non-methylated human DNA is purified from the HCT116 DKO (double knock-out) cell line, which contains genetic knockouts of both DNA methyltransferases DNMT1 (-/-) and DNMT3b (-/-). The methylated DNA standard is purified HCT116 DKO DNA that has been enzymatically methylated at CpG sites.



Example MSP experiment using MSP designed primers for RASSF1. Sample 1 is positive for a Methylated Template. Sample 2 is positive for a Non-Methylated Template and Sample 3 contains Methylated and Non-Methylated Templates. MSP experiment also shows proper controls: Meth (+) DNA Control corresponds to the Human Methylated DNA standard (D5014-2) and the Meth (-) DNA Control corresponds to the Human Non-methylated DNA standard (D5014-1). 2% Agarose Gel, 130V for 35 mins. M = Methylated specific primers, U = Non-Methylated specific primers

Methylation Distribution and Agreement



Methylation estimates across the genome. Each platform's methylation percentages were collected for all loci represented and compared. Density was calculated for each platform from the methylation percentages for the D5013 and D5014 methylation standards. (A) methylated standards D5013-2 (left) D5014-2 (right) (B)non-methylated standards, D5013-1 (left) D5014-1 (right)

(Cited from: X. Yang, R. Yancey, et al. Assessing HiFi Long Read Sequencing versus Whole Genome Bisulfite Sequencing and Methylation EPIC BeadChip Array: A Comparative Analysis Utilizing DNA Methylation Standards.; (Abstract:PB2225). Presented at the Annual Meeting of The American Society of Human Genetics, Nov 1st 2023, Washington D.C.)

Product	Cat. No.	Size	Specifications	Uses
Human Methylated & Non-Methylated (WGA) DNA Set	D5013	5 µg/20 µl	Format: HCT116 DKO Genomic DNA Concentration: 250 ng/µl	Control for bisulfite conversion; DNA methylation quantitation
Human Methylated & Non-methylated DNA Set	D5014	5 µg/20 µl		

Zymo-Seq Methyl Spike-in Control

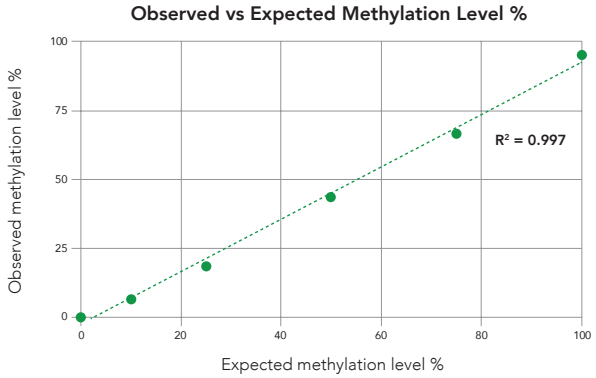
Highlights:

- Ensures reliable calculation of bisulfite conversion efficiency post library prep.
- Six unique amplicons with 0, 10, 25, 50, 75, and 100% methylation levels allow for a standard curve and robust data normalization.
- Compatible with various species (except for *E. coli*) and bisulfite sequencing library preparation methods.

Description:

Zymo-Seq Methyl Spike-in Control is comprised of six unique double-stranded synthetic amplicons (180-200 bp) with distinct sequences derived from the *E. coli* K12 genome, and each amplicon represents a different CpG methylation level ranging from 0% to 100%. This control serves as an *in situ* control for NGS library preparations, providing an unbiased way of calculating the efficiency of the bisulfite conversion reaction. It can also be used to validate bioinformatics pipeline calibration by demonstrating a strong correlation between observed and expected methylation levels of the amplicons.

Accurate Methylation Detection



The observed methylation levels of a Zymo-Seq Methyl Spike-in Control, exhibit a high correlation with the expected methylation level when used with the Zymo-Seq WGBS Library Kit (D5465). Bioinformatic analysis using the reference control with known methylation values ensures high-quality data for each individual sample.

True Bisulfite Conversion Efficiency in Non-CpG Context

Species	Sample gDNA	Sample DNA with Zymo-Seq Methyl Spike-in Control
Cotton	81%	99%
Soybean	89%	99%
Arabidopsis thaliana	97%	99%
Cattle	99%	99%
Human	99%	99%

Bisulfite conversion efficiency in non-CpG context from various species was measured using the sample gDNA with and without Zymo-Seq Methyl Spike-in Control. Utilizing the Zymo-Seq Methyl Spike-In Control resulted in improved accuracy in calculations, especially for non-traditional organisms that have methylation in non-CpG context.

Product	Cat. No.	Size	Specifications	Uses
Zymo-Seq Methyl Spike-in Control	D5500	25 preps	Format: Double-stranded Synthetic Amplicons Derived from the *E. coli* Genome Concentration: 60 pg/µl	Control for bisulfite conversion; DNA methylation quantitation

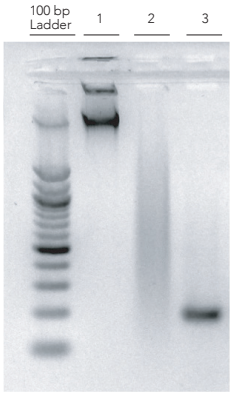
Universal Methylated DNA Standards

Highlights:

- **Ideal Highly-Methylated Controls:** Purified DNA from normal human or mouse tissue that is enzymatically methylated at all CpG sites for use as a positive control.
- **Side-by-Side Processing:** Standards can be processed in parallel with experimental samples to monitor bisulfite conversion efficiency.
- **Convenient:** Provided with control primers to amplify a fragment of DNA after bisulfite conversion.

Description:

The Universal Methylated DNA Standards are designed for use as positive controls to assess the efficiency of bisulfite-mediated conversion of DNA. The control DNAs can be assayed in parallel with samples to monitor the bisulfite conversion reaction. Each primer set has been designed to amplify a fragment of the supplied DNA following bisulfite treatment.



Assess Bisulfite Conversion Efficiency and Primer Design

Gel electrophoresis depicting genomic DNA, bisulfite-converted genomic DNA, and genomic DNA amplified with bisulfite-specific primers. Lane 1 – Input DNA: Universal Methylated Human DNA Standard (D5011). Lane 2 – Bisulfite-converted Universal Methylated Human DNA (D5011) using EZ DNA Methylation-Direct™ Kit (D5020). Lane 3 – Universal Methylated Human DNA (D5011) bisulfite converted and amplified with supplied hMLH1 control primers.

Additional Bisulfite Conversion Controls

Description:

The Bisulfite-Converted Universal Methylated Human DNA Standard is designed to be used as a control for DNA bisulfite conversion and downstream analyses including PCR, MSP, and other amplification-based assays. This DNA is identical to our Universal Methylated Human DNA Standard, but has been bisulfite-converted using the EZ DNA Methylation – Direct (D5020) kit. The primer set included with the standard has been designed and validated to amplify a segment of the bisulfite-converted DNA.

The Methylated & Non-methylated pUC19 DNA Set consists of control DNAs and a set of specifically designed primers. The set is ideal as a "spike-in" control to assess bisulfite conversion efficiency within the same reaction as the sample, or to produce known mixtures of methylated and non-methylated DNA for assay calibration.

E. coli non-methylated genomic DNA is from a Dam– and Dcm– strain (ER2925) of *E. coli*. It works perfectly as a negative control for DNA methylation analyses requiring DNA with absolutely no methylation.

Product	Cat. No.	Size	Specifications	Uses
Universal Methylated Human DNA Standard	D5011	5 µg/20 µl	Format: Male Genomic DNA Concentration: 250 ng/µl	Control for bisulfite conversion; DNA methylation quantitation
Universal Methylated Mouse DNA Standard	D5012	5 µg/20 µl		
Bisulfite-converted Universal Methylated Human DNA Standard	D5015	1 µg/50 µl	Format: Bisulfite-converted Male Genomic DNA Concentration: 20 ng/µl	
Methylated & Non-Methylated pUC19 DNA Set	D5017	20 ng/20 µl	Format: Linearized Plasmid Concentration: 1 ng/µl	
E. coli Non-Methylated Genomic DNA	D5016	1 µg/50 µl	Format: *E. coli* Genomic DNA Concentration: 250 ng/µl	

Matched DNA Sets

Highlights:

- **High-Quality:** Set of organ-specific human genomic DNA originating from a single individual.
- **Accurate:** Precisely quantified levels of 5-methylcytosine & 5-hydroxymethylcytosine via LC/MS.
- **Versatile:** Useful control for detection methods of 5-methylcytosine or 5-hydroxymethylcytosine.

Description:

Matched DNA Sets are an ideal control for detection and/or quantification methods against 5-mC and 5-hmC as both modified cytosines are present at physiologically relevant levels and loci. The Human Matched Tissue DNA Set is a set of organ-specific human genomic DNAs, originating from a single individual. The Mouse Tissue 5-hmC & 5-mC DNA Set contains organ-specific mouse genomic DNAs, isolated from a pool of 8-10 week old Swiss Webster mice. The levels of 5-mC and 5-hmC have been precisely quantified by mass spectrometry (LC/MS).

5-mC & 5-hmC DNA Standard Set

Highlights:

- Control DNA for 5-methylcytosine (5-mC) and 5-hydroxymethylcytosine (5-hmC quantitation applications (i.e. - mass spectrometry, HPLC, TLC, etc.).
- Substrate for studies involving 5-hmC interacting proteins.

Description:

The 5-mC & 5-hmC DNA Standard Set features three DNA standards, which contain linear dsDNA, which have the same sequence. Each of the three standards are identical except in cytosine modification: 1) 100% unmodified cytosines 2) 5-mC 3) 5-hmC. Since the sequence and extent of cytosine modification is known, this DNA standard set is ideal for use in calibration of various applications intended for quantitation of cytosine modifications.

Product	Cat. No.	Size	Specifications	Uses
Human Matched DNA Set	D5018	1 set	Source: Human Male Concentration: 250 ng/µl	Control for bisulfite conversion; DNA methylation quantitation
Mouse 5-hmC & 5-mC DNA Set	D5019	1 set	Source: Swiss Webster Mice Concentration: 250 ng/µl	
5-mC & 5-hmC DNA Standard Set	D5405	1 set	DNA Amount: 2 µg each DNA Concentrations: 50 ng/µl each	Cytosine modification studies (i.e 5-mC & 5-hmC); HPLC; Mass Spec; TLC

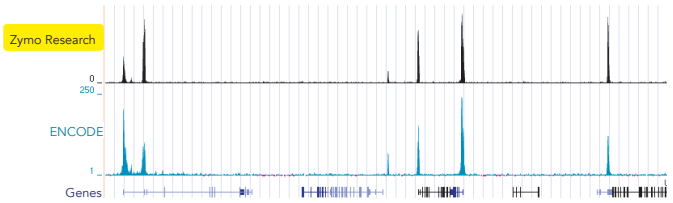
Zymo-Spin™ ChIP Kit

Highlights:

- **Simplified Workflow:** Streamlined protocol for chromatin immunoprecipitation and purification of ChIP DNA.
- **High-Quality:** Ultra-pure, concentrated ChIP DNA can be eluted in as little as 6 µl.
- **NGS-Ready:** ChIP DNA is suitable for ChIP-Seq, ChIP-qPCR, and other sensitive molecular applications.

Description:

The Zymo-Spin™ ChIP Kit from Zymo Research provides a streamlined ChIP procedure for investigating protein-DNA interactions that have been "fixed" in their natural state and can be used to effectively identify binding sites for transcription factors, co-factors, and other DNA regulatory proteins.

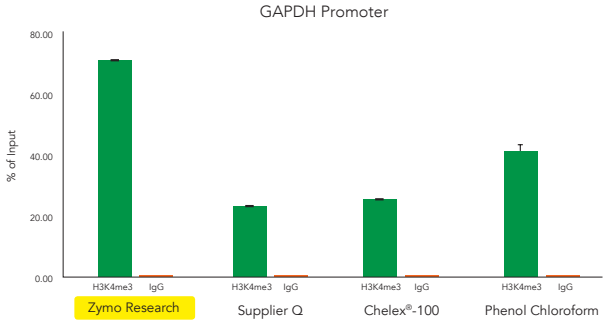


ENCODE Quality ChIP Workflow: Browser tracks depicting H3K4me3 ChIP-Seq assay using the Zymo-Spin™ ChIP Kit. Peaks overlap the same sites identified at the Broad Institute of MIT and Harvard as part of the ENCODE project.

ChIP DNA Clean & Concentrator® Kit

Highlights:

- **Fast:** Two-minute DNA clean-up from any step in a standard ChIP protocol.
- **High-Quality:** Ultra-pure, concentrated ChIP DNA can be eluted in as little as 6 µl.
- **Ready-to-Use:** DNA is ideal for PCR, arrays, DNA quantification, Southern blot analysis, sequencing, and other molecular applications.



Efficient DNA Clean-up from ChIP Protocols

ChIP DNA Purification Comparison: ChIP assays were performed with HeLa cells using ChIP-grade anti-H3K4me3 and rabbit IgG antibodies. Both total and immunoprecipitated chromatin were reverse cross-linked and recovered using either the ChIP DNA Clean & Concentrator® (included in the Zymo-Spin™ ChIP Kit), DNA recovery kit from Supplier Q, Chelex®-100 protocol or phenol-chloroform extraction. The amount of ChIP DNA was determined using qPCR with primers specific to the GAPDH promoter. ChIP DNA enrichment is graphed as % input.

Product	Cat. No.	Size	Specifications	Uses
Zymo-Spin™ ChIP Kit	D5209 D5210	10 preps 25 preps	Sample Source: Mammalian Cells	Chromatin Immunoprecipitation (ChIP)
ChIP DNA Clean & Concentrator® (Uncapped Columns	D5201	50 preps	Format: Spin-Column Elution Volume: ≥ 6 µl DNA Size Limit: 50 bp - 23 kb DNA Recovery: 50 bp - 10 kb 70-90%; > 10 kb 70% Binding Capacity: 5 µg Processing Time: 2 minutes	DNA purification from any step in a ChIP assay
ChIP DNA Clean & Concentrator® (Capped Columns)	D5205	50 preps		
ZR-96 ChIP DNA Clean & Concentrator®	D5206 D5207	2 x 96 Rxns. 4 x 96 Rxns.	Format: 96-Well Elution Volume: ≥ 10 µl DNA Size Limit: 50 bp - 23 kb DNA Recovery: 50 bp - 10 kb 70-90%; > 10 kb 70% Binding Capacity: 5 µg Processing Time: 45 minutes	

Chelex® is a trademark of BIO-RAD LABORATORIES, INC.

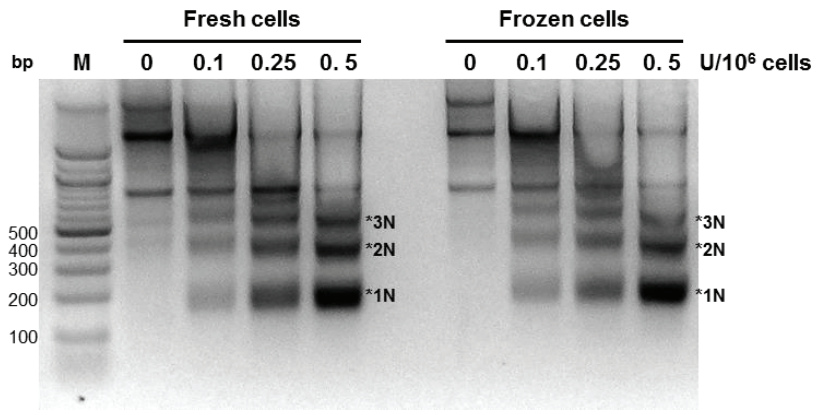
EZ Nucleosomal DNA Prep Kit

Highlights:

- For the isolation of nucleosome-associated DNA from fresh or frozen cells.
- Ideal for use in nucleosome mapping studies.
- Pure nucleosomal DNA ready for analysis in less than 45 minutes.

Description:

The EZ Nucleosomal DNA Prep Kit is a streamlined procedure for the isolation of nucleosome-associated DNA. The kit includes reagents and procedures for: cell nuclei isolation, intact nuclei enzymatic digestion, and nucleosomal DNA purification. This kit includes two different enzymes for nucleosomal DNA preparation: Atlantis dsDNase and Micrococcal Nuclease. Enzymatic digestion yields very homogeneous populations of core nucleosomes and purification of the nucleosome-associated DNA is performed using Zymo Research's proven spin-column technology.



Mammalian Nucleosomal DNA Preparation: Mammalian nuclei prepared as indicated by the Mammalian Nuclei Prep Protocol was treated with 0.1 U, 0.25 U, and 0.5 U (unit) Atlantis dsDNase for 20 min at 42°C. DNA was subsequently resolved in a 2% agarose gel. M is a 100 bp DNA ladder (Zymo Research). Asterisks (1N, 2N, 3N) represent mono-, di-, and tri-nucleosomal DNAs, respectively.

Product	Cat. No.	Size	Specifications	Uses
EZ Nucleosomal DNA Prep Kit	D5220	20 preps	Enzyme Concentration: 0.1 U/µl Storage: -20°C Inactivation: 5X MN Stop Buffer Standard Reaction Time: 45 minutes	Compatible in mammalian cells, yeast, and nuclei

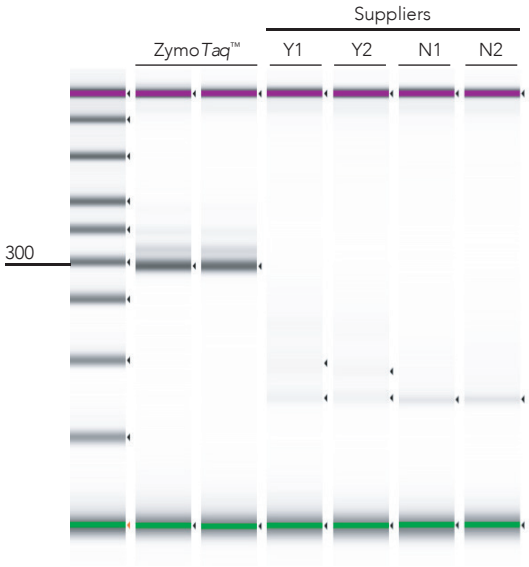
Zymo*Taq*™ DNA Polymerase

Highlights:

- **Reliable:** Hot-start DNA polymerase robustly amplifies DNA, including bisulfite-treated samples.
- **Specific:** Reduces non-specific PCR product formation from difficult templates.
- **Versatile:** Compatible with real-time, quantitative PCR and suitable for TA-cloning.

Description:

Zymo*Taq*™ DNA Polymerase is a hot-start polymerase that is ideal for amplification of bisulfite-converted DNA. Since it is a heat-activated, thermostable DNA polymerase, Zymo*Taq*™ reduces primer dimer and non-specific product formation, whereas conventional polymerases typically exhibit these problems with bisulfite-converted DNA templates. In addition to the amplification of bisulfite-treated DNA for methylation detection, Zymo*Taq*™ DNA polymerase can be used for conventional PCR and real time PCR. The enzyme also has 3′-terminal transferase activity, making it ideal for use in TA-cloning by the addition of "A" overhangs to amplified DNA.



Efficient PCR amplification of bisulfite treated DNA for methylation detection. The figure shows a 274 bp product amplified from bisulfite-treated DNA using Zymo*Taq*™ DNA Polymerase vs. polymerases from Supplier Y and N. In each case, equal amounts of bisulfite-treated DNA (EZ DNA Methylation-Lightning® Kit from Zymo Research) were used for each duplicate PCR reaction and the products visualized using the Agilent 2200 TapeStation®.

Product	Cat. No.	Size	Specifications	Uses
Zymo*Taq*™ DNA Polymerase	E2001 E2002	50 Rxns 200 Rxns	Provided as a PreMix or as part of a set Enzyme Concentration: 5 U/µl One unit (U) is defined as the amount of enzyme required for the incorporation of 10nM dNTPs into an acid-insoluble form in 30 minutes at 72°C	Amplification of bisulfite-converted & CpG rich DNA; Amplification of DNA; TA cloning
Zymo*Taq*™ PreMix	E2003 E2004	50 Rxns 200 Rxns		
Zymo*Taq*™ qPCR PreMix	E2054 E2055	50 Rxns 200 Rxns		

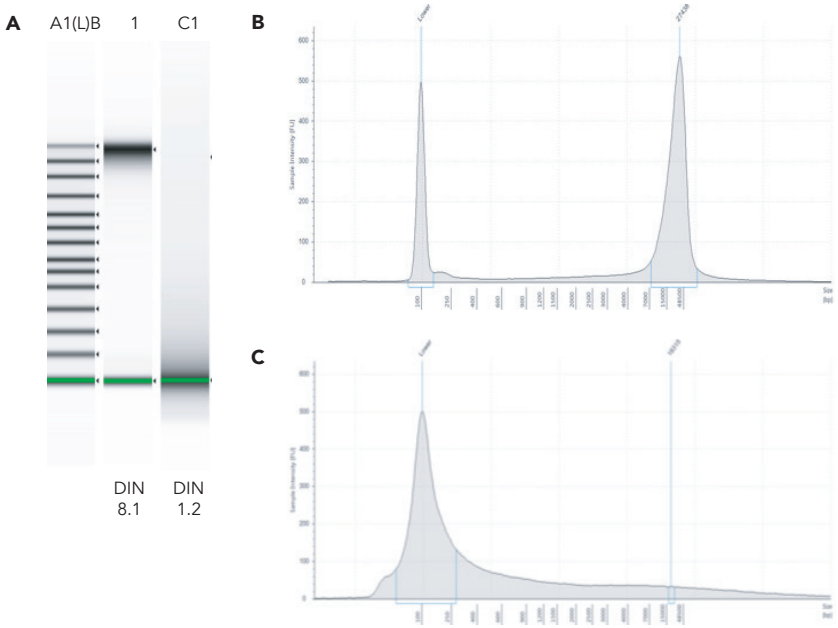
DNA Degradase™ & DNA Degradase Plus™

Highlights:

- **Fast:** One-hour, single-enzyme digestion solution to the conventional 6-16 hour multi-step enzyme digestion protocols.
- **Streamlined Workflow:** Quick, simple procedure for completely degrading DNA into individual nucleotides (DNA Degradase™) or nucleosides (DNA Degradase Plus™).
- **No Clean-Up Necessary:** Digested DNA products are immediately ready for downstream analysis by global quantitative methods including HPLC, TLC, and LC-MS.

Description:

DNA Degradase™ and DNA Degradase Plus™ are nuclease mixes that quickly and efficiently degrade DNA to its individual nucleotide or nucleoside components, respectively. DNA Degradase™ is ideal for global DNA methylation analysis, including hydroxymethylation and other demethylation intermediate products, by a number of downstream applications (i.e., LC-MS, HPLC, TLC, etc.). Digestion with the enzyme is a simple single-step procedure that works faster than other available methods.



DNA Degradase Plus™ efficiently degrades DNA. Mouse brain DNA (1 µg) was digested with 5 U of DNA Degradase Plus™ for 1 hr at 37°C and analyzed using Agilent 2200 TapeStation®. A) TapeStation gel image (A1- genomic ladder, B1- control DNA, C1- DNA Degradase Plus™ digested DNA). Electropherogram of control DNA (B) and DNA Degradase Plus™ digested DNA (C).

Product	Cat. No.	Size	Specifications	Uses
DNA Degradase™	E2016 E2017	500 U 2000 U	Enzyme Concentration: 10 U/ µl Storage: -20°C Inactivation: 70°C for 20 minutes Standard Reaction Time: 1 hour One unit (U) is defined as the amount of enzyme required to degrade 1 µg of DNA in a total reaction volume of 25 µl for 1 hour at 37°C.	Complete digestion of DNA into individual nucleotide/nucleoside components
DNA Degradase Plus™	E2020 E2021	250 U 1000 U	Enzyme Concentration: 5 U/ µl Storage: -20°C Inactivation: 70°C for 20 minutes Standard Reaction Time: 1 hour	

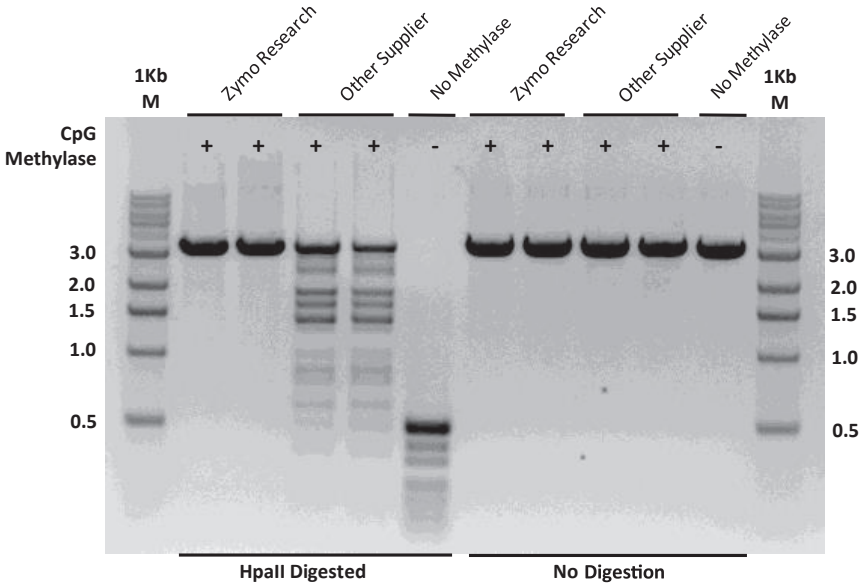
CpG Methylase (M.SssI)

Highlights:

- For complete, *In-vitro* methylation of DNA for methylation analysis.
- Methylation of chromatin DNA for DNA accessibility studies.
- Inhibition of endonucleases with overlapping CpG sequence recognition.
- [3H]-labeling of DNA.

Description:

Zymo Research's CpG Methylase (M.SssI) completely methylates all cytosines (C^5) in double-stranded, non-methylated, and hemimethylated DNA possessing a dinucleotide sequence 5'…CpG…3'. The recombinant methylase is isolated from an *E. coli* strain that expresses the methyltransferase gene from *Spiroplasma sp.* strain MQ1. Reaction conditions have been optimized to maximize the processivity of the enzyme to ensure rapid, complete, and reproducible methylation of DNA for accurate DNA methylation analysis. This product is supplied with 10X Reaction Buffer and S-Adenosyl methionine cofactor.



The CpG Methylase from Zymo Research catalyzes complete methylation of the CpG sites in DNA. Methylase activities of CpG Methylase from Zymo Research versus that of another supplier were tested for complete methylation of equivalent amounts of a linearized plasmid DNA using reaction conditions recommended by the supplier. "Completion" of CpG methylation was assessed by resistance to digestion with a methylation-specific endonuclease (HpaII) and subsequently analyzed in an agarose gel. As shown in the figure above, the CpG Methylase from Zymo Research completely methylated the CpG sites in the DNA whereas that of the other supplier did not. Samples were assayed in duplicate.

Product	Cat. No.	Size	Specifications	Uses
CpG Methylase (M.SssI)	E2010 E2011	200 U 400 U	Enzyme Concentration: 4 U/ µl Storage: -20°C Inactivation: 65°C for 20 minutes Standard Reaction Time: 2 hours One unit (U) is defined as the amount of enzyme required to protect 1 µg of DNA against cleavage by BstUI restriction endonuclease in a total reaction volume of 20 µl for 1 hour at 37°C.	*In-vitro* methylation of DNA

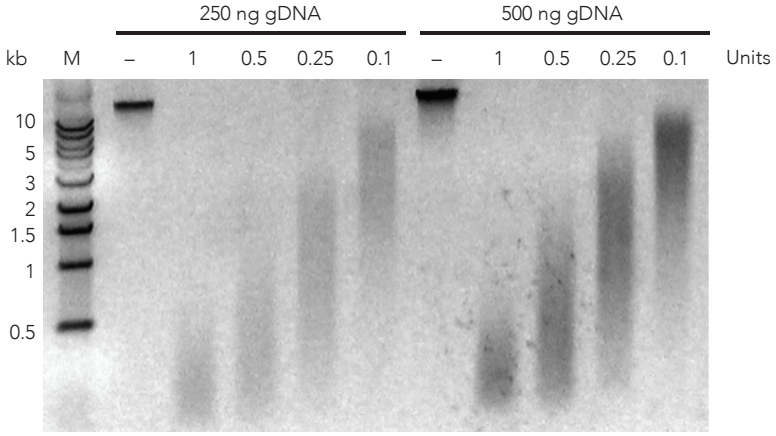
dsDNA Shearase™ Plus

Highlights:

- **Simple:** The simplest method for generating random-end dsDNA fragments.
- **Tunable:** Fragment size is easily controlled by adjusting enzyme concentration.
- **NGS-Ready:** dsDNA Shearase™ Plus-generated fragments are ideal for library construction, NGS, and DNA immunoprecipitation (i.e. MeDIP, MeDIP-Seq).

Description:

Digestion with dsDNA Shearase™ Plus is the simplest method for DNA fragmentation, as it circumvents the use of otherwise costly and cumbersome mechanical shearing devices. dsDNA Shearase™ Plus is an endonuclease that cleaves phosphodiester bonds in DNA to yield oligonucleotides with 5′-phosphate and 3′-hydroxyl termini. It has a particularly strong preference for double-stranded DNA (dsDNA) and generates random-ended DNA fragments of the desired size in a single-step. Sequencing data demonstrates that this enzyme does not introduce any detectable bias in the sequencing library preparation. It is compatible with low-volume inputs, thus minimizing sample loss. Digested DNA is easily purified in ≥ 6 µl with the recommended DNA Clean & Concentrator® technology (page 79) making it ideal for use in end modification (linker & adapter) procedures and other applications.



DNA is effectively fragmented using dsDNA Shearase™ Plus. 250 ng or 500 ng of HCT116 cell genomic DNA was incubated with 1, 0.5, 0.25, or 0.1 U dsDNA Shearase™ Plus for 20 min at 42°C. The reaction was stopped by incubating at 65°C for 5 min. Fragmented DNA was purified using the DNA Clean & Concentrator® kit and subsequently resolved in a 1% agarose gel. The amount of DNA fragmentation observed was directly correlated to the amount of enzyme used.

Product	Cat. No.	Size	Specification	Uses
dsDNA Shearase™ Plus	E2018-50 E2018-200	50 U 200 U	Enzyme Concentration: 1 U/µl Storage: -20°C Inactivation: 65°C for 5 minutes Standard Reaction Time: 20 minutes One unit (1 U) is defined at the amount of enzyme required to convert 250 ng human DNA into DNA fragments in the range of 100-500 bp in 20 minutes at 42°C in total reaction volume in 10 µl.	DNA fragmentation
dsDNA Shearase™ Plus with DNA Clean & Concentrator®-5	E2019-50 E2019-200	50 U+50 preps 200 U+200 preps		

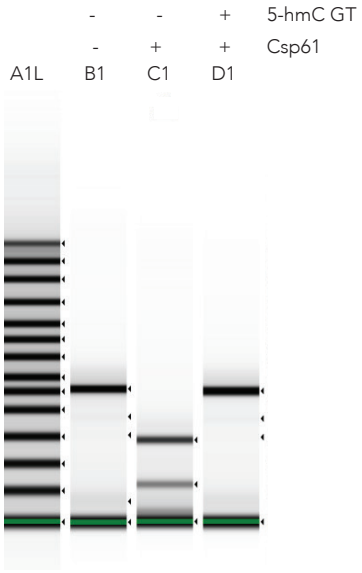
5-hmC Glucosyltransferase

Highlights:

- Highly processive enzyme for specific modification of 5-hydroxymethylcytosine (5-hmC) with a glucose moiety.
- Ideal for locus specific and global quantification of hydroxymethylated DNA.

Description:

The 5-hmC Glucosyltransferase is a highly active enzyme that specifically tags 5-hydroxymethylcytosine in DNA with a glucose moiety yielding glucosyl-5-hydroxymethylcytosine, which in turn can be used for sequence specific, genome-wide, or global 5-hmC detection.



5-hmC Glucosyltransferase demonstrates high activity and specificity. 1 µg of 5-hmC Control DNA (Cat. No. D5405) was incubated with 4 U of 5-hmC Glucosyltransferase (5-hmC GT) for 1 hour at 37°C and digested with 10 U Csp61. Results analyzed using Agilent 2200 TapeStation® show digestion of DNA not treated with 5-hmC Glucosyltransferase (C1) and no digestion of DNA treated with 5-hmC Glucosyltransferase indicating all 5-hmC residues were fully glucosylated (D1).

Product	Cat. No.	Size	Specifications	Uses
5-hmC Glucosyltransferase	E2026 E2027	100U 200U	Enzyme Concentration: 2 U/ µl Storage: -20°C Standard Reaction Time: 2 hours One unit (U) is defined as the amount of enzyme needed to protect 1 µg of 5-hmC DNA Standard (D5405-3, p. 21) from GlaI digestion.	5-hmC detection; 5-hmC enrichment

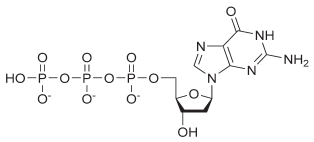
dNTP Solutions

Highlights:

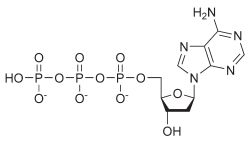
- Ready to use dNTP Mix (dATP, dTTP, dGTP, dCTP) of ultra high purity; > 99% triphosphate by HPLC.
- Readily incorporated into PCR amplicons with Zymo*Taq*™, or other DNA polymerases.
- Free of endo-, exodeoxyribonuclease, ribonuclease, phosphatase and nicking activities.

Description:

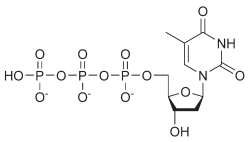
dNTP Mix and dATP, dTTP, dGTP, dCTP from Zymo Research are ultra-pure and can be used to generate DNA by PCR using Zymo*Taq*™ or other DNA polymerases.



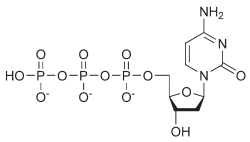
dGTP



dATP



dTTP



dCTP

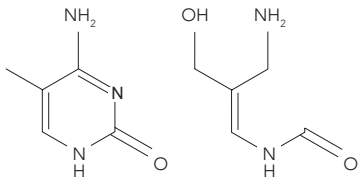
Methylated Nucleotides

Highlights:

- Ready to use and 5-Methylcytosine dNTP mix (dATP, dTTP, dGTP, d5mCTP) is of ultra-high purity; > 99% triphosphate by HPLC.
- Readily incorporated into PCR amplicons with Zymo*Taq*™, or other DNA polymerases.
- Free of endo-, exodeoxyribonuclease, ribonuclease, phosphatase and nicking activities.

Description:

Methylated nucleotides are of ultra-high purity and can be used to generate DNA by PCR using ZymoTaq™, or other DNA polymerases.



5-mC

Product	Cat. No.	Size	Uses
dNTP Mix (10 mM)	D1000 D1000-1	500 µl 100 µl	PCR mixes
dATP (100 mM)	D1005	250 µl	
dTTP (100 mM)	D1010	250 µl	
dGTP (100 mM)	D1015	250 µl	
dCTP (100 mM)	D1020	250 µl	
5-Methylcytosine dNTP Mix (10 mM)	D1030	250 µl	
5-Methyl dCTP (10 mM)	D1035	100 µl	

Transcriptomics

08

RNA-Seq is a powerful technique for transcriptomics research that enables scientists to understand living organisms in greater depth. The Zymo-Seq RiboFree® Total RNA Library Kit empowers researchers to perform whole transcriptome analysis of any organism thanks to its novel species-independent ribosomal RNA depletion strategy. In just four years, the RiboFree® technology has been cited over 100 times in studies of diverse organisms such as human, mouse, chicken, coral, evening primrose, insects, and bacteria. The applications range from the elucidation of fundamental mechanisms to the identification of infectious pathogens and the exploration of host-microbe interactions.

Zymo Research also offers the Zymo-Seq SwitchFree™ 3′ mRNA Library Kit, which simplifies mRNA expression analysis with integrated unique molecular identifiers (UMIs). These RNA-Seq library kits have been developed to make RNA analysis and transcriptomics research accessible and effective for researchers.

Quick Product Guide

Zymo Research offers two RNA-Seq kits for streamlined NGS-based RNA analysis. The kits are all-inclusive, with essential reagents such as unique dual-indexed (UDI) primers and cleanup beads.

Transcriptomics

Differential Gene Expression (DGE) Analysis Focusing on Protein-Coding Genes

Zymo-Seq SwitchFree™ 3′ mRNA Library Kit

Whole Transcriptome Profiling, Coding & Non-Coding Transcript Detection

Zymo-Seq RiboFree® Total RNA Library Kit

www.zymoresearch.com | info@zymoresearch.com | tel: 1-(949) 679-1190 | toll-free: 1-(888) 882-9682 | fax: 1-(949) 266-9452

Zymo-Seq RiboFree® Total RNA Library Kit

Highlights:

- **Universal Depletion:** Novel probe-free technology depletes rRNA from any organism.
- **Simplest Library Prep:** Simultaneous ligation of both adapters reduces hands-on processing.
- **Automation Friendly:** Streamlined protocol for increased scalability.

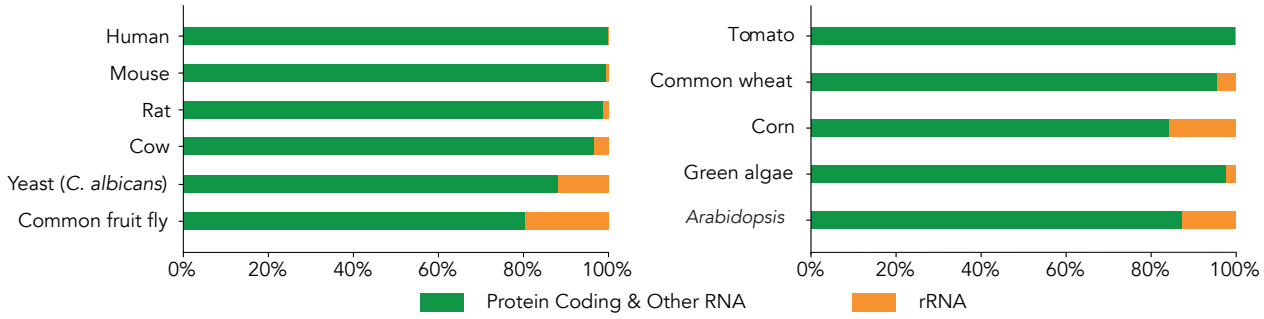
Description:

Ribosomal RNAs (rRNA) can comprise as much as 90% of total RNA and thus present an obstacle to achieving informative and accurate whole transcriptome profiling. The Zymo-Seq RiboFree® Total RNA Library Kit utilizes an innovative probe-free rRNA depletion strategy to enable whole transcriptome analysis for any organism. This simple total RNA library kit delivers the only universal rRNA depletion and high consistency in gene expression profiling. It's truly One for All.

"We have been using this kit for RNA-Seq libraries for all of our recent projects. It is reliable, easy to use, and much more cost-effective than some of the other big-name products out there. We have gotten excellent results after QC and have published our work..."

- Dr. Yvonne Drechsler, Western University of Health Sciences

One for All. Universal rRNA Depletion for Any Organism.



Zymo-Seq RiboFree® Total RNA Library Kit produces dense coverage of protein-coding and other transcripts, with rRNA efficiently depleted across different organisms. Classification of the STAR-aligned reads was based on Ensembl annotations and RepeatMasker rRNA tracks from UCSC genome browser when applicable.

In just 5 years, RiboFree® technology has been cited in 150+ articles, including top journals.

Product	Cat. No.	Size	Specifications
Zymo-Seq RiboFree® Total RNA Library Kit	R3000 R3003	12 preps 96 preps	Sample Source: 10 ng – 250 ng of total RNA from any organism. Processing Time: ~ 85 minutes of hands-on, ~ 4 hours total FFPE-Compatible with only minimal modifications to the standard protocol.

The rRNA depletion module is also sold independently as the Zymo-Seq RiboFree® Universal cDNA Kit.

Tech Tip

Evaluating Quality of Input RNA for NGS Library Preparation

The integrity and purity of the input RNA are critical for preparing high-quality RNA-Seq libraries and obtaining reliable sequencing data. Therefore, performing quality control on the input RNA is a good practice before library prep.

Preserve RNA Integrity During Extraction

Degraded RNA can bias measurements of gene expression, provide uneven gene coverage, and prevent differentiation between alternatively spliced transcripts.[1] Thus, use high-integrity RNA as input whenever possible.

- Extract RNA from samples immediately upon collection to reduce cellular RNase activity when possible. For temporary sample storage, use a stabilization solution such as DNA/RNA Shield™ or TRIzol® to deactivate RNase activities.
- Use sterile filter tips during the entire workflow to minimize RNase and cross-sample contamination.
- Keep purified RNA on ice while in use and store at -80°C in aliquots to reduce freeze-thaw cycles.
- Treat RNA samples with DNase I to eliminate contaminating DNA and reduce bias in subsequent data analysis.

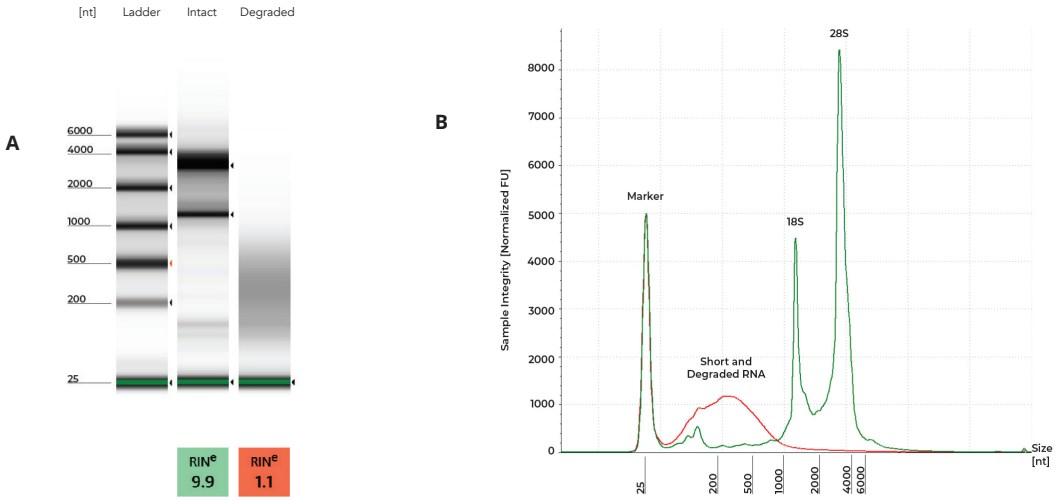


Figure 1. A) High-Quality RNA vs. Degraded RNA Gel Image. B) High-Quality RNA vs. Degraded RNA Electropherogram. High-quality and intact RNA is indicated by the presence of two slow-moving bands (Green). In contrast, degraded RNA is indicated by an accumulation of short, fast-moving fragments (Red). RNA characterized on an RNA ScreenTape with 4150 TapeStation® System.

Evaluating Quality of Input RNA for NGS Library Preparation

Assess the Quality of Input RNA for Reliable NGS Library Preparation

Perform Quality Control on the RNA Input:

- Characterize the integrity of the RNA by obtaining fragment sizes and RNA Integrity Number (RIN) with a preferred method such as Agilent's TapeStation® (Figure 1).
    - High-quality RNA will have two prominent, slow-migrating bands representing the rRNA fragments (e.g., 18S and 28S for HeLa Cells). Smearing/smaller fragments indicate RNA degradation (Figure 1B).
    - Alternatively, traditional gel electrophoresis can also provide the size distribution information in a similar manner (image similiar to Figure 1A).
- Evaluate the purity of the input RNA using a UV-Vis spectrophotometer such as a NanoDrop™ to ensure the RNA is free from contaminating phenol and chaotropic salts. For pure RNA, the ideal A260/A280 ratio is around 2.0, and ideal A260/A230 around 2.0-2.2.[2]
- Free nucleotides and contaminants may bias the quantification of the RNA sample when using Nano Drop™.[3,4] Thus, consider using a more specific method such as Qubit® fluorometers, which use dyes specific for DNA and RNA, respectively.

References:

[1] Kukurba, K. R.; Montgomery, S. B. RNA Sequencing and Analysis. Cold Spring Harb Protoc 2015, 2015 (11), 951-969. DOI: 10.1101/pdb. top084970.

[2] Wilfinger, W. W.; et al. Effect of pH and ionic strength on the spectrophotometric assessment of nucleic acid purity. Biotechniques 1997, 22 (3), 474-476, 478-481. DOI: 10.2144/97223st01.

[3] Unger, C.; et al. Detection of phenol contamination in RNA samples and its impact on qRT-PCR results. Anal Biochem 2019, 571, 49-52. DOI: 10.1016/j.ab.2019.02.002.

[4] Shen, C.-H. Detection and Analysis of Nucleic Acids. In Diagnostic Molecular Biology, Chang-Hui, S. Ed.; Academic Press, 2019; pp 167-185.

Zymo-Seq SwitchFree™ 3′ mRNA Library Kit

Highlights:

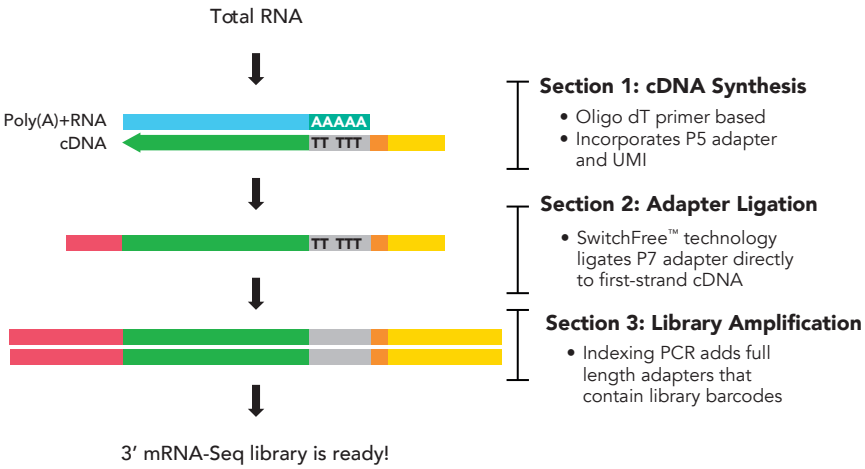
- **Simplest Protocol:** RNA to library in less time with easy handling driven by the SwitchFree™ technology.
- **High Performance:** Built-in Unique Molecular Identifiers (UMIs) allow for accurate deduplication maximizing unique reads.
- **Low Input Compatible:** Utilize as little as 10 ng total RNA without prior mRNA enrichment.

Description:

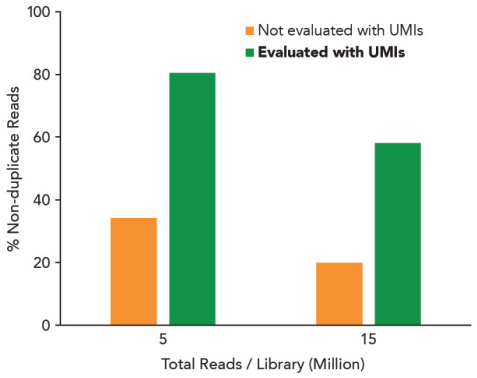
Zymo-Seq SwitchFree™ 3′ mRNA Library Kit features built-in unique molecular identifiers (UMIs), allowing accurate evaluation of duplication rate and maximizing unique reads. The kit's novel SwitchFree™ technology ligates P7 adapter directly to the first-strand cDNA without "switching" to a different strand, leading to easy and fast library preparation. With enriched coverage at the 3′ end of the poly(A)+ transcripts, this kit provides a great tool for simple and efficient mRNA expression analysis.

"The primary strength of this kit was the simplicity of the workflow - by far, this is the easiest protocol I have encountered for RNA-seq library prep."
- James T., Miami University

Simple and Streamlined Workflow



Accurate Duplicate Evaluation



Accurate evaluation of duplicate rate obtained with the built-in UMIs mRNA. Zymo-Seq SwitchFree™ 3′ mRNA libraries were prepared with 100 ng of Universal Human Reference RNA (UHRR) (RIN > 8). UMI-tools and MarkDuplicates (Picard) were used to evaluate duplicate rates with and without UMIs, respectively.

Product	Cat. No.	Size	Specifications
Zymo-Seq SwitchFree™ 3′ mRNA Library Kit	R3008 R3009	12 preps 96 preps	Sample Source: 10 ng – 500 ng of total RNA without the need for mRNA enrichment. Processing Time: ~ 80 minutes of hands-on, ~ 4 hours total. Both UMIs and UDIs included.

Tech Tip

Choosing Between Total RNA-Seq and 3′ mRNA-Seq

Selecting the appropriate RNA-Seq method is crucial, as it directly impacts the data that researchers acquire. Herein, we describe the features of two common RNA-Seq methods, total RNA-Seq and 3′ mRNA-Seq, to assist in selecting the RNA-Seq method that can better fulfill your research needs.

Total RNA-Seq usually involves depletion of rRNA and uses random primers to produce cDNA from both coding and a variety of non-coding RNAs. The generated cDNAs cover the transcripts quite evenly, without obvious bias towards either 5′ or 3′ ends. (Figure 1A). In contrast, 3′ mRNA-Seq typically uses oligo-dT primers to target mRNA via its poly-A tail directly. Paired with other steps in the workflow, the produced cDNA is biased towards the 3′ end of transcripts (Figure 1B).

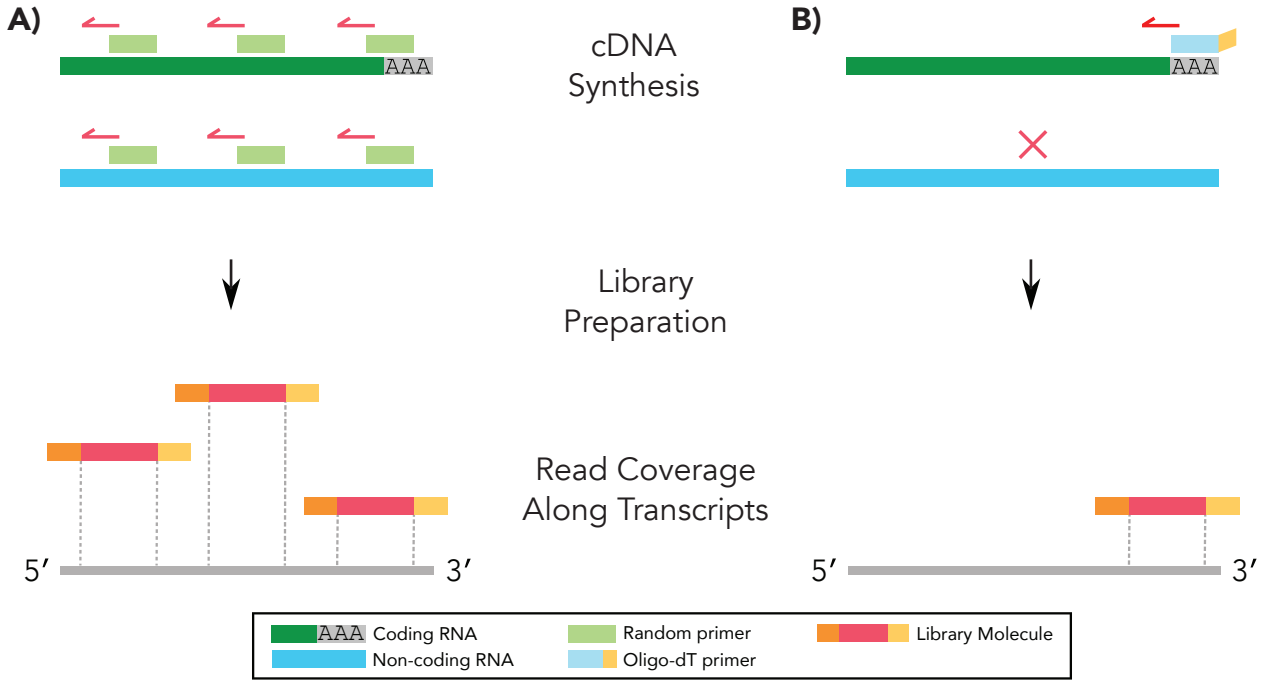


Figure 1. A) Essential concepts in total RNA-Seq library preparation. B) Essential concepts in 3′ mRNA-Seq library preparation.

As a result, these two methods profile different ranges of RNA types and cover different regions across the transcripts, making them ideal for different applications.

- Total RNA-Seq quantifies both coding and non-coding transcripts and provides information across the entire length of the transcripts. This broad coverage makes it versatile and useful to examine whole transcriptome level changes and interactions, splicing patterns, exon/intron boundaries, and RNA regulation.[1]
- 3′ mRNA-Seq delivers a narrower scope of information by focusing on protein-coding genes. It is mainly useful for the most common RNA-Seq application, differential gene expression (DGE) analysis, and quantifies gene expression changes between different biological conditions.[2]

Choosing Between Total RNA-Seq and 3′ mRNA-Seq

Additionally, total RNA-Seq and 3′ mRNA-Seq have distinct library prep principles determining the tolerance for degraded RNA input. RNA extracted from FFPE tissues may not have intact poly-A tails, which can affect 3′ mRNA-Seq's ability to capture the transcripts. The minimum sequencing depth requirement also varies between the two methods. Research suggests that total RNA-Seq requires ~ 3X more reads per library than mRNA-Seq to achieve the same transcriptome coverage.[3] The optimal sequencing depth depends on various factors such as sample species, input quality, experimental goals, and budget. It is advisable to consult the literature and your sequencing provider for suggestions on sequencing depth.

Taken together, when choosing between total RNA-Seq and 3′ mRNA-Seq, it is important to consider the specific research goal. Each covers different RNA types and transcript regions, thus making them suitable for different applications. Additionally, the input RNA's integrity and the resources available also have a significant role to play in selecting the appropriate RNA-Seq method for a well-designed project.

	Total RNA-Seq	*3′ mRNA-Seq*
RNA Type of Interest	• Coding RNA • Non-coding RNA	• Coding RNA
Transcript Coverage	• Even coverage accross 5′ to 3′ ends	• Biased towards 3′ end
Suggested Applications	• Whole transcriptome analysis • Isoform indentification/Alternative splicing • Exon/Intron boundaries	• Differential gene expression (DGE) analysis focusing on protein coding genes
Recommended Zymo-Seq Library Kit	Zymo-Seq RiboFree® Total RNA Library Kit	Zymo-Seq SwitchFree 3′ mRNA Library Kit

Table 1. A summary of selected aspects for methods of total RNA-Seq and 3′ mRNA-Seq.

References:

[1]. Hrdlickova, R.; et al. RNA-Seq methods for transcriptome analysis. Wiley Interdiscip Rev RNA 2017, 8 (1). DOI: 10.1002/wrna.1364.
[2]. McDermaid, A.; et al. Interpretation of differential gene expression results of RNA-seq data: review and integration. Brief Bioinform 2019, 20 (6), 2044-2054. DOI: 10.1093/bib/bby067.
[3]. Zhao, W.; et al. Comparison of RNA-Seq by poly (A) capture, ribosomal RNA depletion, and DNA microarray for expression profiling. BMC Genomics 2014, 15 (1), 419. DOI: 10.1186/1471-2164-15-419.

Complete Your Workflow

Sample Collection

Prevent RNA Degradation

DNA/RNA Shield [Cat. No. R1100-50]

NGS-Grade RNA Extraction

RNA Isolation from Any Sample Type

- *Quick*-RNA Miniprep Plus [Cat. No. R1057]
- Direct-zol RNA Miniprep Plus [Cat. No. R2071]

RNA-Seq Library Prep Kit

- Featuring Universal rRNA Depletion for Any Organism

  Zymo-Seq RiboFree® Total RNA Library Kit [Cat No. R3000]

- All-inclusive Library Preparation for Transcriptomic Analysis

  Zymo-Seq SwitchFree™ 3′ mRNA Library Kit [Cat No. R3008]

Stranded Libraries Ready for Sequencing

In Vitro Diagnostics

09

At Zymo Research, our ultimate vision is to continue to innovate and provide a positive impact in the biomedical field and on the quality of life of patients and their families. Specimen collection/preservation can significantly influence downstream analysis procedures, and ultimately on the quality of diagnostic results. We offer top quality collection and stabilization solutions for any type of clinical specimens (including respiratory fluids, blood, serum, stool, urine, and more). Zymo Research's extraction technologies are optimized to extract the highest quality DNA and RNA from collected specimens. Zymo Research's extraction systems are compatible with the majority of high-throughput liquid handling and bead moving platforms, making Zymo Research's technologies a leading choice for clinical analyses including pathogen identification to early cancer detection.

IVD Sample Collection Devices

Highlights:

- Store the sample at ambient temperature for up to 7 days.
- No cold-chain required for shipping.
- Collection devices for upper and lower respiratory tract specimens.

CE-IVD Marked

Product	Cat No.	Size	Additional Information
DNA/RNA Shield™ (Bulk Reagent)	R1100-50-E R1100-250-E R1200-25-E R1200-125-E	50 ml 250 ml 25 ml 125 ml	Online Online Online Online
DNA/RNA Shield™ Collection Tube	R1102-E	50 pack	PG 34
DNA/RNA Shield™ Lysis & Collection Tubes	R1103-E R1104-E R1105-E	50 pack 50 pack 50 pack	PG 34 PG 34 PG 34
DNA/RNA Shield™ - Fecal Collection Tube - DX	R1101-E	10 pack	PG 30
DNA/RNA Shield™ - Fecal Collection Tube (with beads) - DX	R1137-E	10 pack	PG 30
DNA/RNA Shield™ Collection Tube w/ Swab - DX	R1107-E R1109-E	50 pack 50 pack	PG 31 PG 31
DNA/RNA Shield™ SafeCollect™ Saliva Collection Kit	R1160-E R1161-E	1 Kit 1 Kit	PG 32 PG 32
DNA/RNA Shield™ SafeCollect™ Swab Collection Kit	R1211-E	1 Kit	PG 32
DNA/RNA Shield™ DirectDetect™ - DX	R1400-E	Bulk	PG 38
DNA/RNA Shield™ DirectDetect™ Swab Collection Tube	R1401-1-E	1 Kit	PG 35

Nucleic Acid Extraction for *In Vitro* Diagnostics Use

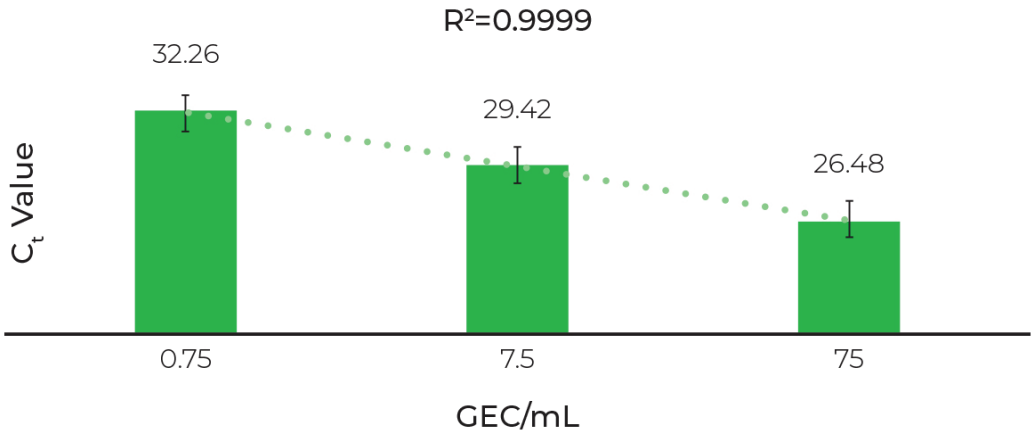
Highlights:

- Nucleic acid extraction from clinical samples including swabs, biological liquids (e.g., plasma, serum, urine, blood, saliva, etc), and collection matrices.
- High-quality DNA/RNA ready for Next-Gen sequencing, RT/qPCR, hybridization, etc.
- High-throughput formats available for high-volume clinical needs.

Description:

Zymo Research provides CE-marked nucleic acid extraction kits that enable high sensitivity target detection (e.g., virus) through downstream Next-Gen Sequencing, (RT)-qPCR, etc. High-throughput formats validated on automated platforms are available for rapid processing of high volume of samples. The *Quick*-RNA™ Viral Kit, *Quick*-RNA™ Viral 96 Kit, *Quick*-DNA/RNA™ Viral MagBead Kit, and *Quick*-DNA/RNA™ HT - Dx are in compliance for *In vitro* diagnostics use according to Regulation (EU) 2017/746 on *In Vitro* Diagnostic Medical Devices (IVDR).

Linear Extraction and Sensitive Detection of SARS-CoV2



RT-qPCR analysis of viral RNA with primers targeting 2019 nCOV_N3 (CV-3). Swabs samples collected in DNA/RNA Shield™ were spiked with non-infectious in vitro SARS-CoV-2 synthetic RNA and extracted with the *Quick*-DNA/RNA™ Viral MagBead kit using an automated liquid handler platform (Tecan Fluent® 1080).

Product	Cat No.	Size	Additional Information
Quick-RNA™ Viral Kit (for viral RNA from plasma/serum, swab, feces)	R1034-E R1035-E	50 preps (Spin- Column) 200 preps (Spin- Column)	PG 115 PG 115
Quick-RNA™ Viral 96 Kit (for viral RNA from plasma/serum, swab, feces)	R1040-E R1041-E	2 x 96 preps (96-Well Plate) 4 x 96 preps (96-Well Plate)	PG 115 PG 115
Quick-DNA/RNA™ Viral MagBead Kit (for viral DNA/RNA from plasma/serum, swab, feces)	R2140-E R2141-E	250 preps (Magnetic Bead) 1000 preps (Magnetic Bead)	PG 115 PG 115
Quick-DNA/RNA™ HT - Dx (All clinical samples)	R2150-E R2151-E	250 preps (Magnetic Beadd) 1000 preps (Magnetic Bead)	PG 133 PG 133

DNA Extraction for Microbiome and Metagenome Analyses

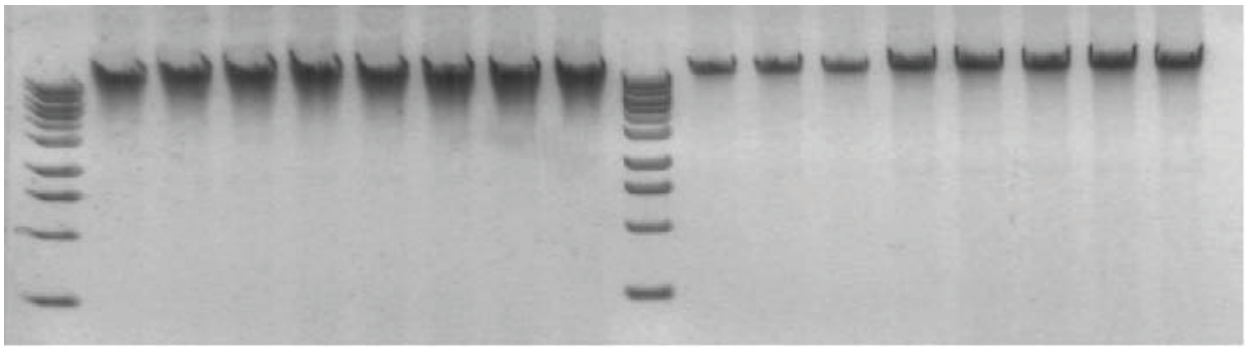
Highlights:

- **Validated Unbiased for Microbiome Measurements:** Unbiased cellular lysis validated using the ZymoBIOMICS® Microbial Community Standard.
- **Inhibitor-Free DNA from Any Sample:** Isolate ultra-pure DNA ready for any downstream application.
- **Certified Low Bioburden:** Boost your detection limit for low abundance microbes.
- **Simple Workflow:** Simply bead-beat sample, purify via spin-plate, and filter to remove PCR inhibitors. No precipitation or lengthy incubations.

Description:

The ZymoBIOMICS® 96 MagBead DNA Kit - Dx is designed for purifying DNA from a wide array of sample inputs (e.g. feces, soil, water, biofilms, etc.), that is immediately ready for microbiome or metagenome analyses. The ZymoBIOMICS® innovative lysis system eliminates bias associated with unequal lysis efficiencies of different organisms (e.g. Gram-negative/positive bacteria including endospores, fungi, protozoans, algae, etc.) making it ideal for microbial community profiling. Unbiased mechanical lysis of tough microbes is achieved by bead beating with the innovative ultra-high density BashingBeads™ and validated using the ZymoBIOMICS® Microbial Community Standard.

ZymoBIOMICS® Technology Results in Higher Yield Microbial DNA



The ZymoBIOMICS® 96 MagBead DNA Kit provides superior yields when compared to Suppliers M, P, and Q. 80 mg of feces was processed using each kit according to the manufactures' recommended protocol. DNA was eluted using 100 µl ZymoBIOMICS® DNase/RNase Free Water. 6 µl of each sample was analyzed in a 1.0% (w/v) agarose/ethidium bromide gel. Samples were processed in triplicate. L is a 1Kb ladder.

Product	Cat No.	Size	Additional Information
ZymoBIOMICS® 96 MagBead DNA Kit - Dx - Lysis Rack	D4302-E	2 x 96 preps	PG 171
ZymoBIOMICS® 96 MagBead DNA Kit - Dx - No Lysis Matrix	D4306-E	2 x 96 preps	PG 171
ZymoBIOMICS® 96 MagBead DNA Kit - Dx - Lysis Tubes	D4308-E	2 x 96 preps	PG 171

Reliable Bisulfite Conversion for Next-Gen Sequencing

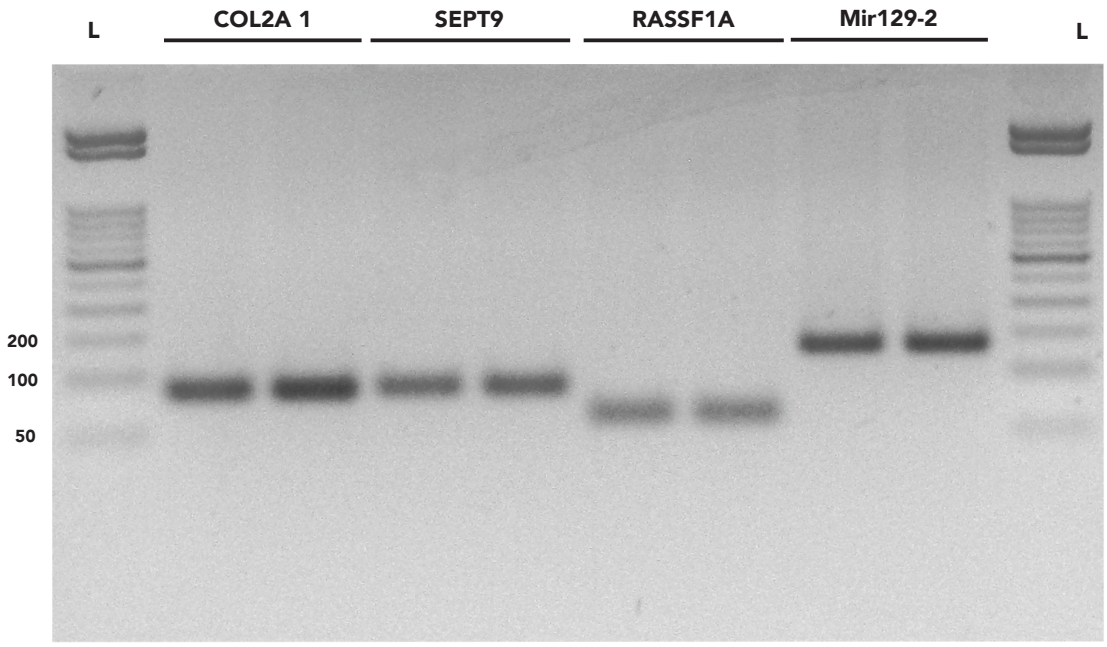
Highlights:

- Ready-to-use conversion reagent is added directly to DNA.
- High-yield, converted DNA is ideal for PCR, MSP, array, bisulfite and Next-Gen Sequencing.

Description:

Chemical treatment of DNA with bisulfite is the prerequisite for many methylation-based diagnostic assays. Clinical diagnostic and screening tests, particularly those for cancer and developmental diseases, are now utilizing methylation profiling of DNA to detect the presence of disease and guide treatment.

PCR-Ready, Bisulfite-Treated DNA from FFPE



DNA isolated from a non-small-cell lung cancer (NSCLC) FFPE block was bisulfite converted using the EZ DNA Methylation-Lightning™ Kit, then PCR amplified with methylation-specific primers for cancer biomarkers SEPT9, RASSF1A, Mir129-2, and control primer COL2A1. L=50bp marker.

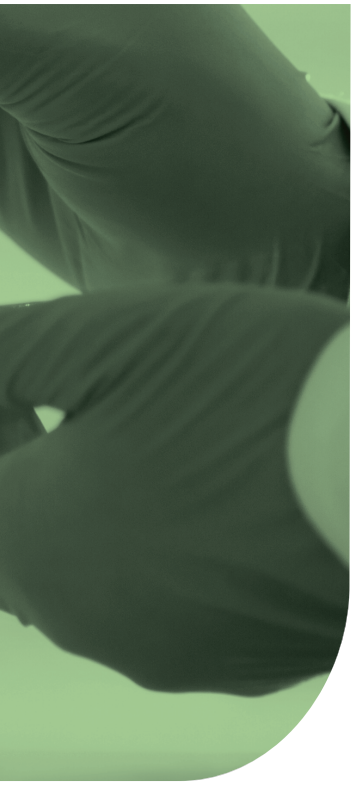
Product	Cat No.	Size	Additional Information
EZ DNA Methylation-Lightning™ Kit	D5030-E D5031-E	50 rxns 200 rxns	PG 192 PG 192
EZ-96 DNA Methylation-Lightning™ MagPrep Kit	D5046-E D5047-E	4 x 96 preps 8 x 96 preps	PG 192 PG 192

Popular Applications

10

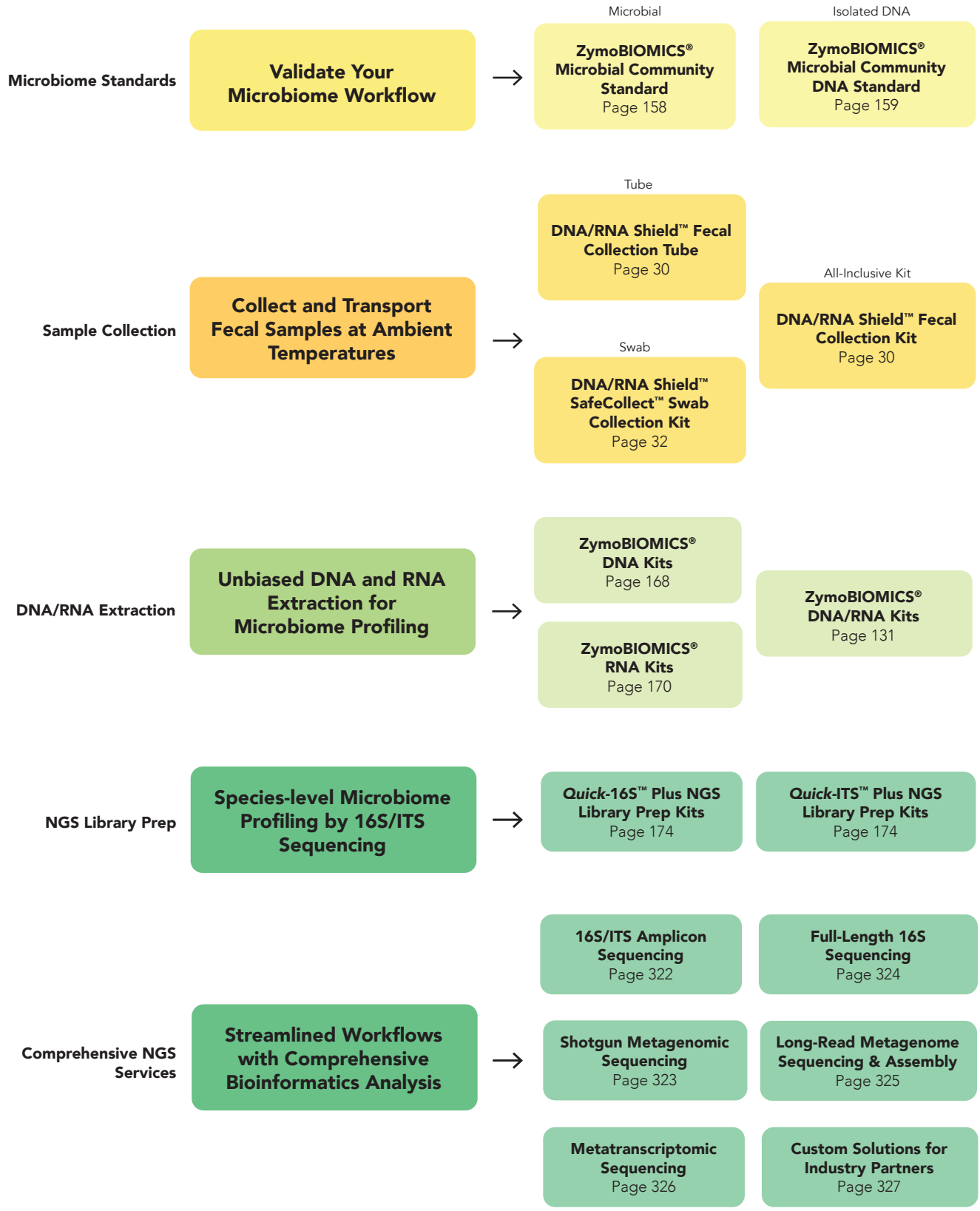
The scientists at Zymo Research have developed a range of products and workflows designed to support a wide variety of research applications with robustness and reliability. This section highlights our suggestions for some of the most commonly used applications in epigenetics, microbiomics, and DNA/RNA research, each optimized for superior results.

Our curated product recommendations ensure efficiency and effectiveness in your studies. If you don't find a kit that fits your specific needs, our technical support team is always available to help you find the perfect solution.



Workflows for Popular Applications

Microbiome Analysis of Feces



DNA Methylation Analysis

DNA Methylation Standards

Ensure Accurate and Seamless DNA Methylation Analysis →

Human Reference
Human Methylated & Non-methylated DNA
Page 206

Spike-in Control
Zymo-Seq Methyl Spike-in Control
Page 207

Spike-in Control
Methylated & Non-methylated pUC19 DNA Set
Page 208

DNA Purification Kits

Easily Extract High-Yields of Ultra-Pure DNA from Any Sample Type →

Cells, Tissues, & Blood
***Quick*-DNA™ Miniprep Plus Kit**
Page 61

Serum, Plasma
MAGicBead™ cfDNA Isolation Kit
Page 66

Cells, Tissues, & Blood
***Quick*-DNA™ FFPE Kit**
Page 63

Bisulfite Conversion

Achieve the Highest Bisulfite Conversion Efficiencies (>99.5%) →

Bisulfite Conversion
EZ DNA Methylation-Lightning™ Kits
Page 192

OR

Non-Bisulfite Conversion

Rapid Determination of DNA Methylation Status →

MSRE Based
OneStep PLUS qMethyl™ PCR Kit
Page 197

Antibody Methods
5-mC DNA ELISA Kit
Page 198

NGS Library Prep

Produce High Quality NGS Libraries from Even the Most Difficult Sample Types →

WGBS
Zymo-Seq Cell Free DNA WGBS Library Kit
Page 184

RRBS
Zymo-Seq RRBS™ Library Kit
Page 186

Comprehensive NGS Services

Streamlined Workflows with Comprehensive Bioinformatics Analysis →

Genome-Wide DNA Methylation Analysis
Page 313

Targeted Bisulfite Sequencing
Page 316

Gene Expression/Transcriptomics Analysis

Sample Collection

Prevent RNA Degradation →

DNA/RNA Shield™ Collection Devices
Page 22

DNA/RNA Shield™ Bulk Reagent
Page 38

RNA Purification

High Quality Total RNA for qPCR & NGS →

RNA from Any Sample
***Quick*-RNA™ Miniprep Plus Kit**
Page 113

RNA from Blood
***Quick*-RNA™ Whole Blood Kit**
Page 116

Robust cfRNA Isolation
***Quick*-cfRNA™ Serum & Plasma Kit**
Page 119

Samples in TRIzol
Direct-zol™ RNA Miniprep Kits
Page 109

RT-qPCR & Next-Gen Sequencing

Optimized and Easy-to-use RNA Analysis Kits →

RT-qPCR
ZymoScript™ One-Step RT-qPCR Kit
Online (Cat No. R3014)

cDNA Synthesis
ZymoScript™ RT PreMix Kit
Online (Cat No. R3012)

Total RNA-Seq
Zymo-Seq RiboFree® Total RNA Library Kit
Page 221

Liquid Biopsy Biomarker Discovery

DNA Methylation Standards

Ideal Positive and Negative Controls for Human-focused Methylation Detection Assays →

Human Reference
Human Methylated & Non-Methylated DNA Set
Page 206

DNA Purification

Simple and Rapid Isolation of Cell-free DNA from Serum & Plasma →

Column-based
***Quick*-cfDNA™ Serum & Plasma Kit**
Page 66

Magbead-based
MAGicBead™ cfDNA Isolation Kit
Page 66

DNA Methylation

Streamlined Bisulfite Conversion and Purification of DNA in 1.5 hours →

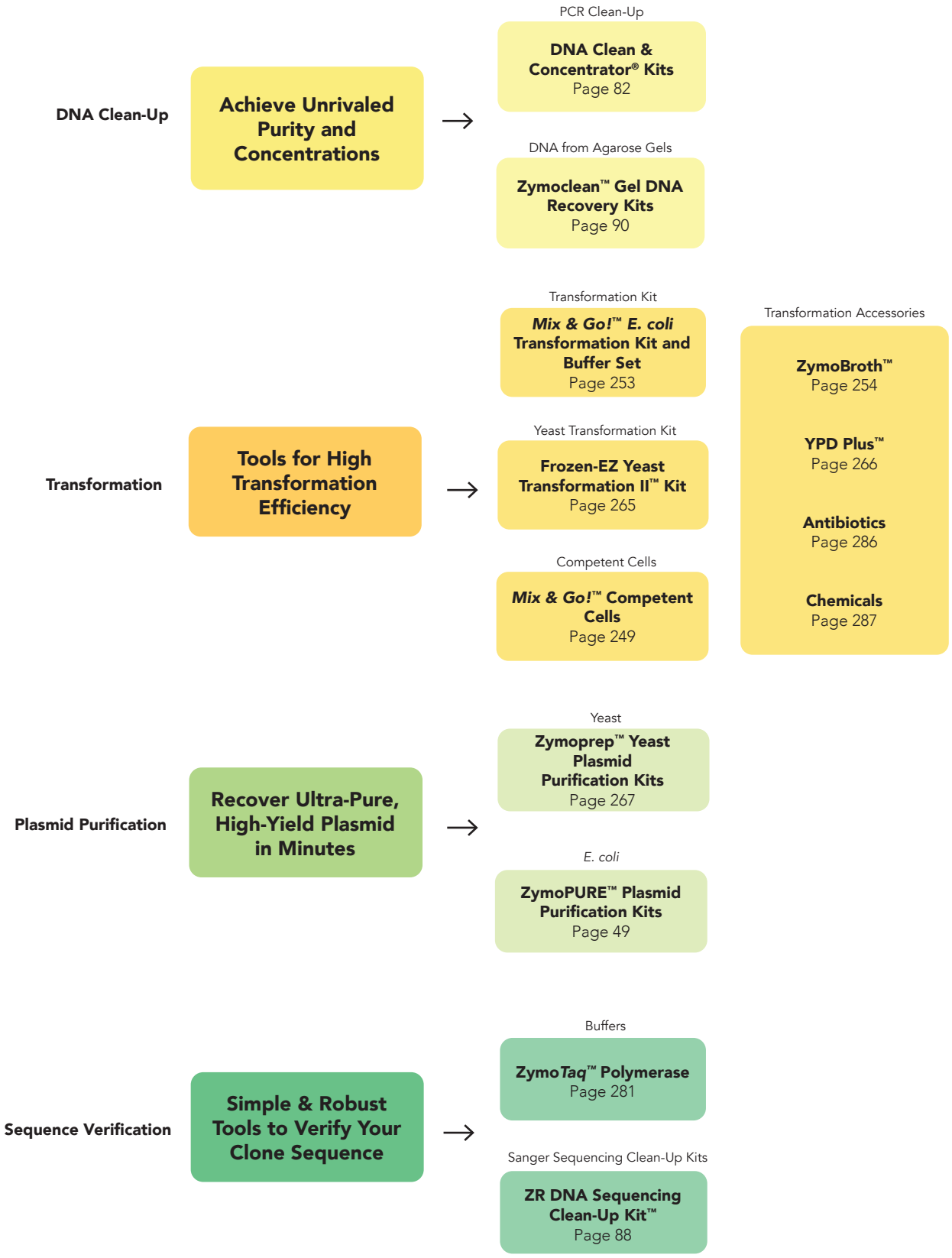
Bisulfite Conversion
EZ DNA Methylation-Lightning™ Kits
Page 192

Next-Gen Sequencing

Streamlined Workflows to Generate Ready-to-sequence Libraries →

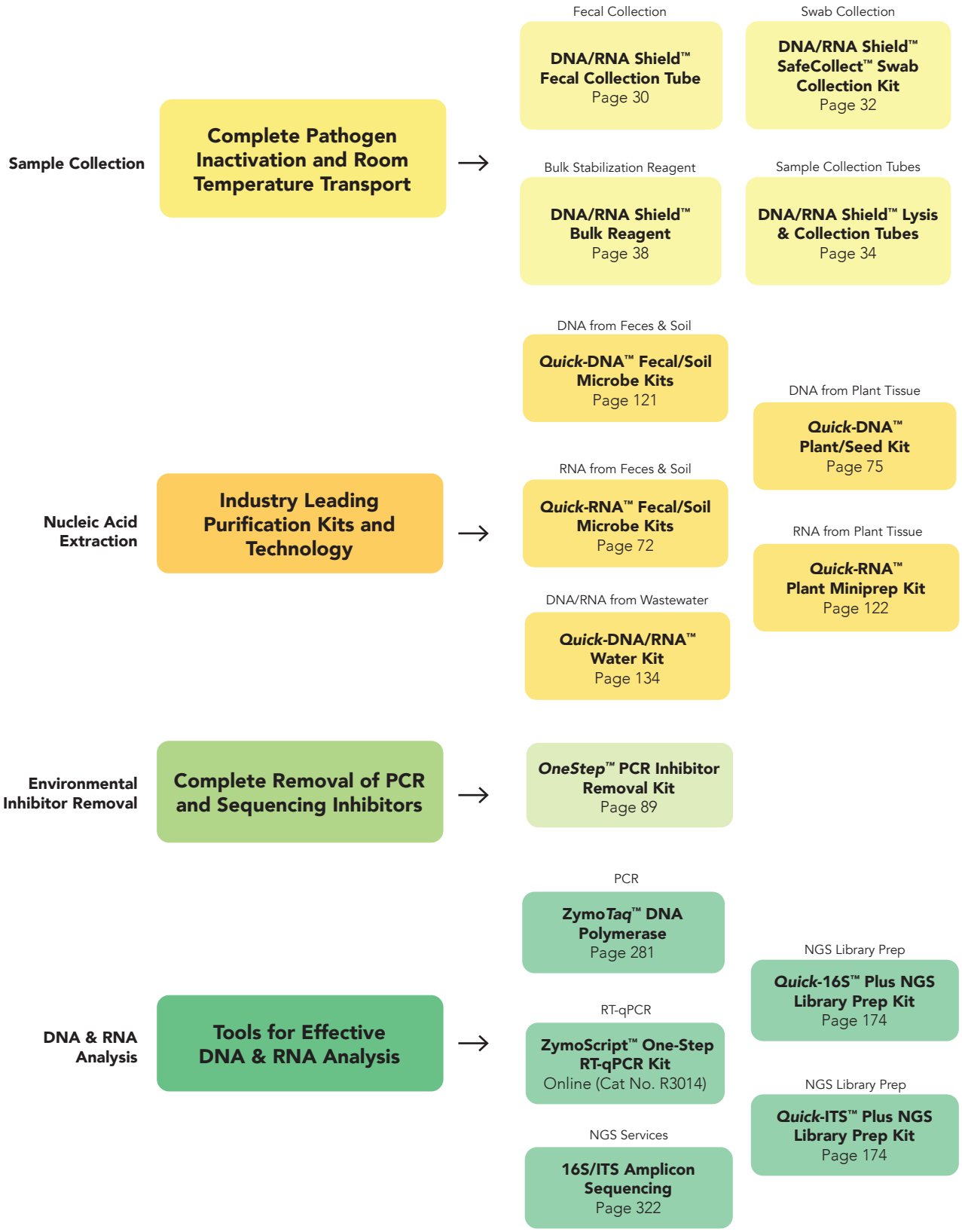
NGS Library Prep
Zymo-Seq Cell Free DNA WGBS Library Kit
Page 184

Molecular Cloning

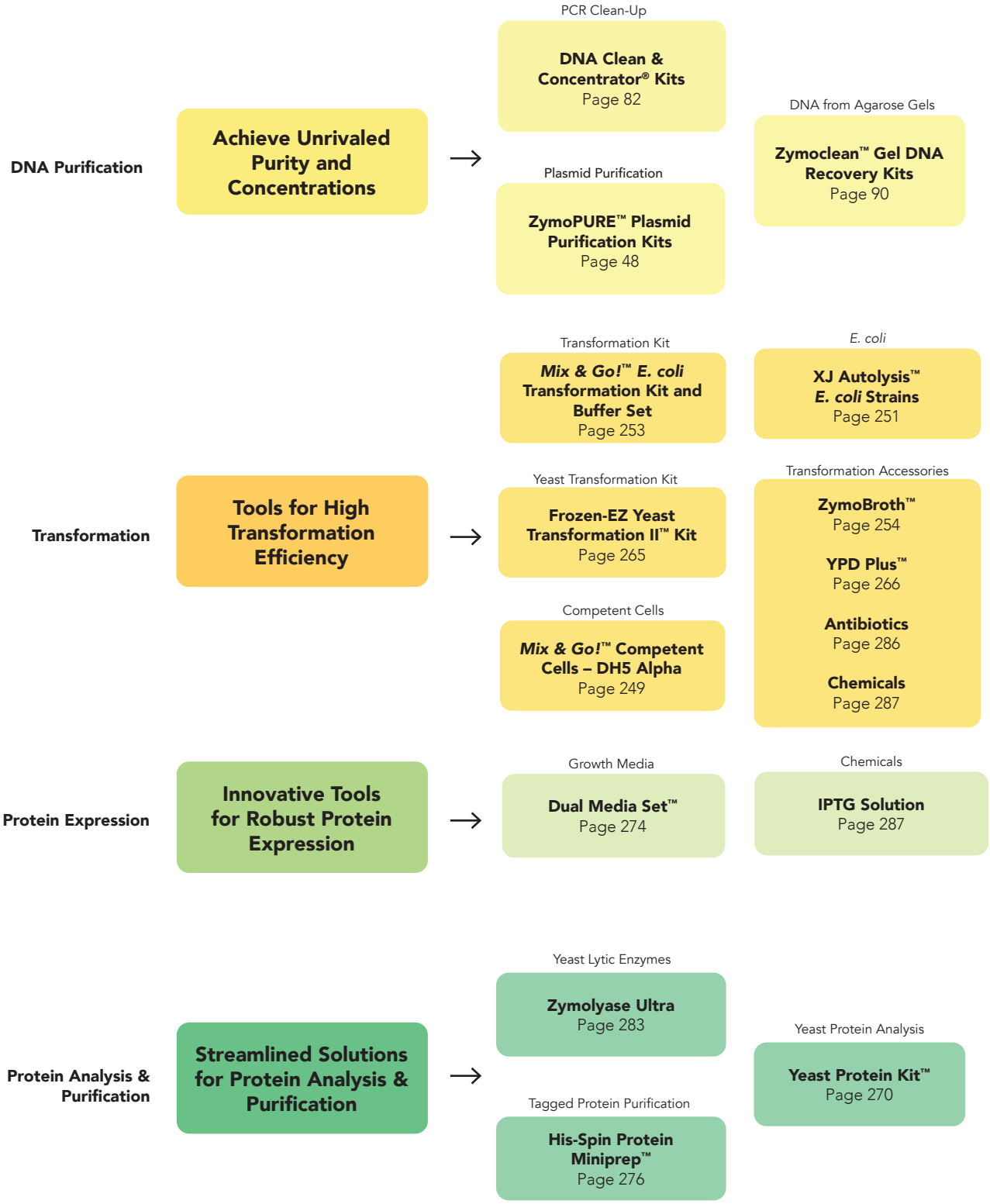


Environmental Testing

Feces, Wastewater, Plant, and Soil

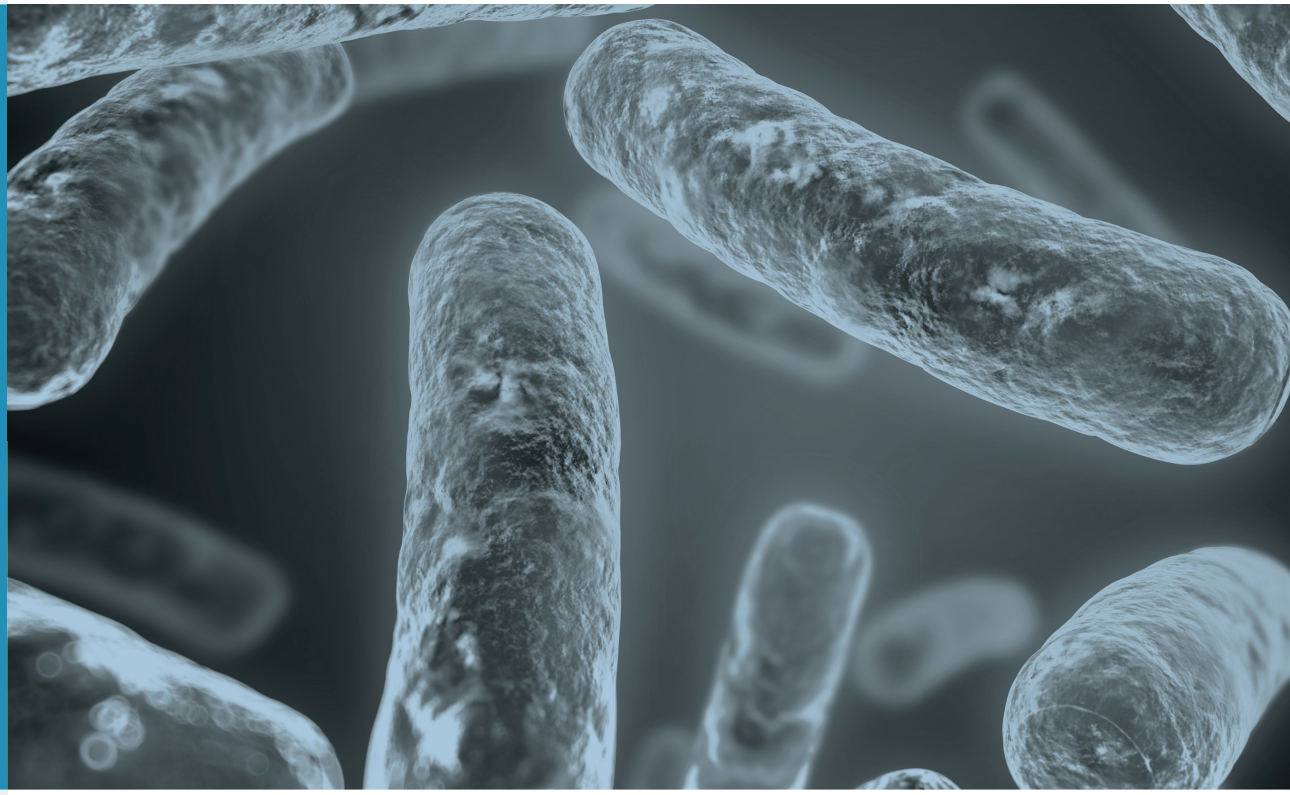


Protein Expression

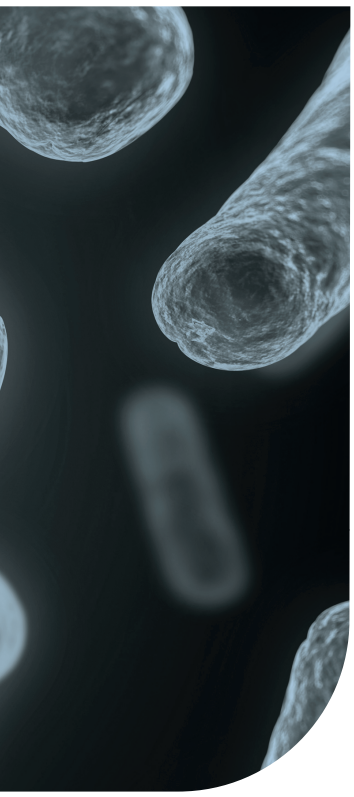


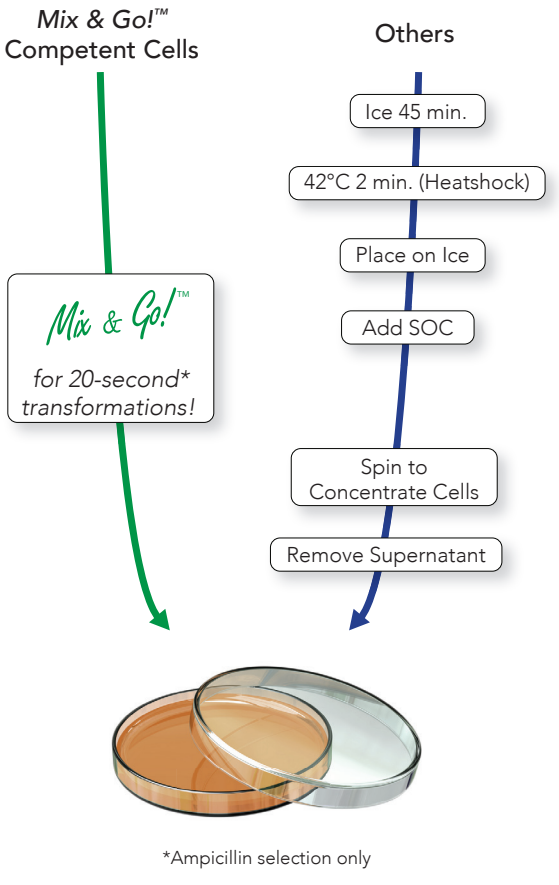
E. coli

11



Despite the remarkable diversity of research projects in labs throughout the world, most labs still have the need to transform *E. coli* for cloning or protein purification. With the needs of the researcher in mind, Zymo Research offers a range of premade chemically competent *E. coli* strains having transformation efficiencies up to 10^9 transformants per µg pUC19 DNA. Zymo Research's innovative *Mix & Go!™* transformation procedure streamlines the process, eliminating the need for long outgrowth times, heat shock, and electroporation. Using premade *Mix & Go!™* Competent Cells from Zymo Research, a scientist can transform *E. coli* in less than 20 seconds. Zymo Research also provides reagents that enable researchers to make their own homemade *Mix & Go!™ E. coli*. We have developed a specially formulated medium, ZymoBroth™, that when used to generate chemically competent cells, enhances the transformation efficiency of many K and B strains of *E. coli*. With the *Mix & Go!™* system, increase transformation efficiency and decrease transformation time!

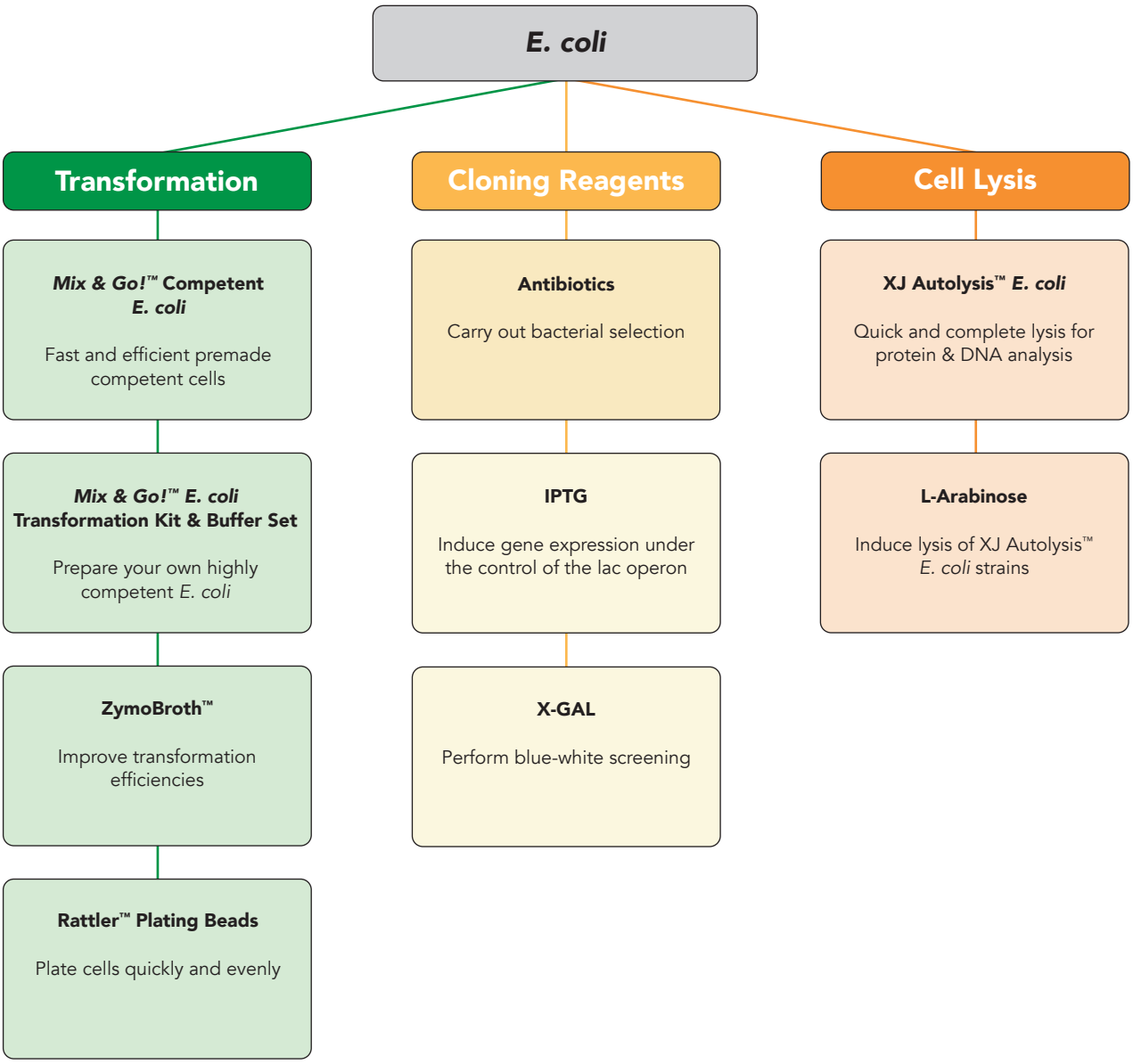




*Ampicillin selection only

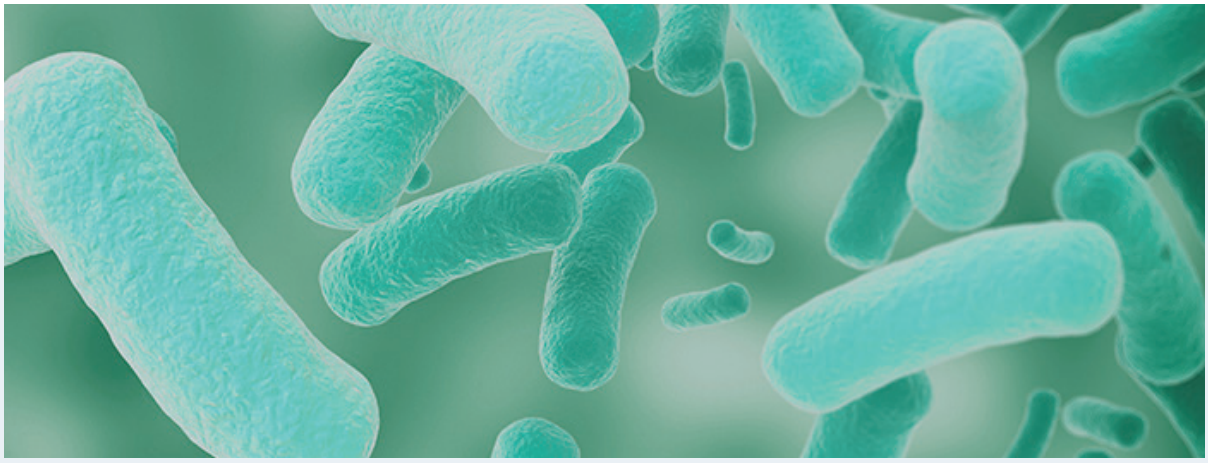
Simplifying the Molecular Biology Workflow

Zymo Research strives to give researchers the best foundation possible through its large selection of innovative *E. coli* products that provide fast, simple, and efficient solutions for cloning and protein expression. Zymo Research's unique *Mix & Go!™* competent *E. coli* streamline the plasmid transformation process by eliminating the traditional long outgrowth times without sacrificing transformation efficiency (up to 10^9 transformants per µg pUC19 DNA). Avoid heat shock and transform cells in less than 20 seconds with Zymo Research's highly efficient premade *Mix & Go!™* Competent Cells. Want to make your own *Mix & Go!™ E. coli* competent cells? Zymo Research offers a complete buffer set that enables researchers to make their own homemade competent cells from any strain of *E. coli* to meet their exact needs. When used with the *Mix & Go!™* system, ZymoBroth™ enhances the transformation efficiency of many K and B strains of *E. coli* while decreasing transformation time. No matter your needs, set the right foundation for your next discovery with Zymo Research.



A New Era in Bacterial Transformation

Say Goodbye to Heat Shock and Lengthy Outgrowth Procedures



Escherichia coli is the most extensively studied model organism in molecular biology. Its rapid growth rate, simple cellular structure, and well-characterized genetics render it the obvious choice for various applications, including cloning, protein expression, and gene function studies. Despite its widespread use in laboratories across the world, working with *E. coli* often involves lengthy and tedious protocols.

Decades ago, researchers spent several days preparing competent *E. coli* and conducting bacterial transformations, only to encounter insufficient transformation efficiency. The procedure's heat shock step posed a significant challenge, requiring a successfully compromised cell membrane for efficient transformation. Recognizing these limitations, the founder of Zymo Research grew frustrated with these slow and ineffective cloning methods and set out to find a better solution.

Guided by the principles of speed and simplicity, Zymo Research scientists embarked on a mission to create a new molecular cloning system. Their comprehensive understanding of the *E. coli* cell membrane paved the way for a scientific breakthrough. In the early 21st century, Zymo Research introduced a chemical shock system to replace the traditional heat shock step, resulting in the *Mix & Go!™ E. coli* Competent Cells and Transformation Kits.

The *Mix & Go!™* system successfully eliminated heat shock and outgrowth procedures, significantly reducing processing time. Bacterial transformation became simpler and faster than ever: scientists just had to add DNA and plate the *E. coli* cells. The chemical shock method ensured consistently high transformation efficiencies of 10^8-10^9 transformants/µg plasmid DNA, and as a result, *Mix & Go!™* emerged as a practical and efficient alternative, catering to both novice and experienced researchers alike.

Years later, Zymo Research's *Mix & Go!™ E. coli* transformation system remains a cornerstone for scientists. With thousands of citations spanning various applications, *Mix & Go!™* continues to empower scientists to navigate molecular biology research with confidence.

Tech Tip

Simplifying Strain Selection

Considerations for choosing the best *E. coli* strain for any application

They're everywhere: our bodies, our environments, and of course, our laboratories. *Escherichia coli* is the most well-known bacterial species and has become an irreplaceable tool in the molecular biology field. There are hundreds, if not thousands, of different *E. coli* strains used in scientific research, each with their own unique modifications. This can make choosing the correct strain for your research a daunting task. The guidelines below can simplify this process and help you choose the best strain for your application.

Laboratory *E. coli* strains used in molecular cloning can typically be classified as either expression strains or propagation strains. If you need to amplify and extract a particular plasmid or construct, it is best to use a propagation strain. On the other hand, if your goal is to express a protein encoded within a plasmid, an expression strain is the best choice. While there are many details involved in choosing a strain, the table below provides an overview of the most common laboratory strains and their key features.

Strain	Propagation or Expression?	Antibiotic Resistance	When to Use?
DH5α	Propagation	N/A	General Cloning and Blue/White Screening
JM109	Propagation	N/A	General Cloning and Blue/White Screening
HB101	Propagation	Streptomycin	Good for pBR322 Plasmids
Zymo 10B	Propagation	Streptomycin	General Cloning and Blue/White Screening
TG1	Propagation	N/A	General Cloning and Blue/White Screening
NEB Stable	Propagation	N/A	Good for Lentivirus Cloning Experiments
XL1 Blue	Propagation	Tetracycline	Blue/White Screening
XL10 Gold	Propagation	Tetracycline and Chloramphenicol	Large Plasmid Propagation
BL21 (DE3)	Expression	N/A	General Protein Expression
BL21 (DE3) pLysS	Expression	Chloramphenicol	Toxic Protein Expression
Lemo21 (DE3)	Expression	Chloramphenicol	Insoluble/Membrane Protein Expression
T7 Express	Expression	N/A	General Protein Expression
BLR (DE3)	Expression	Tetracycline	Unstable Protein Expression
XJa (DE3) Autolysis	Expression	Chloramphenicol	Recombinant Protein Expression
XJb (DE3) Autolysis	Expression	Chloramphenicol	Recombinant Protein Expression

www.zymoresearch.com | info@zymoresearch.com | tel: 1-(949) 679-1190 | toll-free: 1-(888) 882-9682 | fax: 1-(949) 266-9452

Tech Tip (continued)

Simplifying Strain Selection

It is important to have a defined research goal when choosing an *E. coli* strain. Are you aiming to clone highly repetitive or large plasmids? If so, use a specialized strain that can maintain high transformation efficiency. Are you aiming to express a toxic protein? If so, choose a strain that has been designed to withstand toxic environments.

Both propagation and expression strains carry specialized mutations that allow them to thrive under specific conditions and it is important to keep these features in mind when choosing the right strain for your project. *Mix & Go!*™ Competent Cells are a great choice for propagation, as they enable high transformation efficiencies in just 20 seconds. If you are in search of an expression strain, XJ Autolysis™ Competent Cells can simplify the process with an efficient, gentle lysis system. No matter the application, Zymo Research scientists are available to assist you with your strain selection process.

Tech Tip

What You Need to Know About Making Competent Cells

Learn about best practices for preparing chemically competent *E. coli*.

The success of routine techniques such as cloning, genome editing, or even protein production hinges upon the ability to introduce foreign DNA into host cells. One of the most common methods for achieving this is utilizing chemically competent *Escherichia coli*, which have been treated to increase their permeability to exogenous DNA. The following methodological tricks can be used to ensure that bacteria are "competent" for DNA uptake.

1. Prepare Reagents and Labware.
Making competent cells can be a long and tedious ordeal with several lengthy incubations. The process requires use of sterile growth media, glassware, and reagents, which should be prepared prior to starting the procedure.

2. Handle Cells Carefully.
Resuspend and handle cells gently throughout the procedure to prevent damage. Complete removal of wash solutions after centrifugation steps is also critical to ensure optimal transformation efficiencies.

3. Keep Them COLD!
E. coli cells are sensitive and fragile while they are being made competent. Keeping the temperature low helps prevent cell death during processing. We recommend using a cold room if possible, performing the centrifugations at 0-4°C, and using pre-cooled microcentrifuge tubes and racks. Keep microcentrifuge tubes and racks on dry ice before use to ensure they are at the optimal temperature. This allows the cells to freeze faster, which is especially important when aliquoting.

Keeping the cells cold is also imperative during the culturing process. Lower temperature growth conditions (18-33°C) increase transformation efficiencies. We recommend using ZymoBroth™ media, which is specially formulated to promote efficient growth even at lower temperatures.

4. Prepare Freezer Space.
Competent cells need to be stored at -80°C immediately to ensure competency. Flash-freezing in liquid nitrogen and then storing at -80°C can help maintain cell competency for an extended period.

Cells are fragile and prone to rupturing after being made competent. Storing at higher temperatures can dramatically reduce the transformation efficiency. For example, after just 24 hours of storage at -20°C, cells can lose up to 90% of the transformation efficiency.

An alternative option to making competent cells is using commercially available strains. This saves time and ensures optimal transformation efficiency, since premade strains have already been validated. *Mix & Go!*™ Competent Cells have high transformation efficiencies of up to 10^9 transformants per µg of plasmid DNA and bypass the conventional heat shock procedure to perform transformations in 20 seconds.
Competent cells are an important tool for molecular biology research and their preparation is crucial for successful transformations. Whether you choose to purchase or make competent cells, the technical support team at Zymo Research is available to help you through the process.

Mix & Go!™ Competent Cells

Highlights:

- **Simple 20-Second Transformation:** No heat shock! Just add DNA and spread on plate.
- **High Transformation Efficiencies:** Achieve up to 10^9 per µg of plasmid DNA.
- **Versatile:** Excellent for general cloning, blue-white screening, and plasmid isolation.

Description:

The *Mix & Go!*™ Competent Cells are premade, chemically competent cells for simple and highly efficient DNA transformation. *Mix & Go!*™ Competent Cells are made chemically competent by a method that completely eliminates the need for heat shocking and related procedures. For transformation, simply mix DNA with cells and then spread onto solid medium – *Mix & Go!*™ The premade *Mix & Go!*™ Competent Cells are highly efficient (up to 10^9 transformants per µg pUC19 DNA) and can be used for cloning, sub-cloning, PCR fragment cloning, library construction, etc. *Mix & Go!*™ Competent Cells are supplied as a pack of 10 convenient 100 µl/tube single-use aliquots or in a 96-tube format with removable 8-tube strips for your high-throughput transformation needs.

DH5 Alpha		Cat. No.	Size
Genotype	F-ϕ80lacZΔM15 Δ(lacZYA-argF)U169 deoR nupG recA1 endA1 hsdR17 (rK- mK+) phoA glnV44 (supE44) thi-1 gyrA96 relA1, λ-	T3007 SK	10 x 100 µl aliquots (10 tubes)
		T3009	96 x 50 µl aliquots (12 x 8-tube strips)
		T3010	96 x 50 µl aliquots (96-well plate)

SK - Sample Kit Available

Zymo 10B		Cat. No.	Size
Genotype	F- mcrA Δ(mrr-hsdRMS-mcrBC) Φ80lacZΔM15 ΔlacX74 recA1 endA1 araD139 Δ(ara leu) 7697 galU galK rpsL nupG λ-	T3019	10 x 100 µl aliquots (10 tubes)
		T3020	96 x 50 µl aliquots (12 x 8-tube strips)

JM109		Cat. No.	Size
Genotype	F`[traD36 proA+B+ lacIq Δ(lacZ)M15] Δ(lac-proAB) glnV44 (supE44) e14- (McrA-) thi gyrA96 (NalR) endA1 hsdR17(rk- mk+) relA1 recA1	T3003	10 x 100 µl aliquots (10 tubes)
		T3005	96 x 50 µl aliquots (12 x 8-tube strips)

HB101		Cat. No.	Size
Genotype	F- Δ(gpt-proA)62 leuB6 glnV44 (supE44) ara-14 galK2 lacY1 Δ(mcrC-mrr) xyl-5 mtl-1 recA13 thi-1 rpsL20 (SmR)	T3011	10 x 100 µl aliquots (10 tubes)
		T3013	96 x 50 µl aliquots (12 x 8-tube strips)

TG1		Cat. No.	Size
Genotype	F'[traD36 lacIq Δ(lacZ) M15 proA+B+] glnV (supE) thi-1 Δ(mcrB-hsdSM)5 (rK- mK- McrB-) thi Δ(lac-proAB)	T3017	10 x 100 µl aliquots (10 tubes)

Strain Comparison Guide: *Mix & Go!* Competent Cells

	JM109	DH5 Alpha	HB101	TG1	Zymo 10B
Specifications					
Strain Background	K-12	K-12	K-12	K-12	K-12
General Cloning	✓	✓	✓	✓	✓
Plasmid Isolation	✓	✓	✓	✓	✓
Recombinant Protein Expression	✓				
Production of ssDNA (F'episome)	✓			✓	
Suppression of Amber Mutations (glnV44 or supE44)	✓	✓	✓	✓	
Blue-White Selection (lacZΔM15)	✓	✓		✓	✓
High-quality and Yield of Plasmid DNA (endA1)	✓	✓			✓
Reduced Recombination & Insert Stability (recA1 or recA13)	✓	✓	✓		✓
Plasmid Size	Up to 10-15 kb		Up to 10-15 kb	Up to 10-15 kb	
Transformation of Large Plasmids (deoR)		Up to 20-32 kb			Up to 20-32 kb
Ampicillin Resistant (bla or ampR)					
Chloramphenicol Resistant (cat or CmR or CamR)					
Tetracycline Resistant (Tn10 or tetR)					
Kanamycin Resistant (kanR)					
Nalidixic Acid Resistant (gyrA96 or NalR)	✓	✓			
Streptomycin Resistant (strR)			✓		✓
Genotype	F`[traD36 proA+B+ lacIq Δ(lacZ)M15] Δ(lac-proAB) glnV44 (supE44) e14- (McrA-) thi gyrA96 (NalR) endA1 hsdR17(rk-mk+) relA1 recA1	F- φ80lacZΔM15 Δ(lacZYA-argF) U169 deoR nupG recA1 endA1 hsdR17(rK- mK+) phoA glnV44 (supE44) thi-1 gyrA96 relA1, λ-	F- Δ(gpt-proA)62 leuB6 glnV44 (supE44) ara-14 galK2 lacY1 Δ(mcrC-mrr) xyl-5 mtl-1 recA13 thi-1 rpsL20 (SmR)	F'[traD36 lacIq Δ(lacZ) M15 proA+B+] glnV (supE) thi-1 Δ(mcrB-hsdSM)5 (rK- mK- McrB-) thi Δ(lac-proAB)	F- mcrA Δ(mrr-hsdRMS-mcrBC) Φ80lacZΔM15 ΔlacX74 recA1 endA1 araD139 Δ(ara leu) 7697 galU galK rpsL nupG λ-
Catalog Number	T3003	T3007	T3011	T3017	T3019

"We have had great luck using *Mix & Go!*™ Competent Cells for all our routine transformations. The price is very reasonable and made it easy to change from using homemade competent cells to using commercially made. This saves us time and energy and has vastly increased the reliability of our work."

– Dave Westenberg, Missouri S&T

XJ Autolysis™ *E. coli* Strains

Highlights:

- **Fast:** 80 - 90% of *E. coli* are lysed within 10 minutes of harvest.
- **Convenient:** Simple, efficient, and controlled lysis method that is ideal for protein expression and purification or nucleic acid extraction.
- **Versatile:** Fully compatible with a wide range of buffers for protein purification and other physical lysis methods.

Description:

XJ Autolysis™ *E. coli* strains are a new alternative for bacterial transformation and protein expression. These strains are efficiently lysed following arabinose-induced expression of the bacteriophage λ endolysin protein, coupled to a single freeze-thaw cycle. The strains simplify protein expression and purification. They are also applicable for nucleic acid purification, and available with a DE3 lysogen encoding the T7 polymerase for expressing recombinant proteins driven by the T7 promoter.

	XJa Autolysis™ (*E. coli*, K strain JM109)	**XJb Autolysis™** (*E. coli*, B strain BL21)
Cell Growth	Grows well, especially when medium is supplemented with 1 mM Mg^{2+}.	A very robust strain, reaching higher optical densities than *E. coli* K strains.
Autolysis	Lyses easily. The parent strain JM109 itself will release about 20% of cellular protein after one freeze-thaw cycle. This strain will lyse in a wide range of buffer conditions.	XJb lysis efficiency is 10-20% lower than XJa. For optimal lysis, the lysis buffer must be chosen carefully. However, even very low concentrations of a detergent may improve lysis significantly.
Protein Expression	Suitable for general screening, but proteases may degrade small or otherwise unstable recombinant proteins.	XJb is ideal for recombinant protein expression. It lacks Lon and OmpT proteases, leading to higher protein yields.
DNA Extraction	This strain is endA$^-$ and yields high-quality DNA preparations.	XJb is not optimal for DNA extraction.
DNA Stability	The recA$^-$ mutation in XJa stabilizes repetitive DNA sequences.	This strain is recA positive.

Product	Cat. No.	Size
XJa Autolysis™	T5021	1 glycerol stock, 1 ml 500X L-Arabinose
	T3021	10 x 100 µl *Mix & Go!*™ Competent Cells, 1 ml 500X L-Arabinose
XJa (DE3) Autolysis™	T5031	1 glycerol stock, 1 ml 500X L-Arabinose
	T3031	10 x 100 µl *Mix & Go!*™ Competent Cells, 1 ml 500X L-Arabinose
XJb Autolysis™	T5041	1 glycerol stock, 1 ml 500X L-Arabinose
	T3041	10 x 100 µl *Mix & Go!*™ Competent Cells, 1 ml 500X L-Arabinose
XJb (DE3) Autolysis™	T5051	1 glycerol stock, 1 ml 500X L-Arabinose
	T3051	10 x 100 µl *Mix & Go!*™ Competent Cells, 1 ml 500X L-Arabinose

Product Guide: XJ Autolysis™ *E. coli* Strains

	XJa Autolysis™	XJa (DE3) Autolysis™	XJb Autolysis™	XJb (DE3) Autolysis™
Specifications				
Strain Background	K-12	K-12	B	B
General Cloning	✓	✓		
Plasmid Isolation	✓	✓		
General Screening	✓	✓		
Recombinant Protein Expression	✓	✓	✓	✓
Production of ssDNA (F'episome)	✓	✓		
T7 Promoter Transcription (λDE3)		✓		✓
Autolysis (ΔaraB::λR)	Autolysis Inducible by Arabinose	Autolysis Inducible by Arabinose	Autolysis Inducible by Arabinose	Autolysis Inducible by Arabinose
Suppression of Amber Mutations (glnV44 or supE44)	✓	✓		
Blue-White Selection (lacZΔM15)	✓	✓		
High-quality and Yield of Plasmid DNA (endA1)	✓	✓		
Reduced Recombination & Insert Stability (recA1 or recA13)	✓	✓		
Plasmid Size	Up to 10 kb	Up to 10 kb	Up to 10 kb	Up to 10 kb
Transformation of Large Plasmids (deoR)				
Ampicillin Resistant (bla or ampR)				
Chloramphenicol Resistant (cat or CmR or CamR)	✓	✓	✓	✓
Tetracycline Resistant (Tn10 or tetR)				
Kanamycin Resistant (kanR)				
Nalidixic Acid Resistant (gyrA96 or NalR)	✓	✓		
Streptomycin Resistant (strR)				
Genotype	F`[traD36 proA+B+ laclq Δ(lacZ)M15] Δ(lac-proAB) glnV44 (supE44) e14- (McrA-) thi gyrA96 (NalR) endA1 hsdR17(rK- mK+) relA1 recA1 ΔaraB::λR, cat (CmR)	F`[traD36 proA+B+ laclq Δ(lacZ)M15] Δ(lac-proAB) glnV44 (supE44)e14- (McrA-) thi gyrA96 (NalR) endA1 hsdR17(rK- mK+) relA1 recA1 ΔaraB::λR, cat (CmR), λ(DE3)	F- ompT hsdSB(rB- mB-) gal dcm ΔaraB::λR, cat (CmR)	F- ompT hsdSB(rB- mB-) gal dcm ΔaraB::λR, cat (CmR), λ(DE3)
Catalog Number	T3021/T5021	T3031/T5031	T3041/T5041	T3051/T5051

Mix & Go!™ E. coli Transformation Kit & Buffer Set

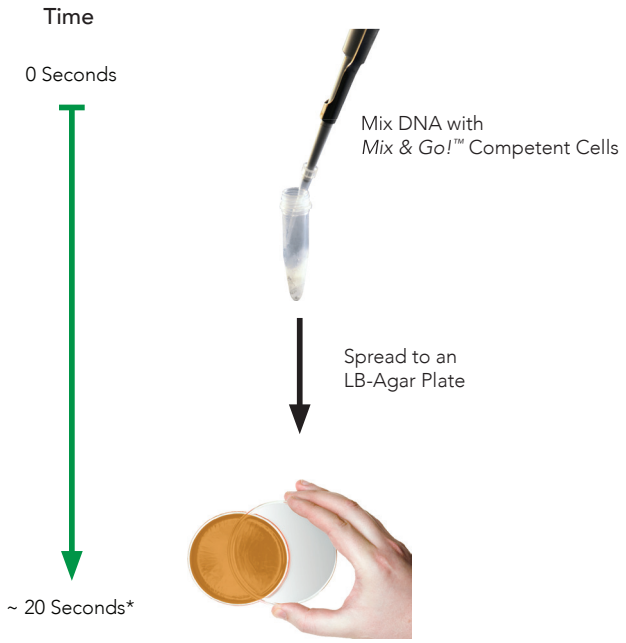
Highlights:

- **Easy 3-Step Protocol:** Produce reliable chemically competent *E. coli* in less than 45 minutes.
- **Simple 20-Second Transformation:** No heat shock! Just add DNA and spread.
- **High Transformation Efficiencies:** Achieve up to 10^9 transformants per µg of plasmid DNA.

Description:

The *Mix & Go!™ E. coli* Transformation Kit and *Mix & Go!™ E. coli* Buffer Set are convenient methods for the preparation of competent *E. coli* cells for simple and highly efficient DNA transformation. The *Mix & Go!™* method completely eliminates the requirement for heat shocking and related procedures. Instead, *Mix & Go!™* bacterial transformation can be performed by adding DNA to *Mix & Go!™* Competent Cells and spreading onto a plate. Transformation efficiencies are typically on the order of 10^8-10^9 transformants/µg plasmid DNA with most *E. coli* strains.

Uniquely formulated reagents make it easy to generate *Mix & Go!™* Competent Cells from nearly all *E. coli* strains that are available in the laboratory. Simply grow the *E. coli* strain of your choice, wash, then resuspend the cells in the provided buffers. The cells are now transformation-ready! The *Mix & Go!™ E. coli* Transformation Kit includes all buffers and ZymoBroth™ medium required to generate 20 ml of *Mix & Go!™* Competent Cells. The *Mix & Go!™ E. coli* Transformation Buffer Set includes all buffers that are required to generate 60 ml of *Mix & Go!™* Competent Cells, and the medium (broth) is supplied by the user.



*Ampicillin selection only

Product	Cat. No.	Size	Specifications	Uses
Mix & Go!™ E. coli Transformation Kit	T3001	up to 20 ml	• Reagents for competent cell preparation • ZymoBroth™ growth medium	Preparation of competent *E. coli*
Mix & Go!™ E. coli Transformation Buffer Set	T3002	up to 60 ml	• Reagents for competent cell preparation	

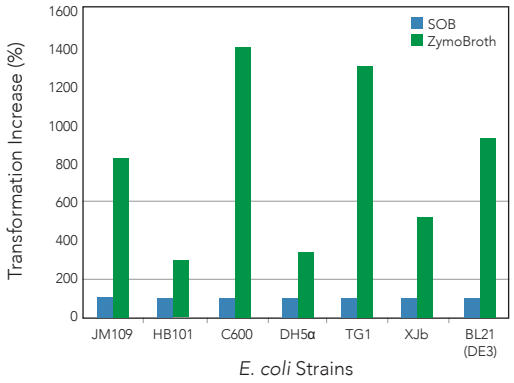
ZymoBroth™

Highlights:

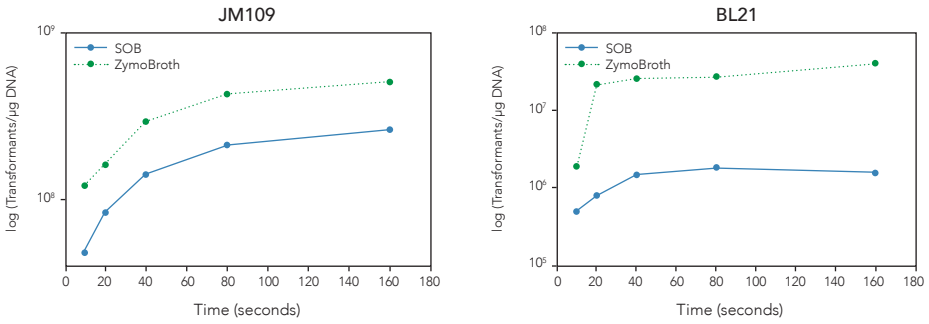
- **Prepare Highly Competent *E. coli*:** Increase transformation efficiency up to 100-fold.
- **Maximize Transformation Efficiency:** ZymoBroth™ stimulates the transformation efficiency of a wide variety of strains, including K-12 derivatives (JM109, HB101, etc.) and B strain derivatives (BL21, etc.)
- **Better Results:** Ideal growth medium for generating competent cells with difficult-to-transform *E. coli* strains.

Description:

ZymoBroth™ (ZB) is a specially-formulated growth medium used for the preparation of highly competent *E. coli* cells for DNA transformation. When compared to classic SOB growth medium, ZymoBroth™ dramatically increases transformation efficiency, typically on the order of 5 - 100 fold (depending on the *E. coli* strain). As part of our popular *Mix & Go!™ E. coli* Transformation Kit, ZB enables researchers to generate their own homemade *Mix & Go!™ E. coli* for DNA transformation. ZB medium has been tested on a wide range of *E. coli* strains. Our data indicate that ZB medium stimulates the transformation efficiency of all *E. coli* strains tested, including K-12 derivatives (such as JM109, HB101, etc.) and B strain derivatives (such as BL21, etc.).



Transformation efficiencies of strains generated with ZymoBroth™ and SOB media. ZymoBroth™ dramatically increases the transformation efficiencies of a broad range of *E. coli* strains. Generally, ZymoBroth™ enhances transformation efficiencies most significantly for difficult-to-transform strains.



Transformation kinetics. *Mix & Go!™ E. coli* prepared with ZymoBroth™ display fast transformation kinetics and high transformation efficiencies.

Product	Cat. No.	Size	Uses
ZymoBroth™	M3015-100 M3015-500	100 ml 500 ml	Preparation of competent *E. coli*

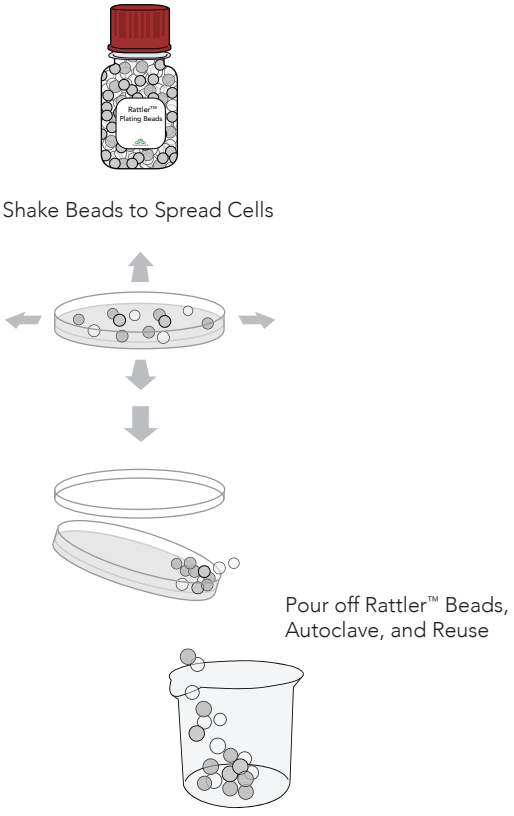
Rattler™ Plating Beads

Highlights:

- **Fast & Easy to Use:** Simply pour beads onto the plate and shake to quickly spread cells evenly over the entire surface. Ideal for processing multiple plates simultaneously.
- **No Flaming Required:** 4.5 mm glass plating beads are provided sterile in polycarbonate bottles.
- **Reusable:** Just clean and autoclave after use.

Description:

Zymo Research offers Rattler™ Plating Beads to save researchers time and effort when plating bacteria or yeast. The sterile glass beads are simply poured onto solid plated medium together with a liquid cell suspension, and the mixture is shaken to distribute the cells evenly over the medium's surface. This allows for numerous plates to be processed quickly and efficiently. Pour the Rattler™ beads onto a series of plates, stack, and shake simultaneously in a side-to-side motion. The beads can be easily removed by inverting the plates and pouring them off the plate lids. Using the Rattler™ Plating Beads is simple, easy, and saves time. The beads are supplied sterile in polycarbonate bottles and can be reused following cleaning and autoclaving.



Product	Cat. No.	Size	Specifications	Uses
Rattler™ Plating Beads - 230 g/bottle	S1001 S1001-5	1 bottle 5 bottles	• Material: Solid, glass 4.5 mm beads can be washed, autoclaved, and reused. • Packaging: Polycarbonate, autoclavable, wide-mouth bottle. The bulk format is supplied non-sterile as a 25 kg bag.	Spreading inocula on solid media (plates)
Rattler™ Plating Beads - bulk format (non-sterile)	S1001-B	25 kg bag		

FAQs about *Mix & Go!*™ Competent Cells

Premade *Mix & Go!*™ Competent Cells:

Will performing heat shock improve my transformation efficiency?
It may be beneficial if making a library, otherwise the heat shock is not needed.

Can my volume of DNA input be greater than the recommended <5%?
The efficiency can decrease several fold as the volume increases. If your DNA is too diluted, we recommend using the DNA Clean & Concentrator® prior to transformation.

Mix & Go!™ Transformation Kit and Buffer Set:

I'm working with a wild-type strain of bacteria; will it work and how can I boost transformation efficiency?
This system is optimized for use with lab strains (K-12 and B derivatives). Wild-type strains generally have low efficiencies. Here are some tips for boosting efficiency:

1. **ZymoBroth™:**
   E. coli cells prepared with this optimized growth medium exhibit faster transformation kinetics and higher transformation efficiencies. This may be as high as several fold to a log increase.

2. **Boosting Transformation:**
   a. Heat Shock: Incubate with DNA on ice for 30 minutes, followed by 5 minutes at 37°C. This is a mild heat shock step and has no detrimental effects; it will only improve transformation efficiency.
   b. Outgrowth: After the transformation mixture has incubated, add 4 volumes of SOC and incubate for 1 hour at 37°C with gentle shaking at 200-300 rpm. Afterwards, spread the mixture directly onto pre-warmed culture plates.

Yeast Research

12

At Zymo Research, our first products were designed to simplify yeast research. This inspired the three "budding yeast" of our logo today. In addition to those technologies described in previous chapters for yeast DNA and RNA purification, we also provide yeast growth and transformation products. Our uniquely formulated YPD medium (YPD Plus™) increases the transformation efficiencies for most yeast strains by ≥ 50%. Our Frozen-EZ Yeast Transformation II™ Kit has been designed to make yeast transformation easier and more efficient compared to conventional methods. We also provide several specialty products for yeast researchers that include α-Factor/a-Factor Mating Pheromones and 5-Fluoroorotic Acid. Our Zymolyase and Yeast Protein Kit remain important reagents for yeast lysis and protein purification, respectively.

Yeast. Our Foundation for Innovation.

Leading the field of yeast research for over 30 years

The first products by Zymo Research were for yeast, which inspired the three "budding yeast" that are a part of the company logo. In addition to technologies for yeast DNA and RNA purification, Zymo Research provides yeast growth and transformation products. For transformation of yeast and fungi, a uniquely formulated YPD medium (YPD Plus™) increases the transformation efficiencies for most yeast strains by ≥ 50%. The Frozen-EZ Yeast Transformation II™ Kit was designed to make yeast transformation easier and more efficient compared to conventional methods. Several specialty products are available for yeast researchers including α-Factor/a-Factor Mating Pheromones and 5-Fluoroorotic Acid (5-FOA). Our Zymolyase and Yeast Protein Kit remain important reagents for yeast lysis and protein purification, respectively.

Purification

Plasmid DNA

Zymoprep™ Yeast Plasmid Miniprep Kits

Simple solution for yeast plasmid DNA isolation using Zymolyase

Genomic DNA

YeaStar™ Genomic DNA Kit

Efficient genomic DNA isolation using Zymolyase

RNA

YeaStar™ RNA Kit

Quickly isolate pure RNA using Zymolyase

Protein

Yeast Protein Kit™

Rapid lysis using Zymolyase for protein analysis

Yeast Lytic Enzyme

Zymolyase

Enzymatic digestion of yeast and fungal cell walls

Zymolyase Ultra

Superior yeast and fungi lysis in 10 minutes

Yeast Transformation

Frozen-EZ Yeast Transformation II™ Kit

Prepare competent yeast cells in less than 10 minutes

YPD Plus™

Increase yeast transformation efficiency by ≥50%

Mating Pheromones

α-Factor and a-Factor Mating Pheromones

Ready-to-use solutions for mating induction and G1 cell cycle arrest

Chemicals

5-FOA

Ultra-pure yeast genetic counter-selection agent

Tech Tip

5 Unique Ways to Transform Yeast

Yeast species have emerged as important eukaryotic model systems due to their rapid growth conditions and similarities to more complex organisms. Transformation, which involves the introduction of exogenous DNA into host cells, is a crucial process for studying and genetically manipulating yeast. Here are some considerations for selecting and conducting a yeast transformation procedure:

Spheroplast Formation: This method requires digestion of the yeast cell wall with a lytic enzyme such as Zymolyase™ or Zymolyase Ultra to create spheroplasts. It is important to optimize the enzyme concentration, incubation time, and temperature to ensure efficient digestion and maintain cell viability. Spheroplast transformation yields relatively high transformation efficiencies, is suitable for introducing both plasmid and linear DNA, and can be used with various yeast strains.

Lithium Acetate Treatment: Treatment with lithium acetate can be used to make yeast cells competent, but transformation efficiencies tend to be low. For this reason, cells should be prepared from actively growing cultures (mid-log phase), and longer heat shock periods may be required. This method is ideal for projects that do not require high transformation efficiencies, as it is simple and cost-effective with minimal equipment needed.

Electroporation: Yeast cells can be made competent by electroporation, which uses an electrical field to create transient pores in the cell membrane. It may be necessary to optimize the voltage and pulse duration to effectively transform various strains. Electroporation reliably produces high transformation efficiencies and is suitable for high-throughput applications. However, it is relatively expensive due to the requirement for specialized equipment.

Biolistic Method: Using the biolistic method, DNA-coated microprojectiles are shot into yeast cells to facilitate transformation. It is imperative to fine-tune helium pressure and microprojectile size to ensure efficient DNA delivery and prevent cell damage. Biolistic transformation is relatively expensive due to the need for specialized equipment. However, it can deliver large DNA fragments and is suitable for difficult-to-transform yeast strains, making it one of the most versatile techniques.

Glass Bead Method: Yeast cells can be transformed by agitation with glass beads to physically disrupt the cell wall. The transformation efficiency using glass beads tends to be low, which necessitates optimization of the bead size and vortexing conditions. Glass beads offer a cost-effective yeast transformation method for studies that do not require high transformation efficiencies.

A convenient alternative to these traditional methods is Zymo Research's Frozen-EZ Yeast Transformation II™ Kit. The procedure is compatible with a wide range of yeast strains, and high-efficiency transformation is completed in just 45 minutes. The best yeast transformation method to use depends on the specific experimental requirements and resources available. Transformation efficiency, cell viability, and the nature of the intended genetic modifications must be considered when selecting a method.

How to Maximize Yeast Transformation Efficiency

Tips and best practices for transforming popular yeast strains

Introducing foreign DNA to yeast cells is essential for two-hybrid system screening and many other genetic manipulation techniques. The transformation efficiency of yeast cells is typically magnitudes lower than that of *Escherichia coli* due to the added challenges associated with permeating the fungal cell wall. However, implementing the following tips can help maximize the transformation efficiency of yeast species such as *Saccharomyces cerevisiae, Schizosaccharomyces pombe, Pichia pastoris,* and *Candida albicans.*

1. **Cell Growth State:** Use cells in the mid-log phase to produce the most transformants. Early or late log-phase cells yield comparatively fewer transformants.

2. **Cell Density:** The optimal cell density for transformation is between 5 x 10^6 and 2 x 10^7 cells/ml (0.8-1.0 OD600). Yeast cultures with cell densities at the high end of this range typically report the highest transformation efficiencies.

3. **Heat Shocking:** Because of their hardy cell walls, yeast cells must be heat-shocked more intensively than *E. coli*. To ensure high transformation efficiencies, yeast should be heat-shocked for 45 minutes.

4. **Plating Media:** Not all commercially available media are created equal. Our results show that Difco media are the most reliable for maximizing transformation efficiency.

5. **DNA Input:** For circular DNA such as plasmids, the transformation efficiency stops increasing linearly for DNA inputs above 1 µg. For integrative transformation with linearized DNA, higher inputs of up to 5 µg of DNA are recommended. The DNA extraction method is crucial, as highly pure DNA should be used for transformation.

Transformation efficiency is also species-dependent, as some strains are more susceptible to transformation than others. The following table provides a range of transformation efficiencies to expect from four prominent yeast strains using traditional transformation protocols.

Strain	Transformation Efficiency (cfu/µg DNA)
S. cerevisiae	10^4 – 10^6
S. pombe	10^3 – 10^5
P. pastoris	10^3 – 10^6
C. albicans	10^2 – 10^4

It is important to note that the true transformation efficiency can vary significantly depending on the transformation method used, quality of the DNA, and other experimental parameters. For applications such as two-hybrid system screening or library screening that require high transformation efficiencies, it is imperative that researchers select a reliable transformation method such as the Frozen-EZ Yeast Transformation II™ Kit for optimal results. As an industry leader in yeast products, Zymo Research is dedicated to helping scientists streamline and elevate their transformations with innovative technologies.

Zymolyase - Yeast Lytic Enzyme

Highlights:

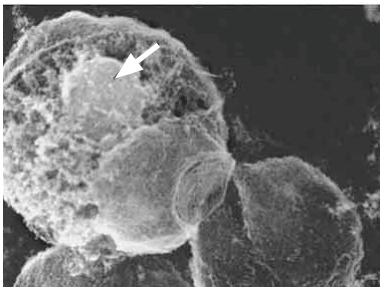
- **100T Equivalent:** Prepared from *Arthrobacter luteus*. Essential enzyme activities are β-1,3-glucanase and β-1,3-glucan laminaripentao-hydrolase.
- **Convenient:** Provided lyophilized along with a storage buffer for reconstitution.
- **Efficient Cell Wall Digestion:** Supplied storage buffer has been optimized to confer maximum levels of enzymatic activity.

Description:

Digestion of yeast and fungal cell walls is necessary for many experimental procedures including spheroplasting, immunofluorescence, transformation, protein purification, and others. Zymolyase, a lytic enzyme, is routinely used for digestion. The Zymolyase from Zymo Research is prepared from *Arthrobacter luteus*, lyophilized, and packaged with a resuspension buffer. The buffer has been optimized to confer maximal levels of enzymatic activity. The main activities of the enzyme are β-1,3-glucanase and β-1,3-glucan laminaripentao-hydrolase, which hydrolyze glucose polymers at the β-1,3-glucan linkages, releasing laminaripentaose as the principal product. Optimal Zymolyase activity is at 30-37°C; lytic activity ceases at higher temperatures.

R-Zymolyase includes 0.5 U/µl RNase A when reconstituted.

Susceptible fungal genera: *Ashbya, Candida, Debaryomyces, Eremothecium, Endomyces, Hansenula, Hanseniaspora, Kloeckera, Kluyveromyces, Lipomyces, Metschnikowia, Pichia, Pullularia, Saccharomyces, Saccharomycodes, Saccharomycopsis, Schizosaccharomyces, Torulopsis.*



Zymolyase can be used for enzymatic digestion of yeast glycan coats and for spheroplast formation. The arrow indicates the nucleus and intracellular components of a spheroplast through a partially digested plasma membrane.*

*Source: A protocol for isolation and visualization of yeast nuclei by scanning electron microscopy (SEM). Elena Kiseleva, Terry D Allen, Sandra A Rutherford, Steve Murray, Ksenia Morozova, Fiona Gardiner, Martin W Goldberg & Sheona P Drummond. Nature Protocols 2, 1943 - 1953 (2007) Published online: 9 August 2007 doi:10.1038/nprot.2007.251

Product	Cat. No.	Size	Specifications	Uses
Zymolyase	E1004 E1005	1,000 U 2,000 U	• Enzyme Concentration: 5 U/µl • Total Protein Concentration: 10 - 15 mg/ml • Storage: -20°C Unit Definition: One lytic unit (U) is defined as catalyzing a 10% decrease in O.D. at at 30° C for 30 minutes.	Spheroplast/ Protoplast formation; Yeast cell fusion; Yeast transformation
R-Zymolyase (with RNase A)	E1006	1,000 U		

5-Fluoroorotic Acid (5-FOA)

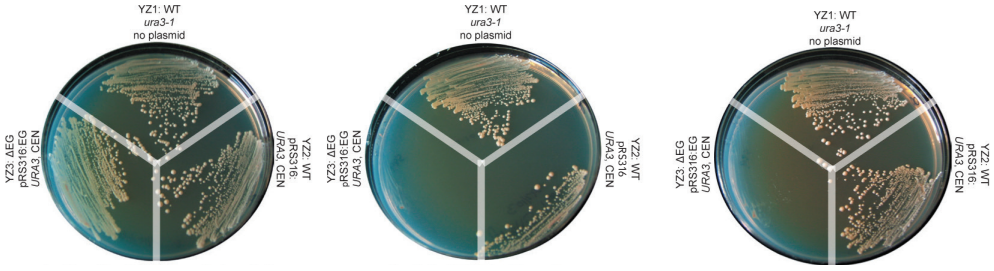
Highlights:

- **Yeast Genetic Counter-Selection Agent:** Commonly used for curing yeast strains of plasmids, plasmid shuffling, allelic replacement, and two-hybrid screens.
- **Convenient:** Available as a pure powder or ready-to-use solution in DMSO.
- **Ultra-Pure:** Determined > 98% by thin-layer chromatography (TLC), melting point, and lot comparison.

Description:

Using 5-Fluoroorotic Acid (5-FOA) for the counter-selection of yeast is a common genetic screening method. Curing yeast strains of plasmids, plasmid shuffling, allelic replacement, and two-hybrid screens are methods that can employ the use of 5-FOA. Otherwise nontoxic to yeast, 5-FOA is converted to the toxic form (i.e., 5-fluorouracil) in strains expressing the functional URA3 gene coding for orotine-5'-monophosphate decarboxylase that is involved in the synthesis of uracil. Yeast strains that are phenotypically Ura+ become Ura- and 5-FOA(R) (resistant) after selection.

The question of 5-FOA solubility is often raised by researchers using ultra-pure (> 98%) 5-FOA powder because of its insolubility in water. Thus, we provide a 100X concentrated (100 mg/ml) 5-FOA solution in DMSO. This has been tested and validated on the basis of counter-selection activity (see below).



1: Synthetic Complete: SC | 2: SC-5-FOA: Powder | 3: SC-5-FOA: 100X Solution

Counter selection of yeast using 5-FOA. Yeast strains that are auxotrophic for uracil (*ura3-1*) were tested for their ability to grow on 5-FOA containing media. Three strains were tested: wt alone (YZ1), wt with a URA3-marked low-copy plasmid (YZ2), and a mutant strain with a deletion of an essential gene (ΔEG) that could not lose a complementing URA3 plasmid (YZ3).

From left to right, top to bottom are synthetic complete glucose medium (SC): 1. SC, synthetic complete no 5-FOA; 2. Standard - SC-5-FOA (SC-5-FOA made from ultra-pure 5-FOA powder, 1 g/liter); 3. SC-5-FOA made from 100X 5-FOA solution.

For each plate, Top: Yeast strain: YZ1 wild-type, Ura- (wt, ura-3-52); Right: Yeast strain: YZ2, wild-type carrying a low copy, URA3 plasmid alone; and Left: Yeast strain: YZ3: ΔEG, containing the complementing plasmid (pRS316: EG, URA3, CEN). The counter selection against strain YZ3 was evident for all media containing 5-FOA with no 5-FOA(R) colonies evident (see left panels, YZ3: in plates 2 and 3). Cells from control strains YZ1 and YZ2 were able to grow on 5-FOA media.

Product	Cat. No.	Size	Specifications	Uses
5-FOA (powder)	F9001-1 F9001-5	1 g 5 g	• Molecular Weight: 174.0 g/mol • Method for Determining Identity: TLC, melting point, and lot comparison • Purity: Estimated >98% • Solubility: 50 mg in 1 ml (1:1 NH_4OH:H_2O) with gentle heating, > 100 mg/ml in DMSO • Storage: -20°C	Yeast counter-selection; Yeast two-hybrid screen; Plasmid curing; Plasmid shuffling; Allelic replacement
100X 5-FOA (liquid)	F9003	10 ml		

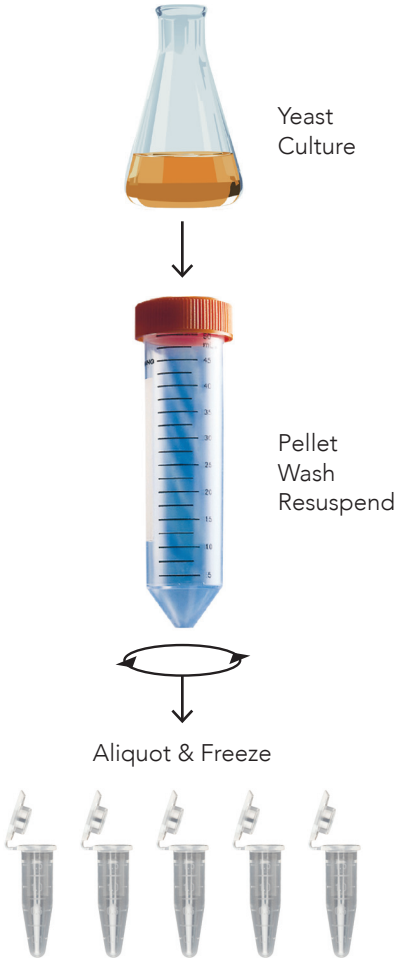
Frozen-EZ Yeast Transformation II™ Kit

Highlights:

- **Fast:** Yeast cells with high transformation efficiencies can be prepared in under 10 minutes.
- **Simple:** Easy method to transform yeast with single or multiple plasmids in ≤ 1 hour without carrier DNA.
- **Versatile:** Can be used with *S. cerevisiae*, as well as other fungi, including *C. albicans, S. pombe*, and *P. pastoris*. Compatible with both circular and linear DNA.

Description:

The Frozen-EZ Yeast Transformation II™ Kit is designed to make yeast transformations and library screening easier and more efficient than currently available methods. The yeast cells can be transformed immediately or can be stored at ≤ -70°C for use at a later time. Yeast prepared with this kit can be transformed with both circular and linear DNAs. Also, the Frozen-EZ Yeast Transformation II™ Kit can be used with other fungi including *C. albicans, S. pombe*, and *P. pastoris*.



Product	Cat. No.	Size	Specifications	Uses
Frozen-EZ Yeast Transformation II™ Kit	T2001	120 rxns	• Transformation Efficiency: 10^5 - 10^6 cfu/µg • Transformation DNA Input: 0.2 - 1.0 µg • Competent Cell Stability: ≥ 1 year at -70°C • Compatibility: *S. cerevisiae, S. pombe, C. albicans, P. pastoris*	Competent yeast cell preparation;

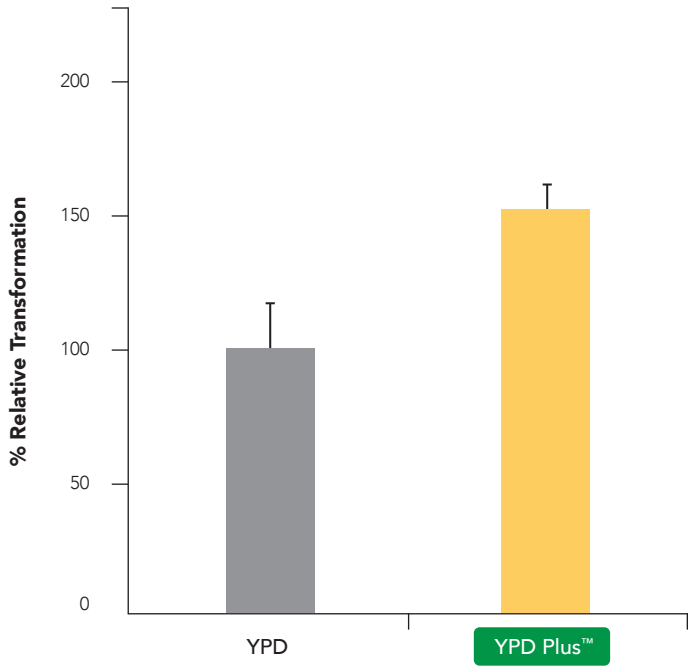
YPD™ Plus

Highlights:

- **Maximize Transformation Efficiency:** Specially formulated yeast outgrowth medium increases yeast transformation efficiencies by > 50%.
- **Better Results:** Recommended for mutant yeast strains exhibiting poor growth characteristics that are not amenable to transformation.
- **Simple:** Just supplement the yeast transformation reaction mixture with YPD Plus™ to achieve consistent increases in yeast transformation efficiencies.

Description:

The outgrowth step in yeast transformation protocols is often critical for increasing overall yeast transformation efficiencies. This is useful when attempting to maximize transformation efficiencies for library screening or transforming yeast with multiple plasmids. YPD Plus™ is specially formulated to increase yeast transformation efficiencies by > 50%. YPD Plus™ is recommended for mutant yeast strains exhibiting poor growth characteristics that are not amenable to transformation. Simply supplement a yeast transformation reaction mixture with YPD Plus™ to achieve consistent increases in yeast transformation efficiencies.



Comparison of YPD vs. Zymo Research's YPD™ Plus medium. Yeast transformations with outgrowth performed in either standard YPD or YPD™ Plus medium. The relative percentage of transformants is shown in the graph above. Each plot represents the relative transformation efficiency averaged from six individual transformations.

Product	Cat. No.	Size	Uses
YPD™ Plus	Y1003-50 Y1003-100	50 ml 100 ml	Yeast transformation & outgrowth

Zymoprep™ Yeast Plasmid Miniprep Kits

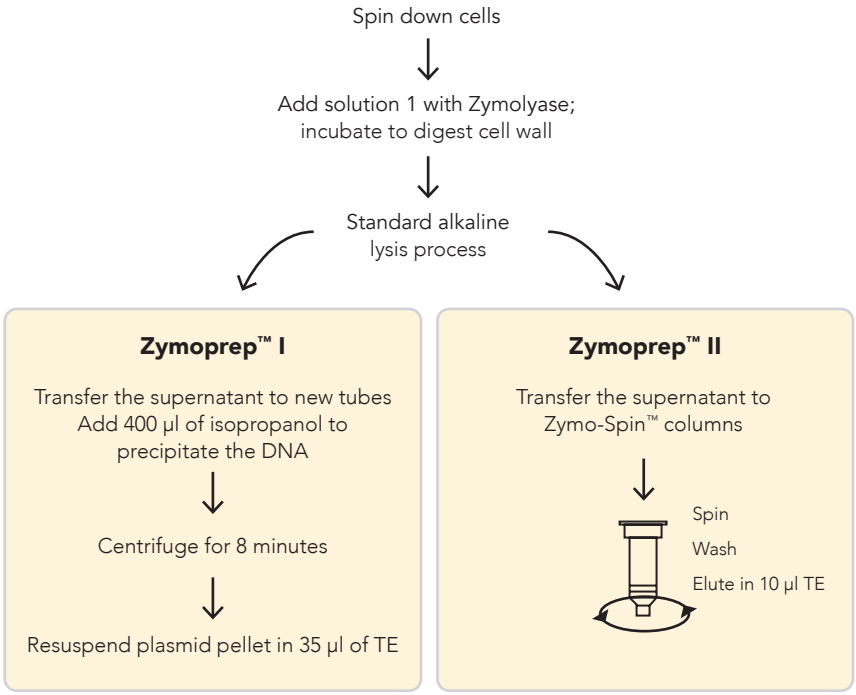
Highlights:

- **Simple:** Quickly and easily rescue plasmid from yeast.
- **Efficient Isolation:** Works well with low-copy and hard-to-isolate plasmids.
- **High-Quality:** Isolated plasmid DNA is ideal for molecular biology techniques, such as PCR, transformation, hybridization, etc.

Description:

The Zymoprep™ Yeast Plasmid Miniprep provides all the necessary reagents for plasmid isolation from *S. cerevisiae, C. albicans, S. pombe,* and any fungi whose cell walls are susceptible to yeast lytic enzyme lysis. The procedure is simple and efficient, with no need for glass beads or phenol. Reliably recover plasmid DNA from yeast colonies, patches on plates, or liquid cultures. The system is ideal for low copy number and hard-to-isolate plasmids. Eluted plasmid DNA can be used directly for *E. coli* transformation, PCR, and Southern blot analysis.

Procedure for Zymoprep™ Yeast Plasmid Miniprep I & II



Product	Cat. No.	Size	Specifications	Uses
Zymoprep™ Yeast Plasmid Miniprep I	D2001	100 preps	• Format: Isopropanol Precipitation • Elution Volume: ≥ 35 µl • Processing Time: 35 - 90 minutes • DNA Size Limits: ≤ 23 kb	Plasmid recovery from yeast
Zymoprep™ Yeast Plasmid Miniprep II	D2004	50 preps	• Format: Spin Column • Elution Volume: ≥ 10 µl • Processing Time: 35 - 90 minutes • Binding Capacity: 5 µg • DNA Size Limits: ≤ 23 kb	
Zymoprep-96 Yeast Plasmid Miniprep	D2005 D2006 D2007	2 x 96 preps 4 x 96 preps 8 x 96 preps	• Format: 96-well • Elution Volume: ≥ 10 µl • Processing Time: 60 - 90 minutes • DNA Size Limits: ≤ 25 kb	

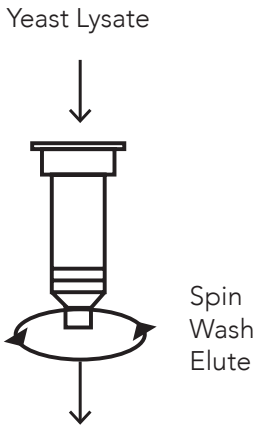
YeaStar™ Genomic DNA Kit

Highlights:

- **Simple:** Fast spin column procedure yields pure yeast genomic DNA without using glass beads or phenol.
- **Versatile:** Efficient DNA isolation from a broad spectrum of fungal species susceptible to Zymolyase.
- **High-Quality:** Isolated genomic DNA is ready for Southern blotting, PCR, restriction enzyme digestion, etc.

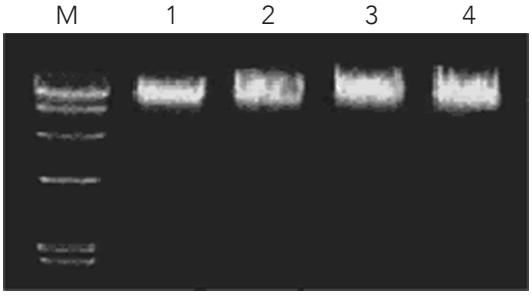
Description:

The YeaStar™ Genomic DNA Kit is designed for reliable and efficient isolation of genomic DNA from a broad spectrum of fungal species, including *Aspergillus fumigatus, Aspergillus nidulans, Aspergillus nivens var. aureus, Candida albicans, Pichia pastoris, Saccharomyces cerevisiae, Schizosaccharomyces pombe*, and any fungi whose cell walls are susceptible to yeast lytic enzyme. The kit is based on a highly efficient enzyme lysis and Zymo-Spin™ column technology. Each standard prep yields about 7 - 20 µg of DNA with a size distribution of 35 - 60 kb. The resulting genomic DNA can be used for direct analysis including Southern blotting, PCR, restriction endonuclease digestion, etc.



Ultra-pure DNA for...

- ✓ PCR
- ✓ Southern Blotting
- ✓ Endonuclease Digestion



Agarose gel electrophoresis of DNA prepared using the YeaStar™ Genomic DNA Kit. Lanes: M: λ-DNA Hind III marker; 1: *S. cerevisiae*; 2: *P. pastoris*; 3: *C. albicans*; 4: *S. pombe*.

Product	Cat. No.	Size	Specifications	Uses
YeaStar™ Genomic DNA Kit	D2002	40 preps	• Format: Spin Column • Binding Capacity: 25 µg • Elution Volume: ≥ 60 µl • Processing Time: 1.5 hours	gDNA isolation from Zymolyase-sensitive fungi

YeaStar™ RNA Kit

Highlights:

- **Simple:** Fast spin column procedure yields pure yeast RNA without using glass beads or phenol.
- **Versatile:** Efficient RNA isolation from a broad spectrum of fungal species susceptible to Zymolyase.
- **High-Quality:** Isolated RNA is suitable for use in RT-PCR, Northern blotting, etc.

Description:

The YeaStar™ RNA Kit enables RNA isolation from a broad spectrum of fungi including: *Aspergillus fumigatus*, *Aspergillus nidulans*, *Aspergillus nivens var. aureus*, *Candida albicans*, *Pichia pastoris*, *Saccharomyces cerevisiae*, *Schizosaccharomyces pombe*, and any fungi whose cell walls are susceptible to yeast lytic enzyme. The kit facilitates the purification of 10-25 µg of high-quality total RNA from 1-1.5 ml of cultured cells using innovative Zymo-Spin™ column technology.

Fast Spin-Column Procedure

Ultra-pure RNA for...

- ✓ Reverse Transcription
- ✓ RT-PCR
- ✓ Northern Blotting

Product	Cat. No.	Size	Specifications	Uses
YeaStar™ RNA Kit	R1002	40 preps	• Format: Spin Column • Binding Capacity: 25 µg • Elution Volume: ≥ 60 µl • Size Limits: ≥ 17 nt • Processing Time: 30 minutes	Total RNA isolation from Zymolyase-sensitive fungi

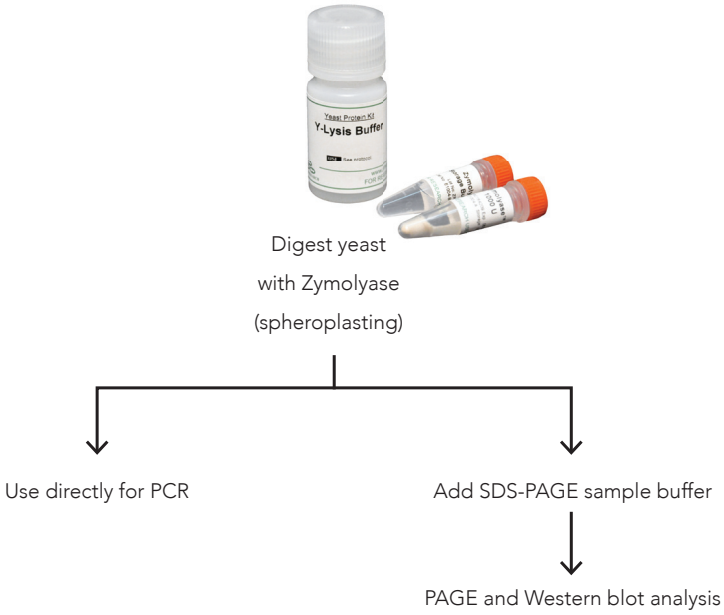
Yeast Protein Kit™

Highlights:

- **Convenient:** Rapid method for efficient lysis of yeast for downstream protein and DNA analyses.
- **Versatile:** Procedure suitable for any fungal species susceptible to Zymolyase.
- **Effective Spheroplasting:** Ideal protocol for Western blotting and PCR.

Description:

The Yeast Protein Kit™ is a simple and convenient method for the rapid, thorough lysis of yeast cells. The kit has been optimized for use with *S. cerevisiae* and *C. albicans* but can be used for any fungal species that is susceptible to yeast lytic enzyme (Zymolyase) digestion. The digestion procedure effectively generates spheroplasts of yeast cells, making them ideal for both protein and DNA analyses including Western blotting and PCR, respectively.



Product	Cat. No.	Size	Specifications	Uses
Yeast Protein Kit™	Y1002	200 preps	• Input: ≤ 500 µl culture • Processing Time: 35 minutes	Yeast cell lysis and spheroplast generation

α-Factor and a-Factor Mating Pheromones

Highlights:

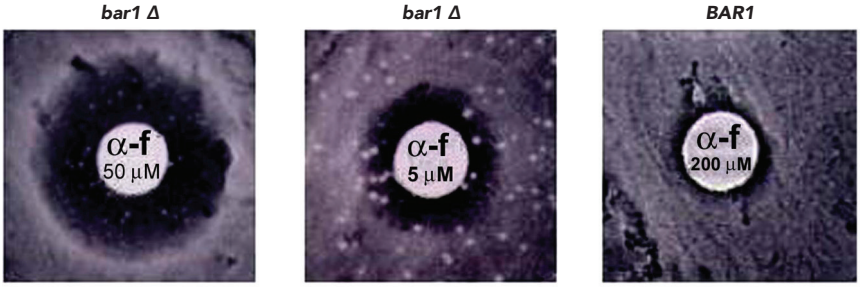
- **Aqueous Solution:** Convenient ready-to-use solution of yeast α-factor and a-factor mating pheromones for mating induction and G1 cell cycle arrest.
- **Robust and Efficient:** Liquid solutions have been optimized for both activity and stability and are guaranteed to retain biological function through multiple freeze-thaw cycles.
- **Easy:** Widely used simple method for studying the cell cycle, cellular morphology, transcriptional induction, and signal transduction pathways.

Description:

When yeast "a" and "α" cells encounter mating pheromones of the opposite cell type, they induce genes necessary for mating, arrest the cell cycle in G1, alter the cell surface and nuclear determinants, and also undergo dramatic morphological elongation into pear shapes, affectionately termed "schmooing." These alterations prepare the yeast cells for mating and fusion to form stable diploids. The a/α diploids are not responsive to mating pheromones of either type, but can be induced to undergo meiosis via nutrient deprivation. The use of yeast mating pheromones has pioneered the study of the cell cycle, cellular morphology, transcriptional induction, as well as signal transduction pathways.

Zymo Research provides the α/a-factor peptide mating pheromones as ready-to-use liquid solutions that have been optimized for both activity and stability and are guaranteed to retain biological function through multiple freeze-thaw cycles.

G1 Phase Arrest Using α-Factor

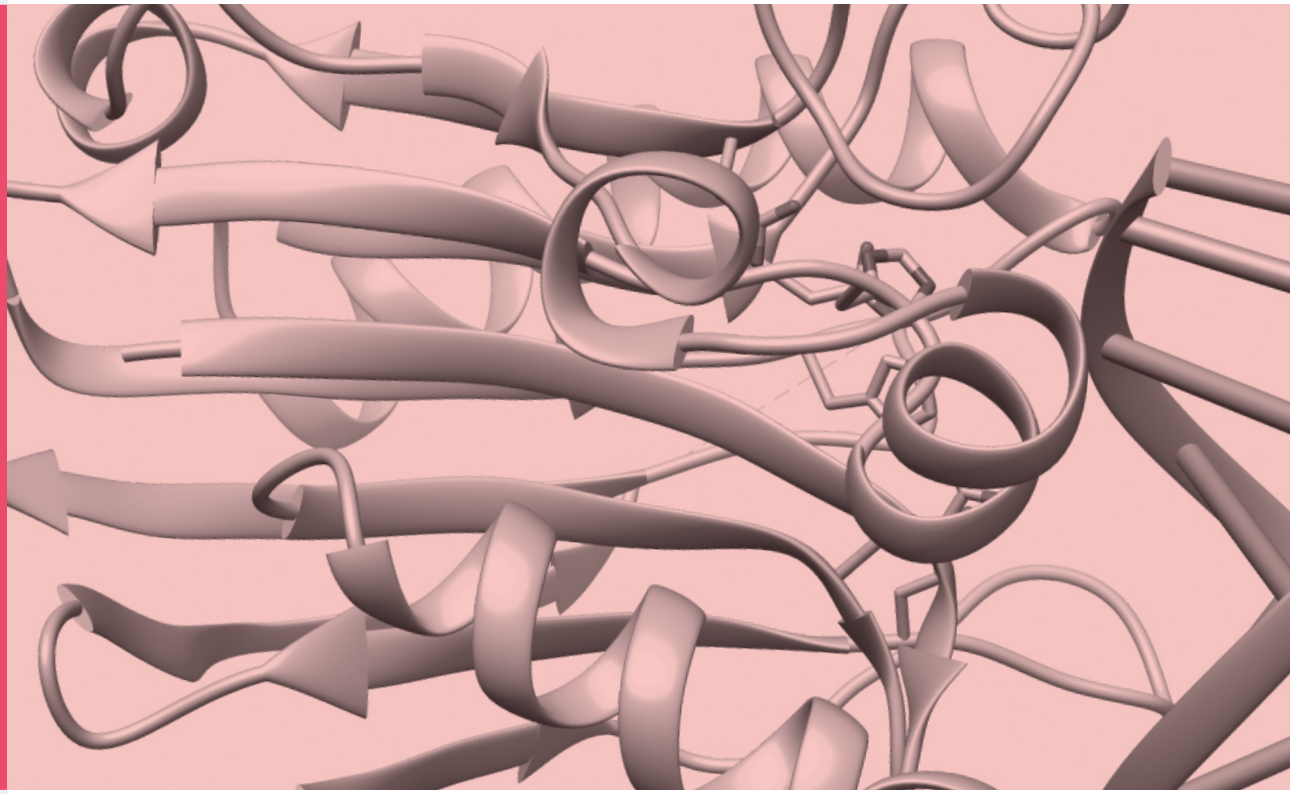


Activity test of α-Factor. α-Factor peptide pheromone (10 µl) was applied to sterile filters on a lawn of *MATa* cells, which were either wild-type for the *BAR1* (200 µM, right) protease or *bar1* Δ (50 µM, left; 5 µM, center). Sensitivity to the α-factor is evident as the zone of clearing (G1-arrested cells). Cells that have the *BAR1* protease deletion are more sensitive to α-factor than *BAR1* protease-positive wild-type strains, which require ~20 - 50X more pheromone to arrest the cells.

Product	Cat. No.	Size	Specifications	Uses
α-Factor Mating Pheromone	Y1001	240 µl	• Concentration: 10 mM in 0.1 M sodium acetate, pH 5.2, (i.e., 4 mg/240 µl) • Molecular Weight: 1684.0 Da • Activity Test: G1 arrest • Purity: > 98% by HPLC • Storage: -20°C	Yeast mating induction; G1 phase arrest
a-Factor Mating Pheromone	Y1004-500	500 µl	• Concentration: 1 mg/ml in methanol • Molecular Weight: 1630.0 Da • Activity Test: G1 arrest • Purity: > 80% by HPLC • Storage: -20°C	

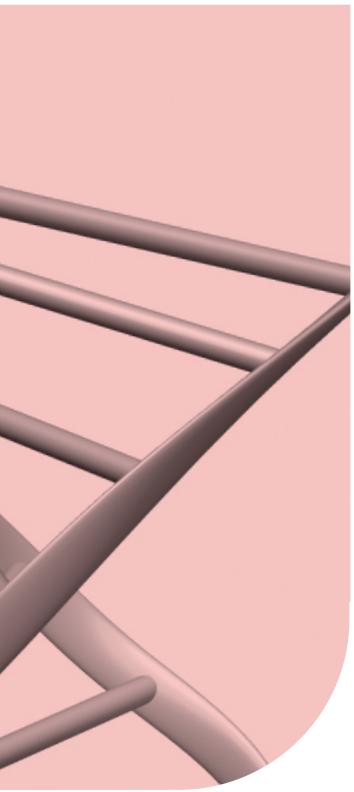
Enzymes & Protein Expression

13



Although the expression of recombinant proteins in *E. coli* is a routine procedure, high level expression or overexpression is not always attainable. Zymo Research has designed products to exploit the fact that high levels of protein expression can be consistently obtained when the processes of cell expansion and protein expression are kept separate. This is easily achieved with the use of the Dual Media Set™ where the over-expression of many proteins can be reliably controlled. In conjunction with the Dual Media Set™, our XJ Autolysis™ expression strains (p. 251) are ideal hosts for recombinant protein expression. With these strains, bacterial cell lysis is complete after a single freeze/thaw cycle. Researchers will find the single step lysis procedure simple, reproducible, and faster than conventional methods.

The His-Spin Protein Miniprep™ provides researchers a simple, fast method for His-tagged protein purification. The procedure is based on innovative protein purification chemistry as well as state of the art Zymo-Spin™ Column technology. Up to 1 mg of His-tagged protein can be purified per preparation in as little as 5 minutes. The purified protein can be used directly in enzymatic assays, protein biochemical analyses, SDS-PAGE, and other applications. The straightforward spin-wash-elute protocol ensures results are obtained in minutes, not hours.



Culture Media Used For Protein Expression

Tag-Spin Protein Purification

Enzymes

Dual Media Set™

Highlights:

- Simple, reliable method for high level recombinant protein expression in *E. coli*.
- Eliminates the need to monitor cell density and the time of inducer addition.
- Synchronizes cultures that express different recombinant proteins.

Description:

Although recombinant protein expression in *E. coli* has become routine, high level protein expression or overexpression is not always attainable for every protein. Our research has shown that high level protein expression can be achieved consistently when two processes, cell expansion and protein expression, are kept separate.

The Dual Media Set™, different from commonly used protein expression procedures using Luria-Bertani (LB) medium or other specially prepared medium, contains two specially formulated media: Expansion Broth (EB) and Overexpression Broth (OB). For expansion, *E.coli* cells are grown in EB which keeps the production of recombinant protein repressed. To initiate high level protein expression, OB is simply added to the culture. By using the Dual Media Set™, protein overexpression can be reliably controlled for many recombinant proteins (see Figure 2). In some circumstances, when the expressed protein is either toxic or insoluble, overexpression may be counter-productive. In such cases, protein production can be kept at a minimum by adding the inducer IPTG (for lac-based promoters) to cells growing in EB (see Figure 1).

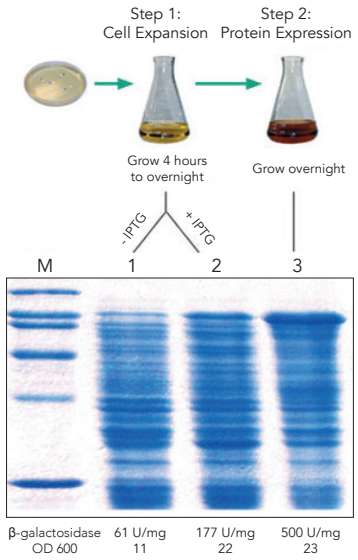


Figure 1. Controlled overexpression of β-galactosidase. Cells were grown in EB, where only background levels of the T7-lac promoter-controlled product are produced (1). Moderate amounts of the enzyme were produced by incubating overnight in EB with IPTG (2), the highest amounts of protein are produced in OB (3).

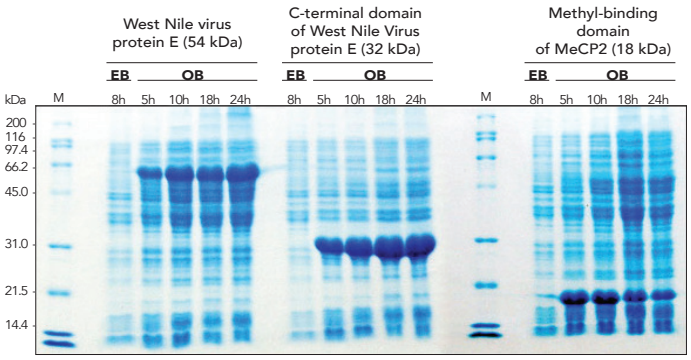


Figure 2. Overexpression of three distinct proteins in *E. coli* utilizing the Dual Media Set™. Protein expression was initially suppressed in EB media. Upon inoculation into the OB media, the activation of protein expression occurred. Robust protein expression was observed within the timeframe of 5 to 24 hours.

Product	Cat. No.	Size	Uses
Dual Media Set™ (EB + OB)	M3011	100 ml EB - 500 ml OB	Recombinant protein expression
Expansion Broth (EB)	M3012-100 M3012-500	100 ml 500 ml	
Overexpression Broth (OB)	M3013-100 M3013-500	100 ml 500 ml	

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Tag-Spin Technology Overview

Protein purification is an essential step in research to identify and study the structure, function and interaction of proteins. Technologies for protein purification are particularly crucial for rapidly emerging fields where high-throughput screening of proteins with high purity but short processing times are necessary.

Affinity chromatography is a widely used technique to simplify the purification of recombinant proteins. For this, the protein of interest is fused to an affinity tag which mediates specific binding of the target protein to immobilized ligands. The most frequently used affinity tags that facilitate very efficient purification of recombinant proteins is poly(His)-tag.

Zymo Research offers an extremely fast and highly innovative spin-column based technology to perform affinity purification of proteins. The Tag-Spin technology is ideal for purifying recombinant proteins from cell-free extracts for screening purposes of protein functions.

The straightforward spin-wash-elute protocols allow isolation of pure recombinant proteins in only a few minutes for small-scale protein studies.

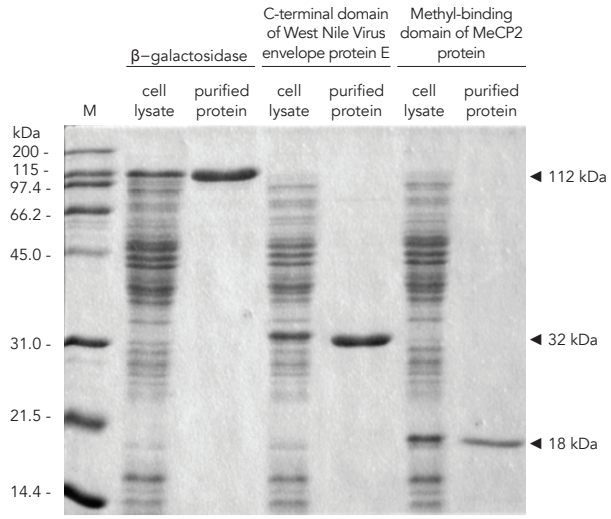
His-Spin Protein Miniprep™

Highlights:

- **Fast:** Purify His-tagged proteins from cell lysates in less than 5 minutes.
- **Simple:** Prepare pure protein for small-scale studies using a spin-column.
- **Convenient:** No special instrumentation needed other than a benchtop microcentrifuge.

Description:

The His-Spin Protein Miniprep™ provides researchers with a method for fast His-tagged protein purification. The easy-to-follow procedure is based on a nickel-charged His-Affinity Gel (IMAC), innovative protein purification, and unique Zymo-Spin™ Column technology. Up to 1 mg of His-tagged protein can be purified in as little as 5 minutes and can be eluted into as little as 100 µl of the provided His-Elution Buffer. The purified protein can be used directly for enzymatic assays, protein biochemical analyses, SDS-PAGE, as well as other protein based applications. The His-Spin Protein Miniprep™ has been optimized to yield maximal protein purity indices: a single protein band is often visualized following Coomassie Blue staining of proteins in SDS-PAGE gel (see figure below). The straightforward spin-wash-elute protocol dramatically simplifies protein purification and results are obtained in minutes, not hours!



Purification of His6-tagged proteins. *E. coli* cell lysate containing indicated proteins (i.e., 112, 32, 18 kDa) expressed as a N-terminal 6X His-fusion, as well as the proteins purified using His-Spin Protein Miniprep™ were analyzed using a 15% SDS-PAGE gel and stained with Coomassie Blue.

Product	Cat. No.	Size	Specifications	Uses
His-Spin Protein Miniprep™	P2001 P2002	10 preps 50 preps	Format: Spin-Column Protein Binding Capacity: 1 mg	His-tagged protein purification
His-Affinity Gel	P2003-2	14 ml		

5-hmC Glucosyltransferase

Description:

5-hmC Glucosyltransferase from Zymo Research is a highly active enzyme that specifically tags 5-hydroxymethylcytosine in DNA with a glucose moiety yielding glucosyl-5-hydroxymethylcytosine. Glucosylation of 5-hydroxymethylcytosine by 5-hmC Glucosyltransferase can be used for sequence-specific, locus-specific, as well as global quantification of 5-hydroxymethylcytosine.

Specifications:

Cat. No.	Size
E2026	100 U
E2027	200 U

Provided with 10X 5-hmC GT Reaction Buffer and 10X UDPG.
Enzyme Concentration: 2 U/µl
Optimum Reaction Temperature: 30°C
Standard Reaction Time: 2 hours
Unit Definition: One unit (U) is defined as the amount of enzyme needed to protect 1 µg of 5-hmC DNA Standard [D5405-3] from Csp6I restriction enzyme digestion via glucosylation in a reaction incubated at 30°C for 1 hour.

Atlantis dsDNase

Description:

Atlantis dsDNase is a double-strand DNA specific endonuclease that cleaves phosphodiester bonds in DNA to yield homogeneous populations of core nucleosomes.

Specifications:

Cat. No.	Size
E2030	12.5 U

Typical buffer consists of 20 mM Tris-HCl (pH 7.5) and 5 mM $MgCl_2$.
Enzyme Concentration: 0.1 U/µl
Inactivation: 5X MN Stop Buffer or EDTA.
Optimum Reaction Temperature: 42°C
Standard Reaction Time: 20 min.
Unit Definition: One unit (U) is defined as the amount of enzyme needed to produce an increase in absorbance at 260 nm of 0.001 per minute, using 50 mg/ml high MW DNA in 50 mM Na-acetate pH 5.0 and 5 mM $MgCl_2$ (Kunitz, 1950).

CpG Methylase (M. SssI)

Description:

The CpG Methylase from Zymo Research completely methylates all cytosine bases at the C5 position in double-stranded, non-methylated and hemi-methylated DNA having the dinucleotide sequence 5′…CpG…3′. The reaction conditions are optimized to maximize the processivity of the enzyme to ensure rapid, complete, and reproducible methylation of DNA for accurate DNA methylation analysis.

Specifications:

Cat. No.	Size
E2010	200 U
E2011	400 U

Provided in solution (4 U/µl) with 10X CpG Reaction Buffer and 20X SAM (S-adenosylmethionine).
Source: Recombinant methylase is isolated from *E. coli* expressing the methyltransferase gene from *Spiroplasma sp.* strain MQ1.
Heat Inactivation: 65°C for 20 min.
Unit Definition: One unit (U) is the amount of enzyme required to protect 1 µg of λ DNA from cleavage by BstUI restriction endonuclease in a total reaction volume of 20 µl for 1 hour at 37°C.

DNA Degradase™ and DNA Degradase Plus™

Description:

DNA Degradase™ and DNA Degradase Plus™ from Zymo Research are nuclease mixes that quickly and efficiently degrade DNA into individual nucleotides or nucleosides, respectively. DNA Degradase™ is ideal for whole-genome DNA methylation analysis by a number of downstream applications (i.e., HPLC, LC/MS, TLC, etc.). Digestion is performed via a simple one-hour, one-step procedure.

Specifications:

Provided with 10X DNA Degradase™ Reaction Buffer.
Enzyme Concentration: 10 U/µl
Enzyme Inactivation: 70°C for 20 min.
Optimum Reaction Temperature: 37°C
Unit Definition: One unit (U) is the amount of enzyme required to degrade 1 µg of λ DNA in a total reaction volume of 25 µl for 1 hour at 37°C.
Above specifications are for DNA Degradase™

Product	Cat. No.	Size
DNA Degradase™	E2016 E2017	500 U 2,000 U
DNA Degradase™ Plus	E2020 E2021	250 U 1,000 U

dsDNA Shearase™ Plus

Description:

dsDNA Shearase™ Plus is an endonuclease that cleaves phosphodiester bonds in DNA to yield oligonucleotides with 5′-phosphate and 3′-hydroxyl termini. It has a particularly strong preference for dsDNA and generates random-ended DNA fragments of the desired size in a single step. This enzyme is compatible with low volume inputs thus minimizing sample loss.

Specifications:

Provided with 5X dsDNA Shearase™ Plus Reaction Buffer.
Enzyme Concentration: 1 U/µl
Inactivation: 65°C for 5 min.
Optimum Reaction Temperature: 42°C
Standard Reaction Time: 20 min.
Unit Definition: One unit (U) is defined as the amount of enzyme required to convert 250 ng human DNA into fragments in the range of 100-500 bp in 20 minutes at 42°C in a total reaction volume of 10 µl.

Cat. No.	Size
E2018-50	50 U
E2018-200	200 U

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DNase I Set

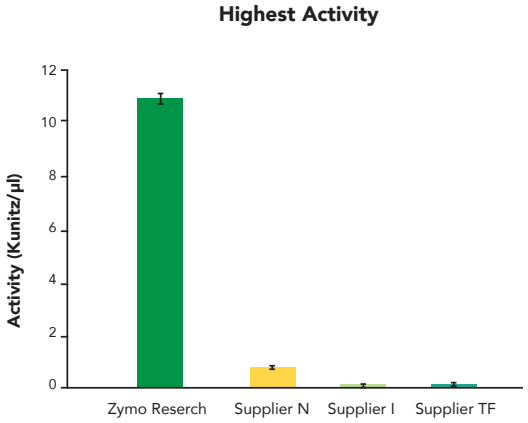
Recombinant, RNase-free and Protease-free

Highlights:

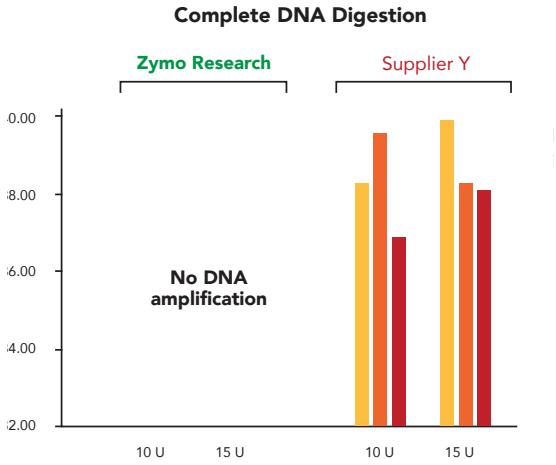
- **Highest Activity:** 10x faster at digesting DNA than the Market-Leading DNase I.
- **RNase-free and Protease-free:** Guaranteed to have no detectable RNases or proteases.
- **Exceptional Solubility and Stability:** Maintains activity and stability even after > 10 freeze-thaw cycles and vortexing for 3 minutes.

Description:

DNase I is an endonuclease that nonspecifically cleaves single- and double-stranded DNA. It requires divalent metal cations to be active.



Comparison of DNase I activity efficiency against commercial DNase I's with 150 µg of salmon sperm DNA at 25°C. Zymo Research DNase I is 10x faster at digesting DNA than Market-Leading DNases.



0.1-1 µg co-extracted DNA/RNA from HeLa cells treated with 5-15 U of DNase I from Zymo Research and a supplier Y. Zymo Research DNase I (10 U and 15 U) shows no DNA amplification from qPCR after treatment.

Specifications:

Lyophilized enzyme provided with DNA Digestion Buffer.
Heat Inactivation: 75 °C for 10 min with 5 mM EDTA.
Unit Definition: One Kunitz causes an increase in absorbance at 260 nm of 0.001 per minute per ml, at 25°C, pH 7.5, when acting on salmon sperm DNA according to the assay method of Kunitz. One Unit of DNase I is equivalent to 12 Kunitz.

Cat. No.	Size
E1010	250 U
E1011	1,500 U
E1012	5 x 1,500 U

RNase A

Description:

Pancreatic RNase A specifically cleaves at the 3′-side of pyrimidine (uracil or cytosine) phosphate bonds. The enzyme does not hydrolyze DNA, because DNA lacks 2′-OH groups essential for the formation of cyclic intermediates. The enzyme can also be used to hydrolyze RNA from protein samples. It is compatible for use in RNase protection assays, to remove unspecifically bound RNA, in the analysis of RNA sequences, to hydrolyze RNA contained in protein samples, and in the purification of DNA.

Specifications:

Lyophilized enzyme.
Enzyme Commission Number: (EC 3.1.27.5)
Source: Bovine Pancreas
Enzymatic Activity: 50 - 100 Kunitz units per mg protein.

Cat. No.	Size
E1008-30	30 mg

PureRec RNase A

Recombinant, DNase-free and Animal-free

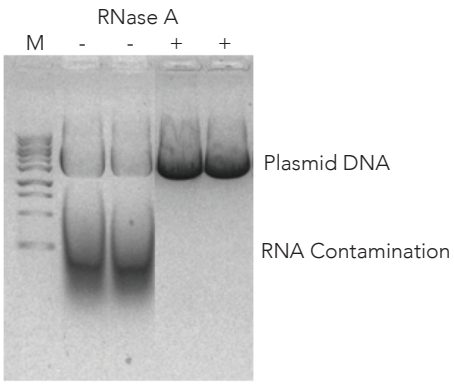
Highlights:

- Novel, tag-free & animal-free recombinant production, made in the USA.
- DNase-free and Protease-free.
- Bulk and custom size orders available.

Description:

PureRec RNase A is a recombinant RNase A, overexpressed and extensively purified from a prokaryotic host. It is extremely active, free of DNase and guaranteed animal-free. It is ready to use, supplied at 1mg/ml concentration.

Efficient RNA Removal in Plasmid Purification



Plasmid purified using a plasmid miniprep kit with or without PureRec RNase A added to the resuspension buffer (P1 buffer). When PureRec RNase A is added, there is no RNA contamination in the purified plasmid DNA. M: ZR 1 kb DNA marker (M5003-200). (-) No RNase A added to miniprep P1 buffer. (+) 100 µg/ml PureRec RNase A was added to P1 buffer.

Cat. No.	Size
E1019T	0.1 mg
E1019-5	5 mg
E1019-20	20 mg

Micrococcal Nuclease

Description:

Micrococcal Nuclease cleaves single-stranded and double-stranded DNA and RNA. Complete digestion with Micrococcal Nuclease yields mono- and oligonucleotides with 3′-phosphates.

Specifications:

Typical buffer consists of 20 mM Tris-HCl, (pH 8.8), 1 mM $CaCl_2$. $CaCl_2$ is essential for activity.
Enzyme Commission Number: (E.C. 3.1.31.1)
Enzyme Concentration: 0.1 U/µl
Optimum Reaction Temperature: 37°C
Unit Definition: One unit of the enzyme releases 1.0 A260 unit of acid-soluble products in 30 min at 37 °C.

Cat. No.	Size
D5220-1	10 U/100 µl

Zymo*Taq*™ DNA Polymerase

Description:

Zymo*Taq*™ DNA Polymerase contains all the reagents needed to perform "hot-start" PCR. The inclusion of a heat-activated, thermostable DNA polymerase reduces primer dimer and nonspecific product formation that can occur during PCR. This unique product is specifically designed for the amplification of bisulfite-treated DNA for methylation detection, but is applicable for conventional PCR. The product generates specific amplicons with little or no by-product formation. Simple and easy to use: Heat at 95°C for 10 minutes to initiate polymerization. Zymo*Taq*™ DNA Polymerase is a heat-activated, "hot start" polymerase that has 3′-terminal transferase activity. The addition of "A" overhangs to amplified DNA makes it ideal for use in TA-cloning.

Specifications:

Provided as a PreMix (E2003, E2004) or as a component of a set (E2001, E2002).
Source: Recombinant enzyme
Activity: 5′ - 3′ DNA polymerization
Optimum Reaction Temperature: 72°C
Unit Definition: One unit (U) is defined as the amount of enzyme required for the incorporation of 10 nM dNTPs into an acid-insoluble form in 30 minutes at 72°C.

Product	Cat. No.	Size
Zymo*Taq*™ DNA Polymerase	E2001 E2002	50 rxns 200 rxns
Zymo*Taq*™ PreMix	E2003 E2004	50 rxns 200 rxns

Proteinase K

Description:

Proteinase K is a stable serine protease with broad substrate specificity and will degrade many proteins in their native conformation even in the presence of detergents (e.g., SDS). The enzyme is frequently used in molecular biology applications to digest unwanted proteins such as nucleases from DNA and/or RNA preparations from microorganisms, cells, and plants.

Specifications:

Lyophilized enzyme provided with Proteinase K Storage Buffer.
Enzyme Commission Number: (EC 3.4.21.64)
Source: *Engyodontium album*
pH and Temperature Range: 4.0 to 12.0 (8.0 is optimum), 25 to 65°C.
Specific Activity: > 30 units/mg protein
Unit Definition: One unit (U) of enzyme will hydrolyze urea-denatured hemoglobin to produce 1.0 µmole of tyrosine per minute at pH 7.5 at 37°C.

Cat. No.	Size
D3001-2-5	5 mg
D3001-2-20	20 mg
D3001-2-60	60 mg
D3001-2-125	125 mg

Zymolyase

Description:

Digestion of yeast and fungal cell walls is necessary for many experimental procedures including spheroplasting, immunofluorescence, transformation, protein purification, and others. Lytic enzymes like Zymolyase are routinely used for digestion. The Zymolyase from Zymo Research is prepared from *Arthrobacter luteus* and is 100T equivalent. The storage buffer provided with the lyophilized enzyme has been optimized to confer maximal levels of enzymatic activity. R-Zymolyase also contains RNase A.

Specifications:

Lyophilized enzyme provided with Zymolyase Storage buffer.
Source: *Arthrobacter luteus*
Essential Enzyme: β-1,3-glucan laminaripentaohydrolase
Optimum pH and Temperature: pH 7.5, 35°C (lysis of viable yeast), pH 6.5, 45°C (hydrolysis of yeast glucan)
Unit Definition: One unit (U) of lytic activity is defined as the amount of enzyme that catalyzes a 10% decrease in optical density at 800 nm (OD800) in 30 minutes at 30°C.
Assay Condition: Yeast (OD800=0.8-1.0) in 50 mM potassium phosphate, pH 7.5, 10 mM 2-mercaptoethanol.

Product	Cat. No.	Size
Zymolyase	E1004 E1005	1,000 U 2,000 U
R-Zymolyase	E1006	1,000 U

Zymolyase Ultra

Highlights:

- **Ultra Efficient:** > 50 times more efficient than lyticase, works even at 4°C.
- **Ultra Low-Bioburden:** Up to 7000% less DNA contamination compared to other suppliers.
- **Exceptional Solubility & Stability:** Dissolves in seconds and stable for multiple freeze-thaw cycles.

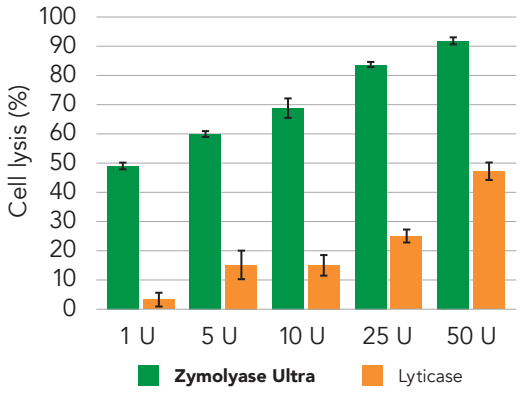
Description:

Zymolyase Ultra is a novel formula that is optimized for efficient yeast cell wall digestion. It contains enzymes that degrade several different components of yeast cell walls. It is extensively purified using a novel DNA/RNA removal technology that results in extremely low nucleic acid contamination.

Specifications:

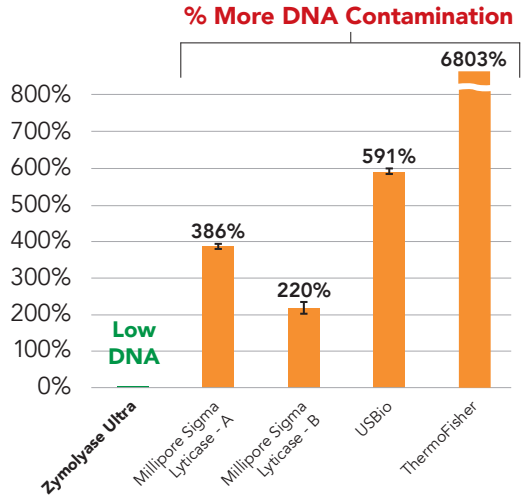
Lyophilized enzyme
Source: *Arthrobacter luteus*
Essential Enzyme: β-1,3-glucan laminaripentao-hydrolase, β-1,3-glucanase, β-1,6 glucanase, Chitinase
Optimum pH and Temperature: pH 7.3-8.0, 37°C
Unit Definition: One unit (U) of lytic activity is defined as the amount of enzyme that catalyzes a 10% decrease in optical density at 800 nm (OD800) in 30 minutes at 30°C.
Assay Condition: Yeast (OD800=0.8-1.0) in 50 mM potassium phosphate, pH 7.5, 10 mM 2-mercaptoethanol.

Over 50x More Efficient Than Lyticase!



1-50 U Zymolyase Ultra or Lyticase were used to test lysing 8 x 10^7 *C. albicans* cells at 37°C for 30 min.

Up to 7000% LESS DNA Contamination!



Bacterial and fungal DNA contamination was measured using Zymo Research Femto™ Bacterial DNA Quantification Kit (E2006) and Femto™ Fungal DNA Quantification Kit (E2007), respectively. The measurements were converted to genomic DNA copies/Unit enzyme in each assay and then combined for total DNA content.

Cat. No.	Size
E1007T	100 U
E1007-2	2,000 U
E1007-10	10,000 U

Antibiotics & Chemicals

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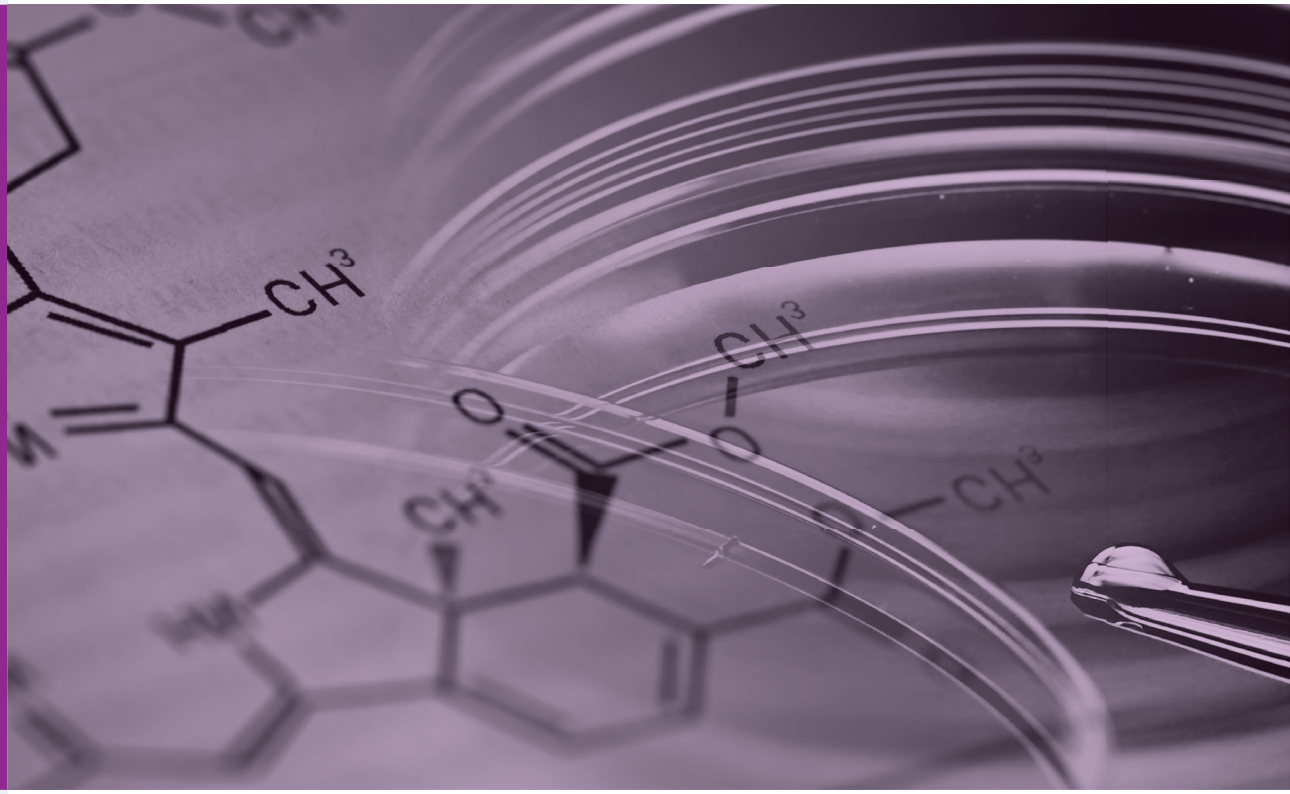
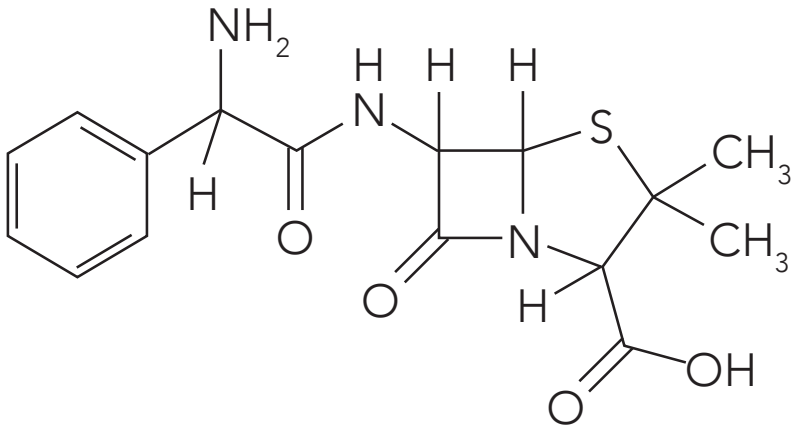


Zymo Research offers a range of premade, high-quality antibiotics and chemicals to satisfy your research needs. Our ready-to-use ampicillin (shown below), chloramphenicol, kanamycin, and tetracycline solutions are perfect for use in bacterial selection procedures.



Antibiotics

Chemicals

Antibiotic	Description	Resistance	Working Concentration (For *E. coli*)
Ampicillin (Ap)	For Gram (+) and (-) bacteria. Penicillin derivative that prevents bacterial cell wall synthesis.	Resistance to ampicillin is conferred by the bla gene which encodes β-lactamase that cleaves the β-lactam bond of the antibiotic.	20 - 100 µg/ml
Chloramphenicol (Cm)	For Gram (+) and (-) bacteria and some mycobacteria. Chloramphenicol inhibits bacterial protein synthesis by binding the 50S ribosomal subunit.	Resistance to chloramphenicol is conferred by the cat gene which encodes an acetyltransferase that acetylates and inactivates the antibiotic.	20 µg/ml
Kanamycin (Km)	For Gram (+) and (-) bacteria. Kanamycin binds to 70S ribosomes resulting in dysfunctional translation of mRNA.	Resistance to kanamycin is conferred by an aminoglycoside phosphotransferase that modifies the antibiotic, preventing its interaction with ribosomes.	30 µg/ml
Tetracycline (Tc)	For Gram (+) and (-) bacteria. Tetracycline inhibits bacterial protein synthesis by binding the 30S ribosomal subunit.	Resistance to tetracycline is conferred by the tet gene product that alters the bacterial cell membrane and transport of the antibiotic into the cell.	10 - 20 µg/ml

Antibiotics

Ampicillin Sodium

Premade ampicillin solution. Ampicillin inhibits bacterial cell wall synthesis. Commonly used to select for ampicillin-resistant plasmid-bearing strains of bacteria. Effective against both Gram (-) and Gram (+) bacteria.

Specifications:

- Purity: ≥ 98%
- Concentration: 100 mg/ml
- Storage: -20°C

Cat No.	Size
A1001-5	5 ml
A1001-25	5 x 5 ml

Chloramphenicol

Premade chloramphenicol solution. Chloramphenicol inhibits bacterial protein synthesis by binding the 50S ribosomal subunit. Commonly used for the amplification of vectors in Gram (-) bacteria. Effective against both Gram (-) and Gram (+) bacteria and some mycobacteria.

Specifications:

- Purity: ≥ 97%
- Concentration: 10 mg/ml
- Storage: -20°C

Cat No.	Size
A1002-5	5 ml
A1002-25	5 x 5 ml

Kanamycin Sulfate

Premade kanamycin solution. Kanamycin inhibits bacterial protein synthesis by binding 70S ribosomes, resulting in dysfunctional translation of mRNA commonly used to select for cosmid vectors. Effective against both Gram (-) and Gram (+) bacteria.

Specifications:

- Purity: ≥ 98%
- Concentration: 35 mg/ml
- Storage: -20°C

Cat No.	Size
A1003-5	5 ml
A1003-25	5 x 5 ml

Tetracycline Hydrochloride - Reagent Grade

Premade tetracycline solution. Tetracycline inhibits bacterial protein synthesis by binding the 30S ribosomal subunit. Effective against both Gram (-) and Gram (+) bacteria.

Specifications:

- Purity: ≥ 98%
- Concentration: 10 mg/ml
- Storage: -20°C

Cat No.	Size
A1004-5	5 ml
A1004-25	5 x 5 ml

Chemicals

500x L-Arabinose

Concentrated arabinose inducer for XJ Autolysis™ *E. coli* strains.

Specifications:

- Concentration: 500X; 1.5 M L-arabinose, 0.5 M $MgCl_2$
- Storage: -20°C

Cat No.	Size
A2001-1	1 ml
A2001-10	10 x 1 ml

His-Affinity Gel

Nickel affinity gel used for the purification of histidine-tagged proteins. 6% beaded agarose. ≥ 15 mg/ml protein binding capacity. See His-Spin Protein Miniprep™, p. 286, for details.

Specifications:

- Concentration: 50% suspension in 30% ethanol
- Storage: 4°C

Cat No.	Size
P2003-2	14 ml

IPTG (Isopropyl-β-D-thiogalactopyranoside)

Premade IPTG in water. Formulated for optimal inactivation of the lac repressor. Used in conjunction with X-Gal for blue-white colony screening or by itself to induce expression of recombinant genes under control of the lac operon in *E. coli*.

Specifications:

- Purity: ≥ 98%
- Concentration: 0.5 M
- Storage: -20°C

Cat No.	Size
I1001-5	5 ml
I1001-25	5 x 5 ml

X-Gal (5-bromo-4-chloro-3-indolyl β-D-galactopyranoside)

Sterile, ready-to-use X-Gal solution. Minimizes false positives during blue-white colony screening and generates a rich blue color in *E. coli*.

Specifications:

- Concentration: 2% w/v in DMF
- Storage: -20°C

Cat No.	Size
X1001-5	5 ml
X1001-25	5 x 5 ml

Devices & Instruments

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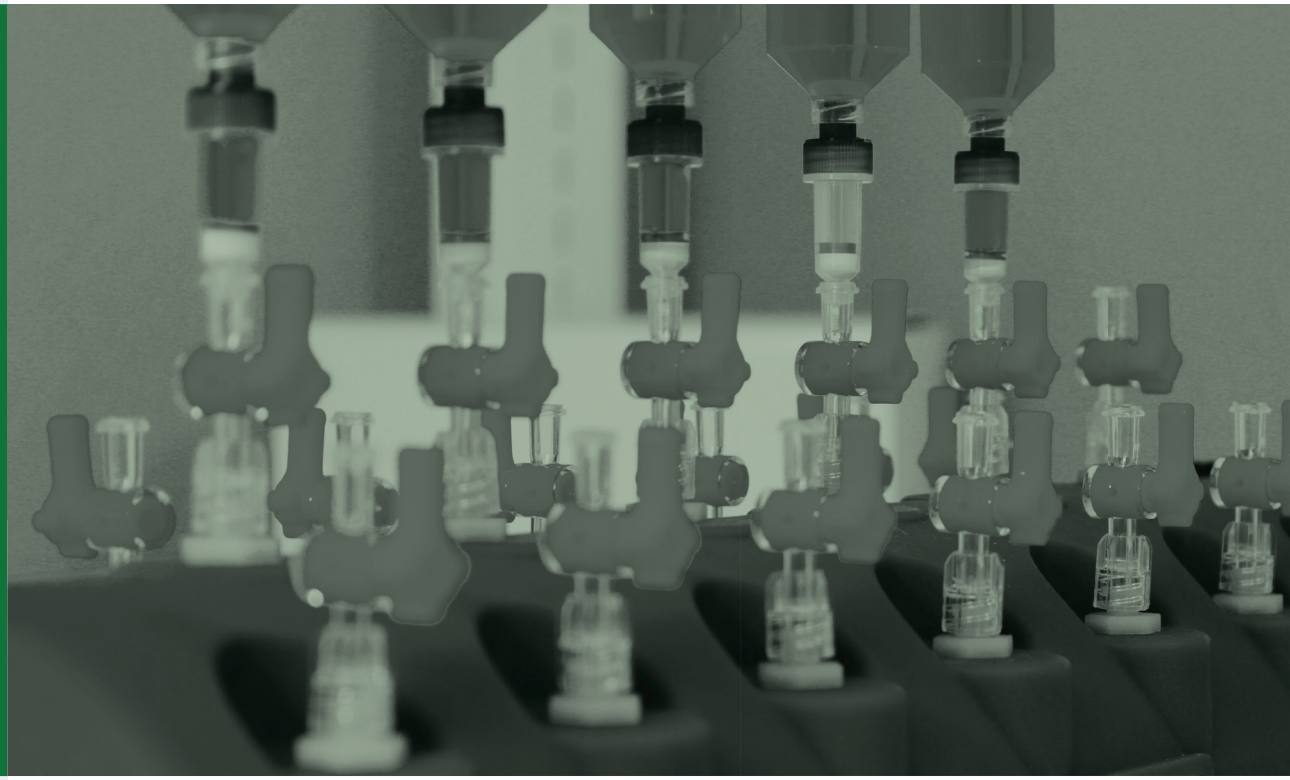
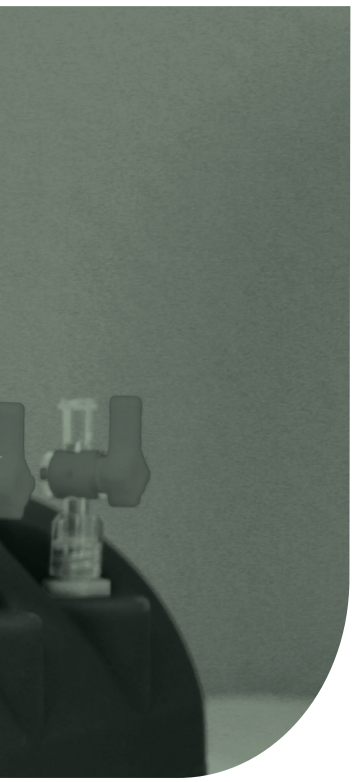


The nucleic acid binding columns are vital components of the kits presented in preceding chapters. Most of these columns, plates, filters, tubes, and other accessories can be purchased separately and are highlighted in this chapter.

Column design is crucial to the quality of eluted nucleic acid. Zymo Research's Zymo-Spin™ series of columns and plates are uniquely designed to make high yield recovery of DNA and RNA simple, fast, and reliable. The columns and plates contain silica-based matrices of exclusive chemical composition, which are optimized for maximal adsorption of DNA and/or RNA, and can efficiently remove contaminants during the purification process. Zymo-Spin™ technology ensures rapid and complete filtration of solutions through the column matrix, eliminating the likelihood of buffer carryover.

For instance, our innovative Zymo-Spin™ I column has zero retention volume and an elution volume as low as 6 µl, something no other supplier can claim. Likewise, the Zymo-Spin™ I-96 plate integrates our existing Zymo-Spin™ I column technology into a durable 96-well format that can be used for simple, rapid cleaning and concentration of nucleic acids in centrifugation based protocols. Other Zymo-Spin™ columns are designed for processing larger samples and binding greater amounts of nucleic acids, but the principle is the same: high-quality, high-yield DNA or RNA.

ZR BashingBead™ Lysis Tubes and ZR-96 BashingBead™ Lysis Racks may be purchased separately. Additionally, we carry cell disruptors and accessories from several manufacturers. Each of these machines can be used for easy and efficient cell lysis with the ZR BashingBead™ products. For manual homogenization of tissues, Zymo Research offers Squisher™ homogenization devices in single, 8-well, and 96-well formats. These homogenizers can be cleaned and reused for the simple, efficient processing of tissue samples, such as liver, brain, mouse tail snips, Drosophila, other insects, etc.



Technology Overview: Zymo-Spin™ Columns

Zymo-Spin™ I Columns



Name	Zymo-Spin™ I	Zymo-Spin™ IC	Zymo-Spin™ IC-XL	Zymo-Spin™ IC-S
Format	DNA/RNA binding	DNA/RNA binding	DNA/RNA binding	DNA binding
DNA Binding Capacity / RNA Binding Capacity	5 µg / 10 µg	5 µg / 10 µg	10 µg	5 µg
Elution	≥ 6 µl	≥ 6 µl	10 µl	6 µl
Compatibility	microcentrifuge	microcentrifuge vacuum manifold	microcentrifuge,	microcentrifuge
Matrix / Construction	silica-based / polypropylene	silica-based / polypropylene	silica-based / polypropylene	silica-based / polypropylene
Cat. No. / Size	C1003-50 – 50 pack C1003-250 – 250 pack	C1004-50 – 50 pack C1004-250 – 250 pack	C1002-25 – 25 pack C1002-50 – 50 pack	C1015-25 – 25 pack C1015-50 – 50 pack

Zymo-Spin™ II Columns




Name	Zymo-Spin™ II	Zymo-Spin™ IIC	Zymo-Spin™ IIN	Zymo-Spin™ IIC-XL
Format	DNA/RNA binding	DNA/RNA binding	DNA/RNA binding	DNA/RNA binding
DNA Binding Capacity / RNA Binding Capacity	25 µg / 50 µg	25 µg / 50 µg	25 µg / 50 µg	25 µg / 50 µg
Elution	≥ 25 µl	≥ 25 µl	≥ 25 µl	≥ 35 µl
Compatibility	microcentrifuge	microcentrifuge, vacuum manifold	microcentrifuge, vacuum manifold	microcentrifuge, vacuum manifold
Matrix / Construction	silica-based / polypropylene	silica-based / polypropylene	silica-based / polypropylene	silica-based / polypropylene
Cat. No. / Size	C1008-50 – 50 pack C1008-250 – 250 pack	C1011-50 – 50 pack C1011-250 – 250 pack	C1019-50 – 50 pack C1019-250 – 250 pack	C1102-25 – 25 pack C1102-50 – 50 pack

Zymo-Spin™ III Columns


Name	Zymo-Spin™ III	Zymo-Spin™ IIICG
Format	DNA/RNA binding	DNA/RNA binding
DNA Binding Capacity / RNA Binding Capacity	25 µg / 100 µg	25 µg / 100 µg
Elution	≥ 50 µl	≥ 50 µl
Compatibility	microcentrifuge, vacuum manifold	microcentrifuge, vacuum manifold
Matrix / Construction	silica-based / polypropylene	silica-based / polypropylene
Cat. No. / Size	C1005-50 – 50 pack C1005-250 – 250 pack	C1006-50-G – 50 pack C1006-250-G – 250 pack

Zymo-Spin™ III and IV Columns



Name	Zymo-Spin™ III-F	Zymo-Spin™ III-HRC	Zymo-Spin™ IV
Format	filtration column	DNA/RNA inhibitor removal filtration column	filtration column
Volumetric Capacity	800 ul	50 - 200 ul	700 µl
Compatibility	microcentrifuge, vacuum manifold	microcentrifuge, vacuum manifold	microcentrifuge, vacuum manifold
Matrix / Construction	proprietary/polypropylene, attached snap cap	polyethylene-based with 55 - 120 µm pore size, PCR/RT inhibitor removal resin / polypropylene, attached snap cap	silica-based with 10-20 µm pore size / polypropylene, snap off base, sealable screw cap
Cat. No./Size	C1057-50 – 50 pack	C1058-50 – 50 pack	C1007-50 – 50 pack C1007-250 – 250 pack

Zymo-Spin™ V Columns


Name	Zymo-Spin™ V	Zymo-Spin™ V-E
Format	DNA/RNA binding	DNA/RNA binding
DNA Binding Capacity / RNA Binding Capacity	100 µg DNA/100 µg RNA	125 µg / 250 µg
Elution	≥ 100 µl	≥ 100 µl
Compatibility	microcentrifuge, centrifuge, vacuum manifold	microcentrifuge, centrifuge, vacuum manifold, syringe (luer-lok top)
Matrix / Construction	silica-based / polypropylene	silica-based / polypropylene
Cat. No. / Size	C1012-25 – 25 pack C1012-50 – 50 pack	C1024-25 – 25 pack C1024-50 – 50 pack

Zymo-Spin™ VI Columns


Name	Zymo-Spin™ VI	Zymo-Spin™ VI-P
Format	DNA binding	Plasmid DNA binding
Binding Capacity / Elution	500 µg / ≥ 2 ml	10 mg / ≥ 2 ml
Compatibility	centrifuge, vacuum manifold, luer-lok bottom assembly	centrifuge, vacuum manifold, luer-lok bottom assembly
Matrix / Construction	silica-based / polypropylene	silica-based / polypropylene
Cat. No. / Size	C1013-10 – 10 pack C1013-20 – 20 pack	C1044-5 – 5 pack

Zymo-Spin™ I

The Zymo-Spin™ I column can be used in microcentrifuges for the purification of DNA and/or RNA. The Zymo-Spin™ I features durable polypropylene construction and contains a unique silica-based matrix that allows purification of up to 5 µg of DNA, and 10 µg of RNA, in ≥ 6 µl eluate. Capacity is 800 µl.

Cat. No.	Size
C1003-50	50 pack
C1003-250	250 pack

Zymo-Spin™ IC

Capped version of the Zymo-Spin™ I column. The Zymo-Spin™ IC column can be used in microcentrifuges for the purification of DNA and/or RNA. The Zymo-Spin™ IC features durable polypropylene construction and contains a unique silica-based matrix that allows purification of up to 5 µg of DNA, and 10 µg of RNA, in ≥ 6 µl eluate. Capacity is 800 µl.

Cat. No.	Size
C1004-50	50 pack
C1004-250	250 pack

Zymo-Spin™ IC-XL

The Zymo-Spin™ IC-XL column can be used either in microcentrifuges or on vacuum manifolds for the purification of DNA and/or RNA. The Zymo-Spin™ IC-XL features durable polypropylene construction and contains a unique silica-based matrix that allows purification of up to 10 µg of DNA in ≥ 10 µl eluate. Capacity is 1 ml.

Cat. No.	Size
C1002-25	25 pack
C1002-50	50 pack

Zymo-Spin™ IC-S

The Zymo-Spin™ IC-S column can be used in microcentrifuges for the purification of DNA and/or RNA and fluorescent dye removal. The Zymo-Spin™ IC-S features durable polypropylene construction and contains a unique silica-based matrix that allows purification of up to 5 µg of DNA in ≥ 10 µl eluate. Capacity is 900 µl.

Cat. No.	Size
C1015-25	25 pack
C1015-50	50 pack

Zymo-Spin™ IB

The black, opaque Zymo-Spin™ IB column can be used in microcentrifuges for the purification of DNA and/or RNA and fluorescent dye removal. The Zymo-Spin™ IB features durable polypropylene construction and contains a unique silica-based matrix that allows purification of up to 5 µg of DNA in ≥ 6 µl eluate. Capacity is 800 µl.

Cat. No.	Size
C1014-50	50 pack
C1014-250	250 pack

Zymo-Spin™ PI

The Zymo-Spin™ PI column features durable polypropylene construction and is the same column featured in the His-Spin Protein Miniprep™. Capacity is 800 µl. Note: Column only, does not contain His-Affinity Gel.

Cat. No.	Size
P2003-1	50 pack

Zymo-Spin™ II

The Zymo-Spin™ II column features durable polypropylene construction and contains a unique silica-based matrix that allows purification of up to 25 µg of DNA, and 50 µg of RNA, in ≥ 25 µl eluate. Capacity is 800 µl.

Cat. No.	Size
C1008-50	50 pack
C1008-250	250 pack

Zymo-Spin™ IIC

The Zymo-Spin™ IIC column can be used either in microcentrifuges or on vacuum manifolds for the purification of DNA and/or RNA. The Zymo-Spin™ IIC features durable polypropylene construction and contains a unique silica-based matrix that allows purification of up to 25 µg of DNA, and 50 µg of RNA, in ≥ 25 µl eluate. Capacity is 900 µl.

Cat. No.	Size
C1011-50	50 pack
C1011-250	250 pack

Zymo-Spin™ II-PX

Available as a refill for the ZymoPURE Plasmid Miniprep Kit. The versatile Zymo-Spin II-PX column can be used in microcentrifuges or on vacuum manifolds for the purification of plasmid DNA. The Zymo-Spin II-PX features durable polypropylene construction and a unique silica-based matrix that allows for purification of up to 100 µg of plasmid DNA in ≥ 25 µl eluate when used in combination with ZymoPURE Plasmid Prep buffers. Capacity is 800 µl.

Cat. No.	Size
C1086-50	50 pack

Zymo-Spin™ IIC-XL

The Zymo-Spin™ IIC-XL column can be used either in microcentrifuges or on vacuum manifolds for the purification of high molecular weight DNA and/or RNA. The Zymo-Spin™ IIC-XL features durable polypropylene construction and contains a unique silica-based matrix that allows purification of up to 25 µg of DNA, and 50 µg of RNA, in ≥ 35 µl eluate. Capacity is 900 µl.

Cat. No.	Size
C1102-25	25 pack
C1102-50	50 pack

Zymo-Spin™ IIN

The Zymo-Spin™ IIN column can be used either in microcentrifuges or on vacuum manifolds for the purification of DNA and/or RNA. The Zymo-Spin™ IIN features durable polypropylene construction and contains a unique silica-based matrix that allows purification of up to 25 µg of DNA, and 50 µg of RNA, in ≥ 25 µl eluate. Capacity is 900 µl.

Cat. No.	Size
C1019-50	50 pack
C1019-250	250 pack

Zymo-Spin™ III

The Zymo-Spin™ III column can be used either in microcentrifuges or on vacuum manifolds for the purification of DNA and/or RNA. The Zymo-Spin™ III features durable polypropylene construction and contains a unique silica-based matrix that allows purification of up to 25 µg of DNA, and 100 µg of RNA, in ≥ 50 µl eluate. Capacity is 800 µl.

Cat. No.	Size
C1005-50	50 pack
C1005-250	250 pack

Zymo-Spin™ IIICG

Capped version of the Zymo-Spin™ III column with a green retention ring. The Zymo-Spin™ IIICG column can be used either in microcentrifuges or on vacuum manifolds for the purification of DNA and/or RNA. The Zymo-Spin™ IIICG features durable polypropylene construction and contains a unique silica-based matrix that allows purification of up to 25 µg of DNA, and 100 µg of RNA, in ≥ 50 µl eluate. Capacity is 800 µl.

Cat. No.	Size
C1006-50-G	50 pack
C1006-250-G	250 pack

Zymo-Spin™ III-F

The Zymo-Spin™ III-F is a durable polypropylene filtration column that features an attached snap cap. It is ideal for clarifying solutions, including crude cell lysates and homogenates. Capacity is 800 µl.

Cat. No.	Size
C1057-50	50 pack

Zymo-Spin™ IV-IR HRC Filters

The Zymo-Spin™ IV-IR HRC Filter is a durable polypropylene filtration column filled with a unique matrix that features an attached snap cap. It is ideal for removing PCR/RT inhibitors including polyphenols, humic acids and fulvic acids from DNA/RNA preparations derived from water or soil microbes. Capacity is 50 - 200 µl.

Cat. No.	Size
C1010-50	50 pack

Zymo-Spin™ IV

The Zymo-Spin IV™ is a durable polypropylene filtration column that features a unique snap-off base and sealable orange screw cap. It is ideal for clarifying solutions, including crude cell lysates and homogenates. The silica filtration membrane has an approximate 10 - 20 µm pore size. Capacity is 700 µl.

Cat. No.	Size
C1007-50	50 pack
C1007-250	250 pack

Zymo-Spin™ V

The versatile Zymo-Spin™ V column can be used either in microcentrifuges, centrifuges, or on-vacuum manifolds for the purification of DNA. The Zymo-Spin™ V features durable polypropylene construction and contains a unique silica-based matrix that allows purification of up to 100 µg DNA or RNA in ≥ 150 µl eluate. Capacity is 800 µl.

Cat. No.	Size
C1012-25	25 pack
C1012-50	50 pack

Zymo-Spin™ V-E

The versatile Zymo-Spin™ V-E column can be used either in microcentrifuges, centrifuges, or on-vacuum manifolds for the purification of DNA and/or RNA. This column features a luer-lok top allowing it to be easily attached to a syringe, reservoir, or prefilter. The Zymo-Spin™ V-E features durable polypropylene construction and contains a unique silica-based matrix for the purification of up to 125 µg DNA or 250 µg RNA in ≥ 100 µl elution buffer or water. The capacity of the spin column is 400 µl.

Cat. No.	Size
C1024-25	25 pack
C1024-50	50 pack

Zymo-Spin™ VI

The versatile Zymo-Spin™ VI column can be used either in centrifuges or on-vacuum manifolds for the purification of DNA. Exclusive to this column is a luer-lok bottom assembly. The Zymo-Spin™ VI features durable polypropylene construction and contains a unique silica-based matrix that allows purification of up to 500 µg DNA in ≥ 2 ml eluate. Capacity is 15 ml.

Cat. No.	Size
C1013-10	10 pack
C1013-20	20 pack

Zymo-Spin™ VI-P

Available as a refill for the ZymoPURE™ II Plasmid Gigaprep Kit. The Zymo-Spin™ VI-P can be used in centrifuges or on vacuum manifolds for the purification of plasmid DNA. Exclusive to this column is a Luer-Lock bottom assembly and conical tip. The Zymo-Spin™ VI-P features durable polypropylene construction and a unique silica-based matrix that allows for purification of up to 10 mg of plasmid DNA in ≥ 2 ml eluate when used in combination with ZymoPURE™ Plasmid buffers. Capacity is 15 ml and can be increased to 615 ml when used in conjunction with the 600 ml reservoir (Cat No. C1033-5).

Cat. No.	Size
C1044-5	5 pack

Zymo-Spin™ VI-PX

Available as a refill for the ZymoPURE II Plasmid Gigaprep Kit. The versatile Zymo-Spin VI-PX can be used in centrifuges or on vacuum manifolds for the purification of plasmid DNA. Exclusive to this column is a Luer-Lock bottom assembly and conical tip. The Zymo-Spin VI-PX features durable polypropylene construction and a unique silica-based matrix that allows for purification of up to 25 mg of plasmid DNA in ≥ 3 ml eluate when used in combination with ZymoPURE Plasmid Prep buffers. Capacity is 15 ml and can be increased to 615 ml when used in conjunction with the 600 ml reservoir (Cat No. C1033-5).

Cat. No.	Size
C1080-5	5 pack

Collection/Filter Assemblies

Zymo-Spin™ III-P with 15 ml and 50 ml Reservoir

Available as a refill for the ZymoPURE™ II Plasmid Midiprep Kit. The versatile Zymo-Spin™ III-P with 15 ml conical and 50 ml reservoirs can be used in centrifuges or on vacuum manifolds for the purification of plasmid DNA. The Zymo-Spin™ III-P features durable polypropylene construction and a unique silica-based matrix that allows for purification of up to 400 µg of plasmid DNA in ≥ 100 µl eluate when used in combination with ZymoPURE™ Plasmid buffers. Capacity with reservoir assembly is 65 ml.

Cat. No.	Size
C1040-5	5 pack

Zymo-Spin™ V with Reservoir

The Zymo-Spin™ V with Reservoir assembly can be used in conjunction with centrifuges and on vacuum manifolds for the purification of DNA. The spin-column and reservoir feature durable polypropylene construction, and features a unique silica-based matrix for the purification of up to 100 µg DNA in ≥ 150 µl elution buffer or water. Capacity of the spin column with reservoir is 15 ml.

Cat. No.	Size
C1016-25	25 pack
C1016-50	50 pack

Zymo-Spin™ V-P with 15 ml and 50 ml Reservoir

Available as a refill for the ZymoPURE™ II Plasmid Maxiprep Kit. The versatile Zymo-Spin™ V-P with 15 ml conical and 50 ml reservoirs can be used in centrifuges or on-vacuum manifolds for the purification of plasmid DNA. The Zymo-Spin™ V-P features durable polypropylene construction and a unique silica-based matrix that allows for purification of up to 1.2 mg of plasmid DNA in ≥ 200 µl eluate when used in combination with ZymoPURE™ Plasmid buffers. Capacity with reservoir assembly is 65 ml.

Cat. No.	Size
C1042-5	5 pack

Zymo-Spin™ V-PX with 15 ml and 50 ml Reservoir

Available as a refill for the ZymoPURE II Plasmid Maxiprep Kit. The versatile Zymo-Spin V-PX with 15 ml Reservoir-X and 50 ml reservoirs can be used in centrifuges or on vacuum manifolds for the purification of plasmid DNA. The Zymo-Spin V-PX features durable polypropylene construction and a unique silica-based matrix that allows for purification of up to 3 mg of plasmid DNA in ≥ 300 µl eluate when used in combination with ZymoPURE Plasmid Prep buffers. Capacity with reservoir assembly is 65 ml.

Cat. No.	Size
C1082-5	5 pack

Zymo-Spin™ V-PS with 15 ml and 50 ml Reservoir

Available as a refill for the ZymoPURE II Plasmid Midiprep and ZymoPURE – Express Plasmid Midiprep Kits. The versatile Zymo-Spin V-PS with 15 ml Reservoir-X and 50 ml reservoirs can be used in centrifuges or on vacuum manifolds for the purification of plasmid DNA. The Zymo-Spin V-PS features durable polypropylene construction and a unique silica-based matrix that allows for purification of up to 1.2 mg of plasmid DNA in ≥ 150 µl eluate when used in combination with ZymoPURE Plasmid Prep buffers. Capacity with reservoir assembly is 65 ml.

Cat. No.	Size
C1083-5	5 pack

Zymo-Spin™ V-E with Zymo Midi Filter™

The Zymo-Spin™ V-E with Zymo Midi Filter™ assembly can be used in conjunction with centrifuges and on-vacuum manifolds for the purification of DNA and/or RNA. The spin-column and filter feature durable polypropylene construction. The spin-column features a unique silica-based matrix for the purification of up to 125 µg DNA or 250 µg RNA in ≥ 100 µl elution buffer or water. The capacity of the spin-column with filter is 15 ml.

Cat. No.	Size
C1021-25	25 pack

Zymo-Spin™ VI with Reservoir

The Zymo-Spin™ VI with Reservoir assembly can be used with vacuum manifolds for the purification of DNA. The spin-column and reservoir feature durable polypropylene construction. The spin-column features a unique silica-based matrix for the purification of up to 500 µg DNA in ≥ 2 ml elution buffer or water. The capacity of the spin-column with filter is 75 ml.

Cat. No.	Size
C1018-10	10 pack
C1018-20	20 pack

Zymo-Spin™ VI with Zymo Maxi Filter™

The Zymo-Spin™ VI with Zymo Maxi Filter™ assembly can be used with vacuum manifolds for the purification of DNA. The spin-column and filter feature durable polypropylene construction. The spin-column features a unique silica-based matrix for the purification of up to 500 µg DNA in ≥ 2 ml elution buffer or water. The capacity of the spin-column with filter is 75 ml.

Cat. No.	Size
C1017-10	10 pack
C1017-20	20 pack

ZymoPURE™ Syringe Filter and Plunger Set

The ZymoPURE™ Syringe Filter features durable polypropylene construction and novel filtration media that allows for rapid clarification of up to 60 ml of neutralized bacterial lysate using the supplied polypropylene plunger. Each ZymoPURE™ Syringe Filter also includes a pre-attached ABS Luer-Lock plug in order to keep the tip clean and free from leaking during processing. Syringe filters and plungers are non-sterile and coated with silicone lubricant for easier handling.

Cat. No.	Size
C1036-5	5 pack

ZymoPURE™ Giga Filter

The ZymoPURE™ Giga Filter features durable polypropylene construction and novel filtration media that allows for rapid clarification of up to 500 ml of neutralized bacterial lysate using a vacuum source. The ZymoPURE™ Giga Filter also has a uniquely designed fitting that permits use with either 33 mm or 45 mm-neck glass bottles. Filter units are non-sterile and include a polypropylene cap for the reservoir.

Cat. No.	Size
C1038-1	1 pack

ZRC-GF Filter™

The ZRC-GF Filter™ syringe filter features durable polypropylene construction and contains a 1.6 µm pore size glass fiber filtration membrane. The filter is ideal for separating the cellular component from biological liquids (e.g., urine) and is the same filter featured in the ZR Urine RNA Isolation kit.

Cat. No.	Size
C1009-20	20 pack
C1009-50	50 pack

Reservoirs

15 ml Conical Reservoir

The 15 ml Reservoir, used in conjunction with a luer-lock column, can be used for the purification of DNA and/or RNA. The reservoir features durable polypropylene construction. The volume capacity of the reservoir is 15 ml.

Cat. No.	Size
C1031-25	25 pack

50 ml Conical Reservoir

The 50 ml Reservoir, used in conjunction with a luer-lock column, can be used with vacuum manifolds for the purification of DNA and/or RNA. The reservoir is designed to ensure no liquid is left behind during processing. The reservoir features durable polypropylene construction. The volume capacity of the reservoir is 50 ml.

Cat. No.	Size
C1032-25	25 pack

600 ml Reservoir

The 600 ml Reservoir, used in conjunction with a luer-lock column, can be used with vacuum manifolds for the purification of DNA and/or RNA. The large volume capacity is perfect for large-scale purification such as plasmid Gigapreps (e.g. ZymoPURE™ Gigaprep). The reservoir is designed to ensure no liquid is left behind during processing. The reservoir features durable polypropylene construction. The volume capacity of the reservoir is 600 ml.

Cat. No.	Size
C1033-5	5 pack

Tubes

Collection Tube (2.0 ml)

Durable polypropylene collection tube that is used in conjunction with the Zymo-Spin™ columns (i.e., Zymo-Spin™ I through Zymo-Spin™ V). Capacity is 2 ml.

Cat. No.	Size
C1001-50	50 tubes
C1001-500	500 tubes
C1001-1000	1000 tubes

DNase/RNase-free Tube (1.5 ml)

DNase/RNase-free 1.5 ml microcentrifuge tubes made of durable polypropylene construction.

Cat. No.	Size
C2001-50	50 tubes
C2001-100	100 tubes

Clear Tubes (2.0 ml)

Clear 2.0 ml skirted tubes made of durable polypropylene construction. Available as V-bottom or U-bottom tubes provided with caps.

	Cat. No.	Size
V-bottom	C1025-50	50 tubes
	C1025-500	500 tubes
U-bottom	C1027-50	50 tubes
	C1027-500	500 tubes

Amber Tubes (2.0 ml)

Amber 2.0 ml skirted tubes made of durable polypropylene construction. Available as V-bottom or U-bottom tubes provided with caps.

	Cat. No.	Size
V-bottom	C1026-50	50 tubes
	C1026-500	500 tubes
U-bottom	C1028-50	50 tubes
	C1028-500	500 tubes

ZR BashingBead™ Lysis Tubes (2.0 mm)

Each impact resistant 2 ml tube contains 0.7 ml (dry volume) 2.0 mm BashingBeads™. The state of the art, ultra-high density beads are fracture resistant, chemically inert, and ideal for disrupting tough-to-lyse biological tissues, insects, plant material, etc.

Cat. No.	Size
S6003-50	50 pack

ZR BashingBead™ Lysis Tubes (mixed 0.1mm & 0.5 mm)

Each impact resistant 2 ml tube contains 0.6 ml (dry volume) mixed 0.1 & 0.5 mm BashingBeads™. The state of the art, ultra-high density beads are fracture resistant, chemically inert, and ideal for disrupting tough-to-lyse biological samples, such as microbes and fungi in soil, feces, sludge, etc.

Cat. No.	Size
S6012-50	50 pack

DNA Affinity Beads

MagBinding Beads

Paramagnetic DNA affinity matrix. Featured in Zyppy™ 96 Plasmid MagBead Miniprep and EZ DNA Methylation™ Magpreps.

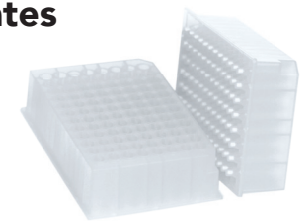
Cat. No.	Size
D4100-2-6	6 ml
D4100-2-8	8 ml
D4100-2-12	12 ml
D4100-2-16	16 ml
D4100-2-24	24 ml

Technology Overview: Zymo-Spin™ Plates

Silicon-A™ Plates

Name	Silicon-A™ Plate
DNA/RNA Capacity	DNA/RNA binding - up to 5 µg of DNA, and 10 µg of RNA, per well
Capacity / Elution	600 µl per well / ≥ 30 µl
Dimensions (HxWxL)	19 mm x 83 mm x 125 mm
Compatibility	centrifuge
Matrix / Construction	silica-based / polypropylene
Cat. No./Size	C2001 – 2 plates

Zymo-Spin™ I-96 Plates



Name	Zymo-Spin™ I-96 Plate	Zymo-Spin™ I-96 Shallow Well Plate
Format	DNA/RNA binding - up to 5 µg of DNA, and 10 µg of RNA	DNA/RNA binding - up to 5 µg of DNA, and 10 µg of RNA
Capacity / Elution	1.1 ml per well / ≥ 10 µl	600 µl per well / ≥ 10 µl
Dimensions (HxWxL)	35 mm x 83 mm x 125 mm	19 mm x 83 mm x 125 mm
Compatibility	centrifuge	centrifuge
Matrix / Construction	silica-based / polypropylene	silica-based / polypropylene
Cat. No./Size	C2004 – 2 plates	C2004-SW – 2 plates

Zymo-Spin™ IB-96 Plates

Zymo-Spin™ I-96-XL Plates

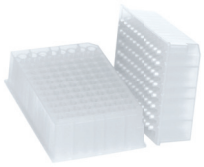
Name	Zymo-Spin™ IB-96 Plate	Zymo-Spin™ I-96-XL Plate
Format	DNA binding - up to 5 µg of DNA per well	DNA binding - up to 5 µg of DNA per wellA
Capacity / Elution	600 µl per well / ≥ 15 µl	1.1 ml per well / ≥ 15 µl
Dimensions (HxWxL)	19 mm x 83 mm x 125 mm	35 mm x 83 mm x 125 mm
Compatibility	centrifuge	centrifuge
Matrix / Construction	silica-based / polypropylene	silica-based / polypropylene
Cat. No. / Size	C2006 – 2 plates	C2010 – 2 plates

96-Well Plates, Blocks, & Racks

Silicon-A™ Plate

The Silicon-A™ Plate can be used in centrifuges for the large scale (i.e., 96-well) purification of DNA and/or RNA. Its low-profile, durable polypropylene construction and unique silica-based matrix make it perfect for purifying up to 5 µg of DNA, and 10 µg of RNA, in ≥ 30 µl eluate per well. Capacity is 600 µl per well.

Cat. No.	Size
C2001	2 plates



Zymo-Spin™ I-96 Plate

The Zymo-Spin I-96™ Plate can be used in centrifuges for the large-scale (i.e., 96-well) purification of DNA and/or RNA. Its durable polypropylene construction and unique silica-based matrix make it perfect for purifying up to 5 µg of DNA, and 10 µg of RNA, in ≥ 10 µl eluate per well. Capacity is 1.1 ml (C2004) or 600 µl (C2004-SW) per well.

Cat. No.	Size
C2004	2 plates
C2004-SW	2 plates

Zymo-Spin™ IB-96 Plate

The Zymo-Spin™ IB-96 Plate can be used in centrifuges for large-scale (i.e., 96-well) purification of DNA and/or RNA. Its low-profile, durable polypropylene construction and unique silica-based matrix make it perfect for purifying up to 5 µg of DNA in ≥ 15 µl/well elution buffer or water. Opaque black in color. Capacity is 600 µl per well.

Cat. No.	Size
C2006	2 plates

Zymo-Spin™ I-96-XL Plate

The Zymo-Spin™ I-96-XL Plate can be used in centrifuges for the large-scale (i.e., 96-well) purification of high molecular weight DNA. Its deep-well, durable polypropylene construction and unique silica-based matrix make it perfect for purifying up to 5 µg of DNA in ≥15 µl eluate per well. Capacity is 1.1 ml per well.

Cat. No.	Size
C2010	2 plates

Zymo-Spin™ P-96 Plate

Available as a ZymoPURE™ 96 Plasmid Miniprep Kit refill, the Zymo-Spin P-96 Plate facilitates large-scale (96-well) plasmid DNA purification with durable polypropylene construction. Its unique silica-based matrix enables purification of up to 100 µg of plasmid DNA in ≥ 50 µl eluate when used with ZymoPURE™ Plasmid Prep buffers. The well has a capacity of 1.1 mL.

Cat. No.	Size
C2023	2 plates

ZymoPURE™ Filter Plate

Available as a refill for the ZymoPURE™ 96 Plasmid Miniprep Kit, the ZymoPURE™ Filter Plate can be employed with centrifuges and vacuum manifolds for the rapid clarification of bacterial lysates when utilized alongside our ZymoPURE™ Plasmid Prep buffers. The capacity of the well is 1.0 mL.

Cat. No.	Size
C2022	2 plates

Wash Plate

Available as a ZymoPURE™ 96 Plasmid Miniprep Kit refill, the Wash Plate is constructed with durable polypropylene. It is compatible with centrifuges and vacuum manifolds to minimize cross-contamination between wells when paired with our Zymo-Spin P-96 Plate. The capacity of the well is 1.3 mL.

Cat. No.	Size
C2024	2 plates

Collection Plate

The 96-well Collection Plates feature deep-well, durable, clear polypropylene construction. Each has a level footprint and conforms to laboratory standards. Adaptable for use with either Silicon-A™, Zymo-Spin™ I-96, Zymo-Spin™ IB-96, and Zymo-Spin™ I-96-XL plates. Capacity is 1.2 ml per round bottom well.

Cat. No.	Size
C2002	2 plates

Elution Plate

These clear polypropylene plates have a level footprint and conform to laboratory standards. Adaptable for use with either Silicon-A™ plates or Zymo-Spin™ I-96 filtration plates. Capacity is 350 µl per "V" bottom well.

Cat. No.	Size
C2003	2 plates

96-Well PCR/Conversion Plate

96-well, non-skirted PCR plate with easy-to-read alphanumeric labels. Rimmed wells minimize cross contamination. Provided with adhesive, pierceable foil cover. Capacity is 200 µl per well.

Cat. No.	Size
C2008	2 plates
C2005	2 plates/foils

96-Well 2.0 mL Deep Well Plate

The 96-Well 2.0 mL Deep Well Plate is tailored for high-throughput DNA and/or RNA purification with automated liquid handlers. Adhering to SBS standards, it accommodates orbital shakers using nested adapters for 2.0 mL NUNC plates. Constructed with durable, clear polypropylene, this plate is also compatible with Zymo Research's magnetic bead nucleic acid purification products.

Cat. No.	Size
C2015	2 plates
C2015-50	50 plates

96 Deep Well Plate (V-Bottom 2.2ml)

The 96 Deep Well Plate is versatile for high-throughput DNA and/or RNA purification in centrifuges, liquid handlers, and magnetic bead movers. Conforming to SBS standards, its unique V-bottom shape ensures compatibility with instruments like KingFisher Flex, Apex, Duo Prime, and Presto. Constructed from durable, clear polypropylene, it has a 2.2 ml capacity.

Cat. No.	Size
C2018-5	5 plates
C2018-50	50 plates

96-Well Block

96-Well Block features durable, clear polypropylene construction. Each has a level footprint and conforms to laboratory standards. Capacity is 2 ml per round bottom well.

Cat. No.	Size
P1001-2	2 blocks
P1001-10	10 blocks

96-Well Block with Cover Foil

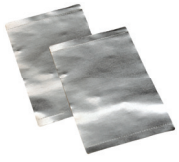
96-Well Block with Cover Foil feature durable, clear polypropylene construction. Each has a level footprint and conforms to laboratory standards. Provided with adhesive, pierceable foil cover. Capacity is 2 ml per round bottom well.

Cat. No.	Size
P1002-2	2 blocks/foils

96 Tip Combs (For V-Bottom Deep Well Plate)

The 96 Tip Comb features durable, clear polypropylene construction and is compatible with our V-bottom 96 Deep Well Plate.

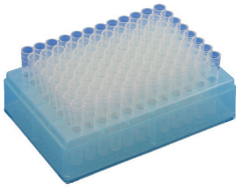
Cat. No.	Size
C2019	2 combs
C2019-100	100 combs



96-Well Plate Cover Foil

Pierceable aluminum foil with strong adhesive strength for sealing 96-well plates and blocks. Ideal for cold storage. Dimensions are 82.6 x 132.6 mm.

Cat. No.	Size
C2007-2	2 foils
C2007-6	6 foils



ZR-96 BashingBead™ Lysis Rack (0.1 & 0.5 mm)

Each impact resistant 1.1 ml tube contains 0.5 ml (dry volume) 0.1 & 0.5 mm BashingBeads™. Tubes are in a 96-well rack with caps and a cover for high-throughput processing. The state of the art, ultra-high density beads are fracture resistant, chemically inert, and ideal for disrupting tough-to-lyse biological samples. These beads are ideal for microbes and fungi in soil, feces, sludge, etc.

Cat. No.	Size
S6002-96-3	1 rack

ZR-96 BashingBead™ Lysis Rack (2.0 mm)

Each impact resistant 1.1 ml tube contains 0.5 ml (dry volume) 2.0 mm ZR BashingBead™ lysis matrix. Tubes are in a 96-well rack with caps and a cover for high-throughput processing. The state of the art, ultra-high density beads are fracture resistant, chemically inert, and ideal for disrupting tough-to-lyse biological samples. These beads are ideal for tissues, insects, plant material, etc.

Cat. No.	Size
S6002-96-2	1 rack

ZR-96 BashingBead™ Lysis Rack (Barcoded)

The ZR-96 BashingBead™ Lysis Rack (Barcoded) is a 96-well microbial lysis rack which enables complete homogenization/lysis of tough-to-lyse bacteria, fungi, yeast, and other cells from a variety of sample types including feces, soil, sludge, saliva, swabs & other biological samples, making it ideal for microbial community profiling, pathogen detection and automated nucleic acid purification systems.

Cat. No.	Size
S6002-96-4	1 rack
S6002-96-5	1 rack

Plating Beads

Rattler™ Plating Beads

Rattler™ Plating Beads save the researcher time and effort when plating either bacterial or yeast cells. Sterile glass plating beads are convenient and easy to use. 230 g/bottle.

Cat. No.	Size
S1001	1 bottle
S1001-5	5 bottles
S1001-B	25kg bag (bulk)

Cell Disruptors & Accessories

FastPrep®-24

The FastPrep®-24 Instrument is a unique, high-speed benchtop homogenizer that employs a powerful, proprietary technology for the rapid lysis of almost any sample in 40 seconds or less. The FastPrep® Instrument makes it possible to isolate DNA, RNA, and protein from sources that are virtually impossible to lyse without the use of its rapid reciprocating motion.

Cat. No.	Size
S6005	1 unit

A

B

C

FastPrep® Accessories

Description	Cat. No.	Size
A. HiPrep™ Adapter (48 x 2 ml tubes)	S6005-1	1 unit
B. CoolPrep™ Adapter (24 x 2 ml tubes)	S6005-2	1 unit
C. TeenPrep™ Adapter (12 x 15 ml tubes)	S6005-3	1 unit

Manual Homogenizers

Squisher™-Single

The Squisher™-Single features durable polypropylene construction and, although disposable, can be cleaned and reused to homogenize small samples of tissue in preparation for DNA, RNA, or protein extraction and purification. Works well with liver and brain tissue as well as mouse tail snips and small insects. Intended for use with conventional style 1.5 ml microcentrifuge tubes.

Cat. No.	Size
H1001	10 pack
H1001-50	50 pack

Squisher™-8 with 96-Well Block

The Squisher™-8 features durable polypropylene construction and although disposable, can be cleaned and reused to homogenize up to 8 small samples of tissue simultaneously in preparation for DNA, RNA, or protein extraction and purification. Works well with liver and brain tissue as well as mouse tail snips and small insects. Comes with 96-Well deep well blocks for efficient sample recovery.

Cat. No.	Size
H1002-5	5 pk/1 blocks
H1002-20	20 pk/2 blocks

Squisher™-96 with 96-Well Block

The Squisher™-96 features durable polypropylene construction and although disposable, can be cleaned and reused to homogenize up to 96 small samples of tissue simultaneously in preparation for DNA, RNA, or protein extraction and purification. Works well with liver and brain tissue as well as small insects. Comes with 96-Well deep-well blocks for efficient processing and sample recovery.

Cat. No.	Size
H1004-2	2 pk/2 blocks
H1004-5	5 pk/5 blocks

Other Instruments & Accessories

EZ-Vac™ Vacuum Manifold

The EZ-Vac™ Vacuum Manifold features durable chemical-resistant construction and is capable of processing up to 20 samples simultaneously using vacuum pressure. The vacuum manifold allows researchers to simplify their nucleic acid purification workflows further by eliminating the need for multiple centrifugation steps and disposal of flow-through from collection tubes.

Cat. No.	Size
S7000	1 unit

EZ-Vac 96™ Vacuum Manifold

The EZ-Vac 96™ Vacuum Manifold is designed for high-throughput manual purification of nucleic acids using the ZymoPURE™ 96 Plasmid Miniprep Kit. It streamlines workflows by eliminating multiple centrifugation steps through vacuum application. The unique design allows convenient collection of filtrate and wash solutions in an external catch flask (not included), eliminating the need for manifold disassembly and simplifying waste handling.

Cat. No.	Size
S7003	1 unit

Vortex-Genie® 2

The Vortex-Genie® 2 offers variable speed for precise mixing from gentle to vigorous, has hands-free or touch-on control, and may be used in cold rooms or incubators. A broad range of attachments are available for most tubes, plates, and other containers.

Description	Cat. No.	Size
120V	S5001	1 unit
230V, European Plug	S5002	1 unit

Vortex-Genie® Family Accessories


A


B


C


D

Description	Cat. No.	Size
A. Microtube Foam Inserts: Accommodates up to 60 microtubes. Fits into 6 in. platform	S5001-1	2 units
B. Microplate Foam Inserts: Accommodates one microplate. Fits into 6 in. platform	S5001-2	2 units
C. 29-37mm Tube Foam Inserts: Fits into recessed platform	S5001-3	2 units
D. Pop-off Cup: Mixing and vortexing in single tubes. Use with Vortex-Genie® 1, Disruptor Genie®, and the Vortex-Genie® 2 family	S5001-4	1 unit


E


F


G

Description	Cat. No.	Size
E. Horizontal 50 ml Tube Holder: Holds 6 tubes	S5001-5	1 units
F. Horizontal 15 ml Tube Holder: Holds 12 tubes. Use with any Vortex-Genie® 2	S5001-6	1 units
G. Horizontal Microtube Holder: Holds 24 microtubes. Use with any Vortex-Genie® 2	S5001-7	1 units

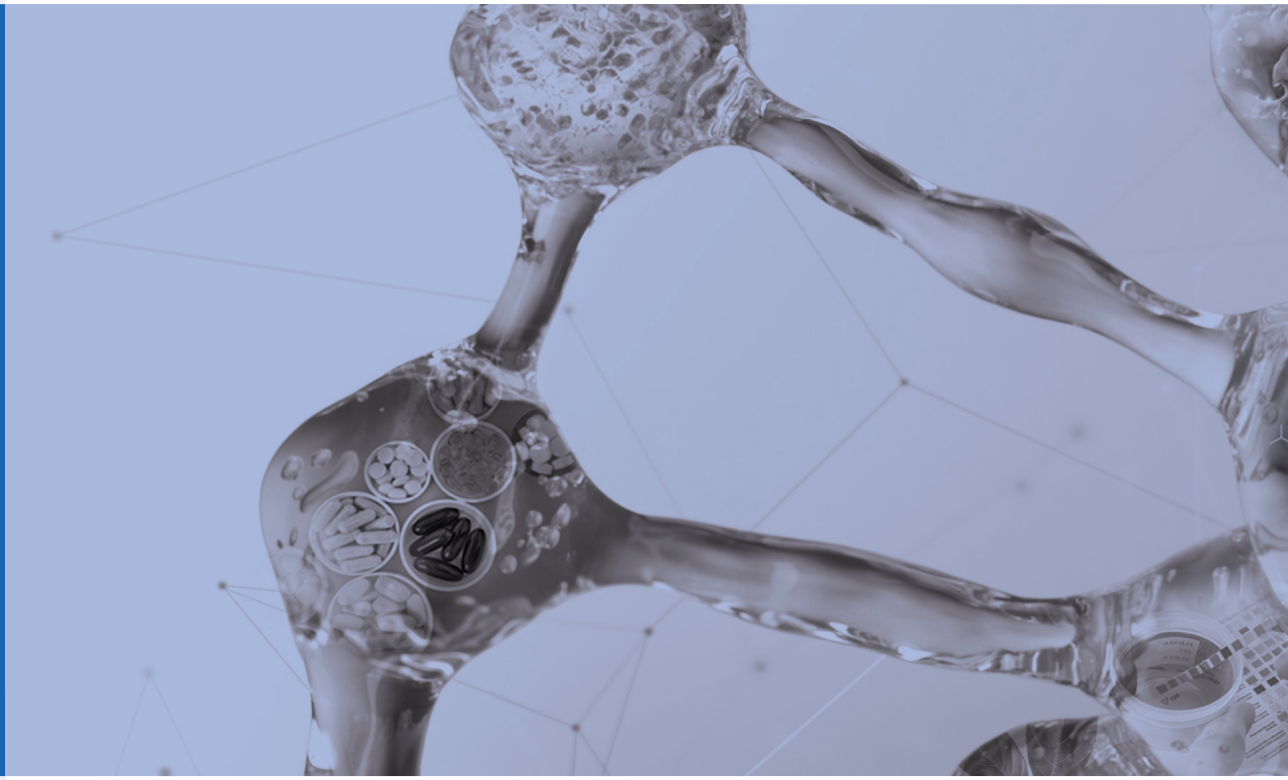
MagStir Genie®

The MagStir Genie® allows programmable high/low speed stirring. High and low speed range including reverse and interval stirring for applications ranging from gentle stirring for cell culture to aggressive mixing for viscous polymers. There are three power levels for various sample viscosities. The low-profile magnetic stirrers use microprocessor control for precise and reproducible operation without heat build-up from internal friction.

Description	Cat. No.	Size
120V	S5009	1 unit

NGS Services

16



The field of genomics is entering a renaissance, driven by cutting-edge technology that enhances the accessibility of multi-omic data. As the demand for next-gen sequencing data surges and the volume of sequence data multiplies, powerful bioinformatic analysis tools have become available. These new tools can identify patterns from sequence data, holding profound implications for novel biomarker discovery, groundbreaking drug prediction, crop development, and new and creative applications for bioremediation.

Zymo Research's innovative chemistries, proven automated workflows, and expert data scientists, ensure that challenging samples are prepared efficiently for downstream applications. We are dedicated to pioneering the most technologically advanced products and services to meet NGS-driven challenges.

Recent initiatives by Zymo Research have focused on improving the accuracy of microbiome measurements. The introduction of the initial commercial microbiome standard for quality control and profiling accuracy measurement signifies progress in the field. Additionally, we've released groundbreaking solutions to streamline DNA extraction and preservation processes, enhancing the efficiency and reliability of our sequencing services.

From microbiome sequencing to genome-wide DNA methylation, our service teams can guide you from any stage of your project to a comprehensive microbiome report, featuring data ready for publication.

Tech Tip

Optimizing Sample Collection and Transport for NGS Services

The Importance of Sample Collection for NGS Sequencing Services

In a time of rapid technological advancements and widening scope of applications, Next-Gen Sequencing (NGS) has emerged as an indispensable tool across various fields. Zymo Research is a proud provider of a range of NGS services that encompass everything from DNA and RNA extraction to publication-ready reporting.

The technical experts on our service team have worked with a wide variety of sample types and are always available for project consultation. Recognizing the pivotal role of the initial sampling method in NGS sequencing outcomes, our team underscores its importance. While advancements have refined biological sample collection techniques over time, it's essential to recognize ongoing considerations related to cost and safety.

The Role of Transport Media in Sample Preservation

Throughout the collection process, samples are typically stored in transport media to ensure their preservation and stability. Transport media or reagents are fundamental in safeguarding samples from external contaminants and maintaining their integrity until processing. However, it's important to recognize that not all transport media effectively neutralize pathogens and bacteria, thereby posing potential risks to individuals handling the samples.

Additionally, certain sample types may necessitate specialized transport conditions, such as cold-chain logistics, to prevent degradation. These logistical complexities can present challenges, especially in research settings that lack immediate access to specialized storage solutions or face environmental constraints.

Choosing The Best Transport Media for The Job

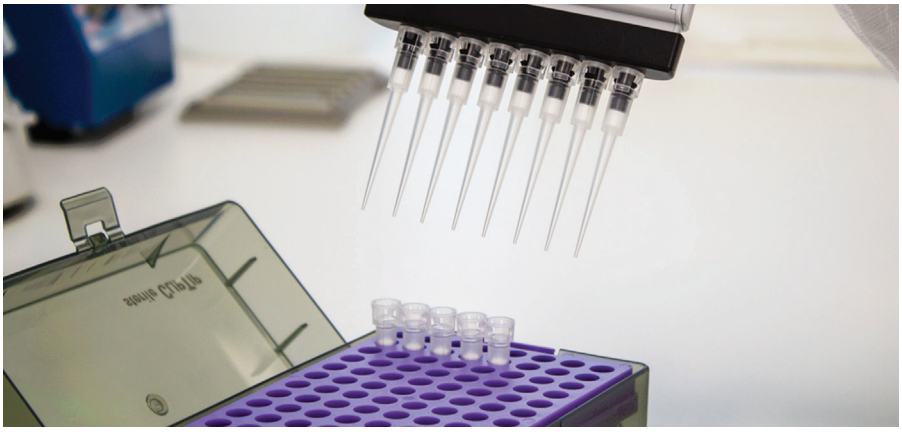
DNA/RNA Shield™ is the first 510(k) cleared transport medium for the collection, preservation, and inactivation for SARS-CoV-2. This transport reagent stabilizes samples by neutralizing bacteria and pathogens, reducing associated risks without requiring costly cold-chain storage and transport.

From a preservation standpoint, DNA/RNA Shield™ contributes to maintaining the stability of DNA for up to two years, and RNA for up to 30 days at ambient temperatures. Such advancements in transport media not only support sample quality but also offer practical solutions, particularly in scenarios where conventional cold transport methods may present limitations.

www.zymoresearch.com | info@zymoresearch.com | tel: 1-(949) 679-1190 | toll-free: 1-(888) 882-9682 | fax: 1-(949) 266-9452

Tech Tip

Streamlining Bioinformatics for NGS Advancements



Next-Gen Sequencing (NGS) is an important tool for an increasing number of basic biology and applied biomedical research applications. The competition and innovation within sequencing technology platforms persist at a rapid pace, enabling researchers across various biological fields to generate substantial amounts of high-quality data for addressing important scientific questions. However, dealing with such large amounts of data poses a challenge for many researchers. Fortunately, Zymo Research offers accompanying bioinformatics analysis for each of its NGS services. NGS data is processed using state-of-the-art pipelines and is then presented in user-friendly reports featuring statistical analysis, charts, figures, data tables, and a single-click data download capability. These interactive reports are readily available for immediate review in convenient HTML file formats.

Zymo Research's bioinformatics data reports include the following key highlights:

- Statistical analysis to identify the most significantly different biomarkers in each dataset
- Clustering heatmaps to visualize trends and patterns among experimental groups
- Pathway analysis to help interpret the biological meaning from computational analyses
- Additional data visualization tools for presentation, poster, proposal, and manuscript preparation

Zymo Research is a proud member of the AWS Partner Network and has implemented the Nextflow bioinformatics workflow language for all its pipelines. This advanced, cloud-enabled approach ensures that data analysis capabilities are scalable, convenient, reproducible, and secure. By offering a standard set of bioinformatics analyses for each provided NGS library type, Zymo Research empowers researchers to identify patterns, construct predictive models, and gain deeper insights from complex datasets than was previously possible. The recent development of onsite high-performance compute clusters enhances capabilities, enabling Zymo Research's services to be even more responsive to customer needs.

A Breakthrough in FFPE Tissue Analysis

Formalin fixed paraffin embedded (FFPE) tissue samples have long served as a cornerstone in pathology labs worldwide, primarily used for gross histology. However, genetic analysis of FFPE preserved tissues poses significant challenges. Extracting DNA and RNA from FFPE tissue is notably complex due to the fixing agent's role in crosslinking nucleic acids to other cellular structures, resulting in significant fragmentation and degradation. Data alignment and quality in sequencing applications can suffer as a result of these factors.

After receiving numerous requests for technical assistance with FFPE samples, Zymo Research scientists began developing a comprehensive solution for accurately analyzing FFPE preserved samples.

Understanding Genetic Analysis of Complex FFPE Tissues

Though the fixation process in FFPE samples preserves cellular structures within tissues, it does little to maintain nucleic acid integrity. Fragmentation of genetic materials in FFPE can confound even robust sequencing methodologies like whole genome sequencing (WGS).

Additionally, factors such as tissue age, type, and storage conditions introduce variability in nucleic acid quality and quantity. To navigate these challenges, current sequencing applications focus on enrichment methods that utilize gene panels or exome sequencing to derive more usable data from these degraded sample types.

Existing library preparation kits can be of little help when analyzing FFPE samples, often yielding suboptimal sequencing results. Furthermore, enrichment methods limit investigations to a confined subset of the genome, thereby restricting capabilities for downstream applications and opportunities for broader discovery.

Zymo Research's Breakthrough Approach

Seeking an end to these inaccuracies, Zymo Research scientists pioneered an end-to-end method for generating complex WGS libraries from FFPE preserved DNA. The key is an enzymatic method to generate complementary second strands from bisulfite-converted DNA, akin to FFPE DNA. This method effectively generates double stranded FFPE DNA, which is vital for downstream processes such as Tagmentation using Illumina's DNA Prep protocol.

Implemented alongside this novel solution is a robust, scalable workflow designed for high-throughput studies. The process involves specialized *Quick*-DNA/RNA™ workflows optimized for FFPE nucleic acids. Samples undergo heating for deparaffinization and subsequent digestion with Proteinase K. Following digestion, DNA lysate undergoes decrosslinking and purification using *Quick*-DNA/RNA™ MagBead protocols.

Concurrently, RNA purification involves DNase treatment to remove DNA contamination. Zymo Research also extended this method to include RNA isolation from FFPE tissue, followed by ribosomal RNA depletion and RNA-seq library preparation.

These methods were implemented alongside the Zymo-Seq WGBS library prep kit to capture the most accurate sequencing data.

FFPE Sample Processing Made Simple

Understanding the complexities of FFPE processing, Zymo Research provides a comprehensive service solution for FFPE samples that includes DNA or RNA extraction, library preparation, NovaSeq X Plus sequencing, and detailed bioinformatic reporting.

Resolve your FFPE Sample-specific challenges by leveraging the technical expertise of Zymo Research's analytic services team, guaranteeing precise adapter trimming and thorough data quality assessments.

Technology Overview: Genome-Wide DNA Methylation Analysis

Zymo Research has developed a multitude of platforms for whole-genome DNA methylation analysis at single-nucleotide resolution, each tailored to meet your specific needs. While these methods share common steps in the library preparation procedure, such as bisulfite conversion, adapter ligation, and PCR amplification, they differ slightly in the initial steps of preparing input DNA materials. All services can accommodate a wide range of sample types, including any species with a reference genome.

	RRBS	Whole Genome Bisulfite Sequencing (WGBS)		
		WGBS	Cell Free WGBS	Ultra low input WGBS
Applications	Pilot study	Complete Methylation Analysis	Clinical Study	Rare cell populations, Historical specimens
Sample Type	Any type of DNA	gDNA	Cell-free, FFPE, or degraded DNA	Any type of DNA
Input range	> 10 ng	> 10 ng	> 1 ng	> 10 pg
Methylome Coverage*	7-9 million sites	Entire methylome	Entire methylome	Entire methylome
Zymo Research Service Features	Automation ready	Unique cell type deconvolution analysis available	Maximized recovery of fragmented DNA	Optimized workflow for picogram quantities of starting DNA

**Methylome is based on human genome coverage*

RRBS Analysis

Highlights:

- **Simple and Automation Ready:** Prepare RRBS libraries in as little as 2 hours of hands-on time, and perform pilot studies in large-scale cohorts.
- **Low Input:** The only RRBS kit that produces NGS libraries from ≥ 10 ng of genomic DNA.
- **Accurate and Reproducible:** Unbiased methylation calling and reproducible CpG coverage for any species and beyond.

Description:

Reduced representation bisulfite sequencing uses restriction endonucleases to help select for and focus on DNA regions rich in CpG sites before moving on to the usual steps in preparing DNA for bisulfite sequencing. RRBS Technology from Zymo Research can cover ≥75% of promoters, CpG islands, and gene bodies.

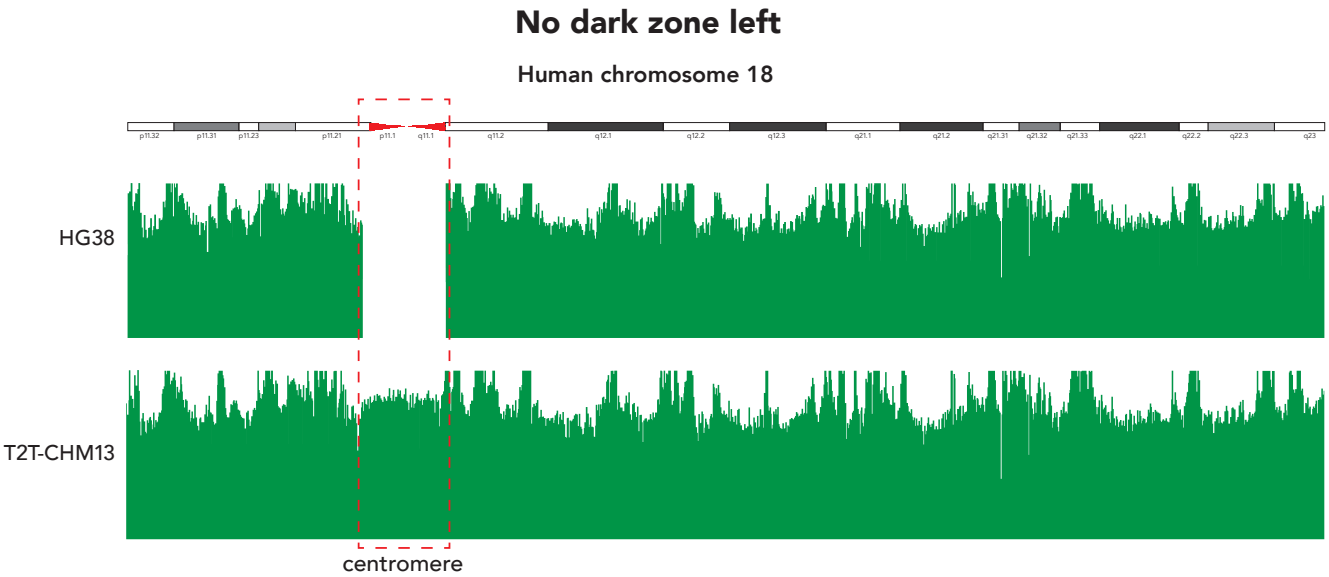
WGBS Analysis

Highlights:

- **Single Tube Workflow:** Enzymatic reactions consolidated in a single tube for streamlined WGBS library preparation in less than 4 hours.
- **Accurate Methylation Calling:** Reduced library preparation bias for the most accurate results.
- **Consistent Genome Coverage:** Single-base methylation profiling of cytosines throughout the entire genome.

Description:

Whole genome bisulfite sequencing technology from Zymo Research detects the methylation status of nearly all the cytosines in the input sample, resulting in comprehensive profile of DNA methylation levels across the entire genome. The increased cost-effectiveness of WGBS, due to new sequencing technologies, positions it as the primary discovery platform for identifying biomarkers in diverse clinical applications.



T2T alignment enables study of the entire methylome.

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Cell Free WGBS Analysis

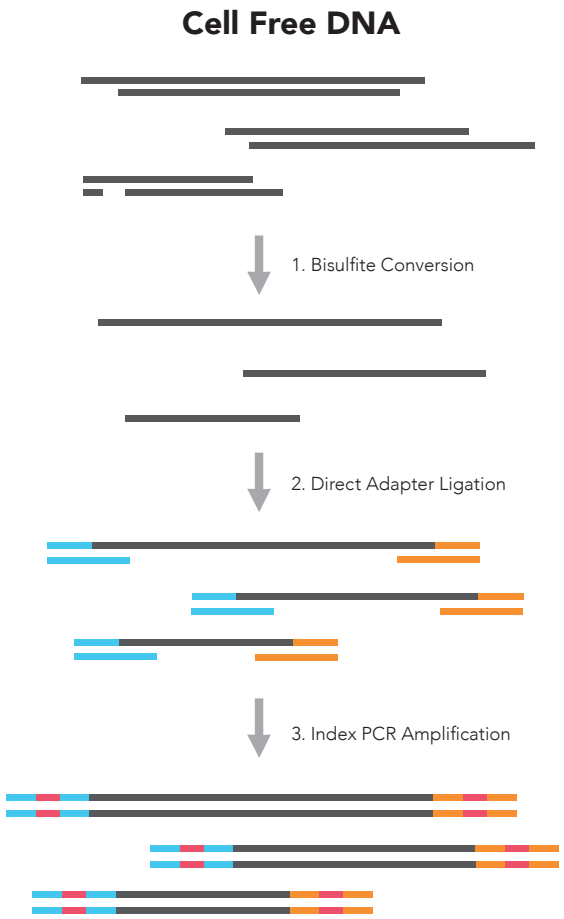
Highlights:

- **Optimized for Small Fragment Input:** Ideal for small and damaged DNA fragments such as cell-free DNA (cfDNA) and FFPE samples.
- **Accurate Methylation Calling:** Direct ligation-based protocol allows for accurate reads and methylation calling of native termini for each DNA fragment.
- **Simple, Streamlined Workflow:** Prepare robust methyl-seq libraries in as little as 3 steps.

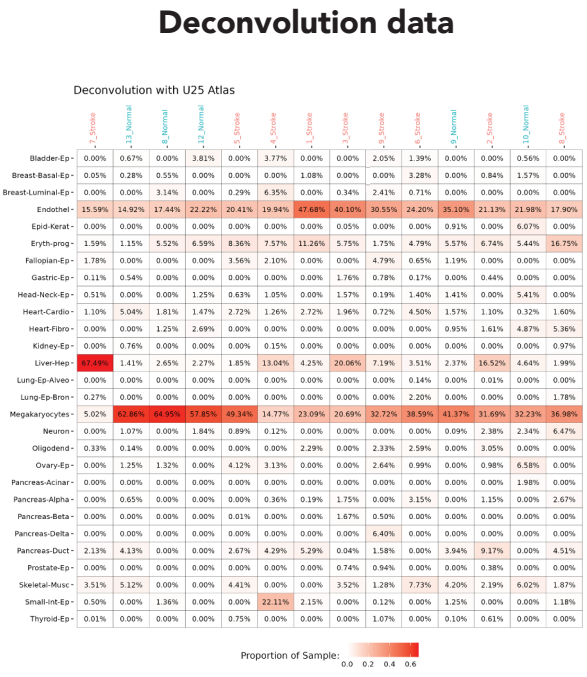
Description:

Numerous studies have established a robust association between DNA methylation markers in cfDNA and the presence of tumors. Beyond oncology, ongoing research is exploring the utility of cfDNA methylation biomarkers in diverse areas, such as prenatal genetic testing, and monitoring organ transplant outcomes.

The Cell Free DNA WGBS technology developed by Zymo Research is optimized to create high quality libraries from as little as 5 ng of cfDNA. This innovative method directly captures and ligates the adapters onto any size DNA fragment. The direct ligation (SwitchFree) also eliminates the need for end repair and dA tailing steps, thus reducing bias by preserving the integrity.



Overview of the Zymo-Seq™ CellFree DNA WGBS Library Kit protocol. The cfDNA is first bisulfite converted using optimized conditions for fragmented input. The innovative adapters capture and directly ligate onto any size DNA fragment, thus accurately preserving the methylation status of each terminus.



Cell composition heatmap showing the relative proportions of different cell types detected in blood plasma cfDNA isolated from normal controls or acute ischemic stroke patients within 24 hours of onset (based on the method of Loyfer et al. Nature, 2023).

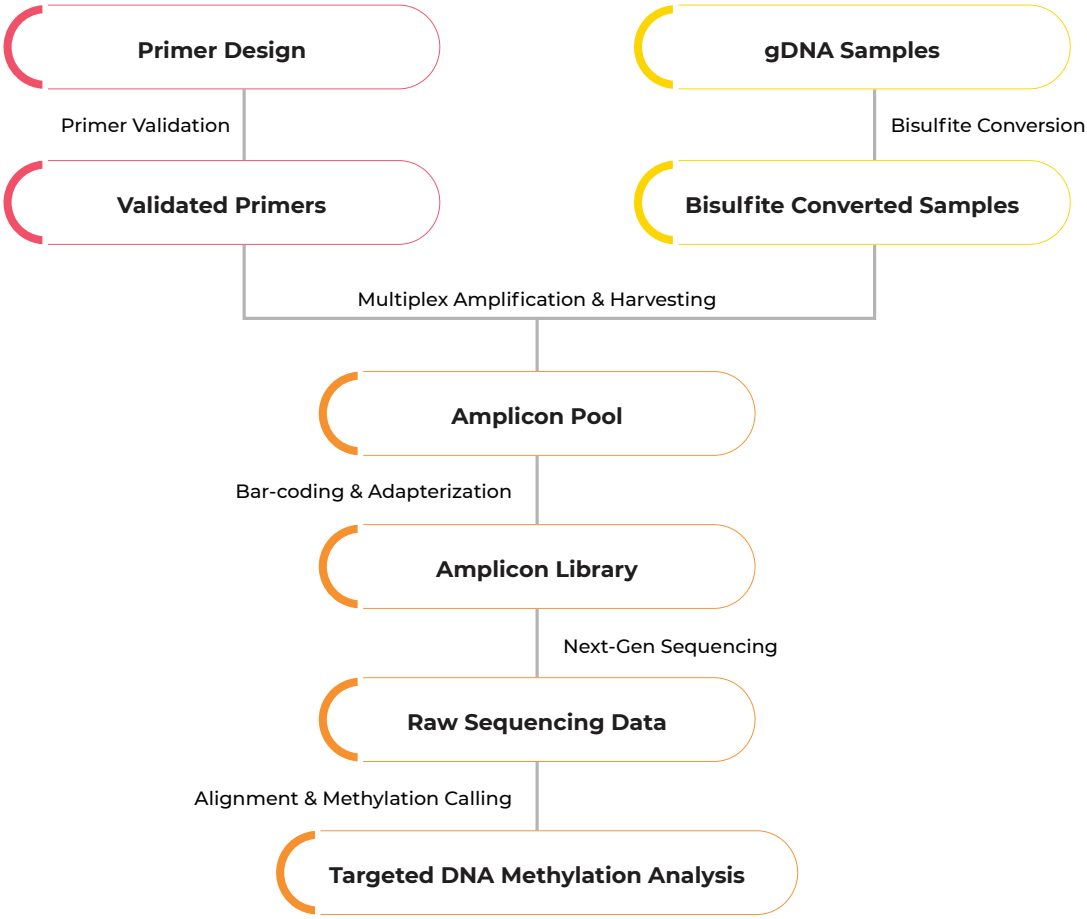
Targeted Bisulfite Sequencing

Description:

Zymo Research makes epigenetic biomarker validation simple with our targeted bisulfite sequencing platform. Whether you have methylation array (27K/450K/850K) data that you would like to validate in a large sample cohort or a specific gene region in mind, our scientists are available to design, validate, and evaluate site-specific DNA methylation changes. Simply send us your samples and regions of interest, and we will perform every step from primer design and bisulfite conversion to data analysis, sending you back publication-quality graphs and figures.

Targeted Bisulfite Sequencing Service Includes:

- ✓ Primer Design & Validation
- ✓ Targeted Amplification
- ✓ Adapterization & Barcoding
- ✓ Sequencing with Illumina™ Technology
- ✓ Sequence alignment to Reference Genome
- ✓ DNA Methylation Analysis



Epigenetic Aging Clock Service SWARM®

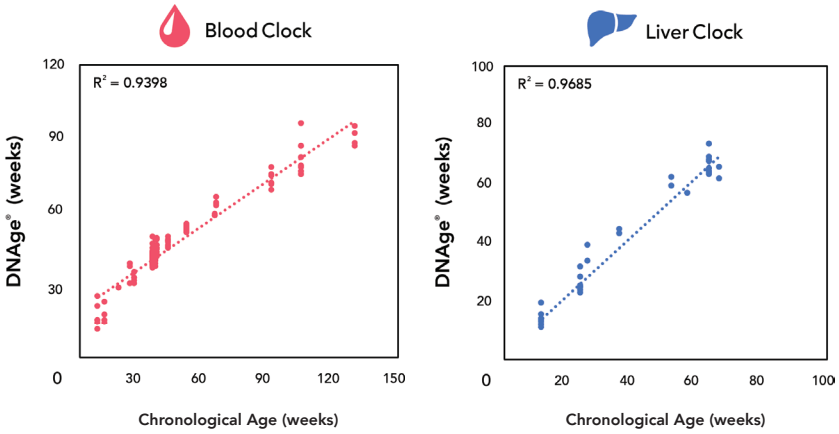
Highlights:

- **All-Inclusive Package:** The service includes sample collection devices, DNA isolation, bisulfite conversion, library prep, sequencing, and bioinformatic analysis. Send samples and receive accurate biological age with comprehensive report.
- **Performance:** DNAge® is highly correlated with chronological age in the general population.
- **Low Input:** Obtain reliable and reproducible epigenetic age prediction using as little as 200 ng DNA.

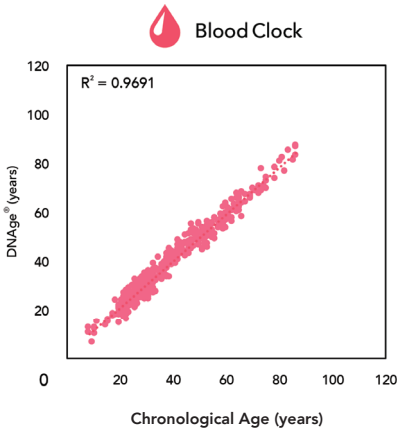
Description:

DNA methylation profiling has been a gold standard to quantify biological age in recent years. Accelerated biological aging has been associated with disease phenotypes including Down Syndrome and HIV-1-infection. DNA methylation-based biological age is a valuable surrogate biomarker of molecular aging. The Epigenetic Aging Clock Service allows everyone to effectively gauge the biological age of human and/or mouse tissue samples.

Mouse DNAge® Performance



Human Blood DNAge® Performance



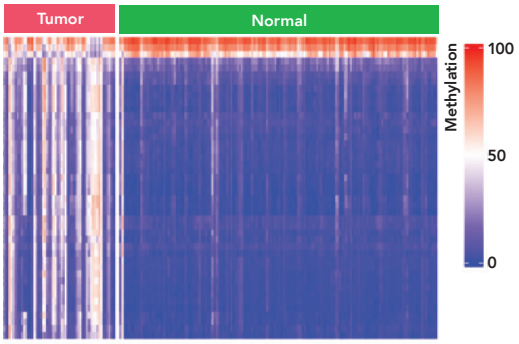
DNAge® is highly correlated with chronological age.

Biomarker Discovery and Validation Service by SWARM®

Expert-Designed Targeting: The primer designs for targeted regions are generated automatically by the Bisulfite Primer Seeker tool and further refined by scientists with over a decade of experience in DNA methylation analysis.

Unparalleled Flexibility: Our targeting options span 50 to 1000 regions, encompassing human, mouse, rat, and dog genomes.

Seamless Automation in a CLIA-Certified Environment: Our fully automated workflow is optimized for the validation of biomarkers in both pre-clinical and clinical trials.



Total RNA-Seq

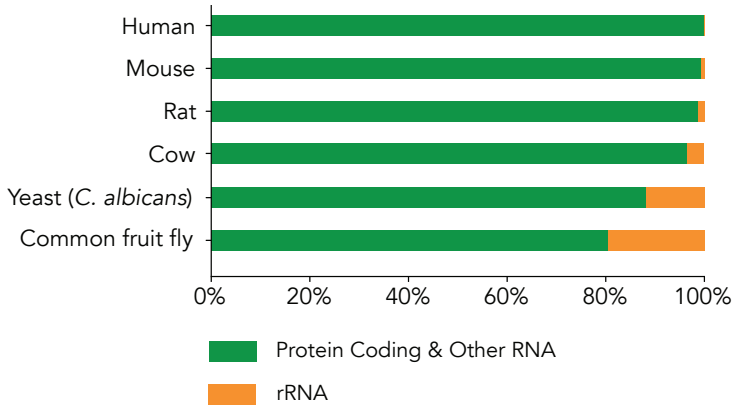
Highlights:

- **Universal Depletion:** Novel probe-free technology depletes rRNA from any organism.
- **Validated for Challenging Samples:** RiboFree® Technology enables whole transcriptome profiling from degraded (e.g., FFPE samples) and low-input samples.
- **High-Throughput:** Streamlined workflow allows processing of large number of samples efficiently.

Description:

Total RNA Sequencing (Total RNA-Seq) profiles both coding and various types of noncoding RNA and has been widely adopted among a myriad of research fields. Zymo Research's Total RNA-Seq utilizes an innovative probe-free rRNA depletion strategy to enable whole transcriptome studies for any organism. This technology provides unbiased gene expression profiling with a simplified workflow. It's truly One for All.

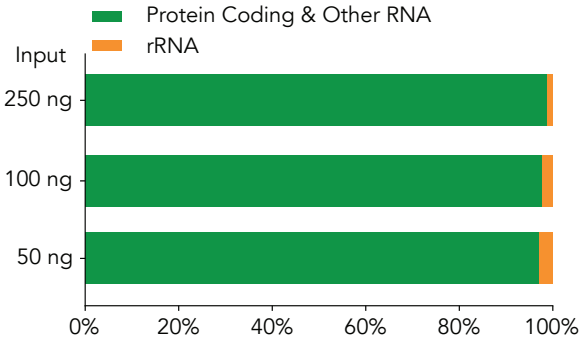
RiboFree® - The Only Universal rRNA Depletion



Also Applied in Peer-Reviewed Publications

- Chicken
- Flat Worm *(Opisthorchis felineus)*
- Evening primroses
- Mustard hill coral
- *Mycobacterium tuberculosis*
- And Beyond!

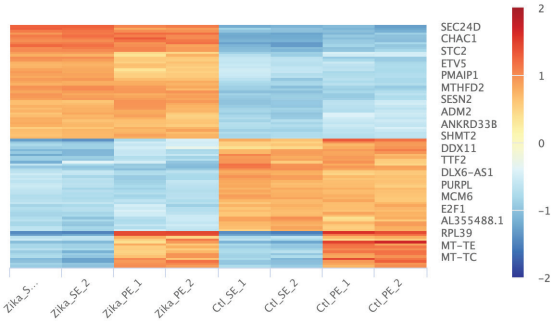
Compatible With Degraded Samples



Dense read coverage of protein coding and other non-rRNA transcripts achieved by Total RNA-Seq.

Complete Differential Gene Expression Analysis

Expression Patterns of Top Genes



Heatmap included the top 100 genes with the highest variance among the groups (4 groups, n = 2). Each row represented one gene and each column represented one sample.

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microRNA-Seq

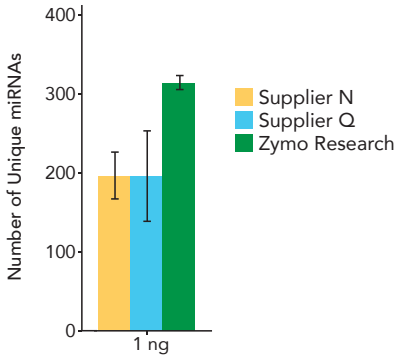
Highlights:

- **Accurate miRNA Profiling:** A streamlined workflow enables high reproducibility from various sample types.
- **Maximize Performance:** Bead-based dimer removal increases miRNA library prep efficiency.
- **Compatible with Low Input:** Detect miRNAs from as low as 50 µL of plasma or 10 ng of total RNA.

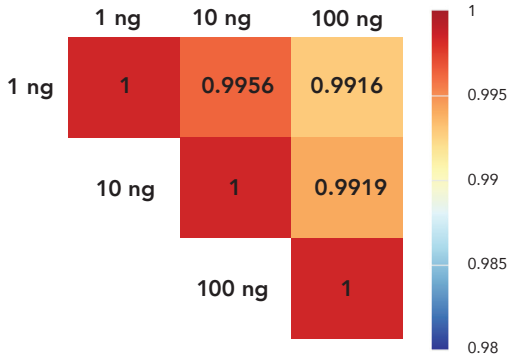
Description:

MicroRNA sequencing (miRNA-Seq) is an increasingly popular method for profiling miRNAs in various sample types, including biofluids. Zymo Research Services utilizes an optimized protocol for library preparation that enhances miRNA detection and simplifies small RNA discovery.

Detect More miRNAs at Lower Inputs

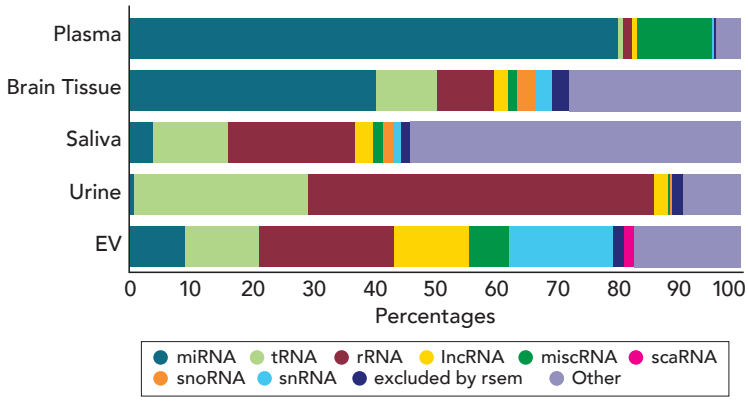


Achieve High-Quality Replication at ANY Input



Libraries were prepared in triplicate using Human Brain Total RNA (ThermoSci). Libraries were sequenced (75 bp single end), downsampled to 1 million reads, and aligned to miRbase v 22.

Discover Small RNAs from Various Sample Types



RNA Type Plot depicts small RNA classes present in each sample type. Total RNA sample from Human Brain Total RNA (Thermo Sci), all other biofluids were purified using Zymo Research purification kits.

Also Validated With

- ✓ Total RNA
- ✓ Cell-free RNA
- ✓ Cells
- ✓ Tissue
- ✓ Plants
- ✓ Drosophila
- ✓ And Beyond!

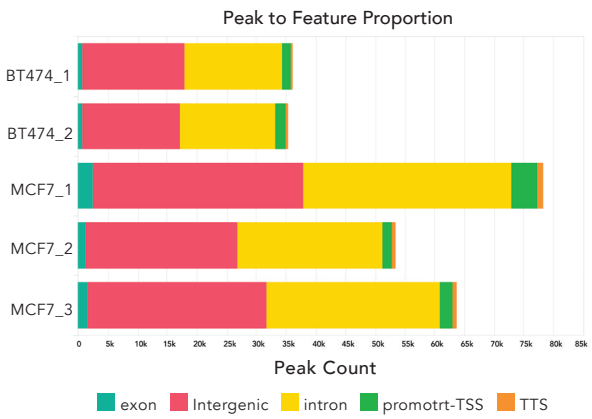
ChIP-Seq

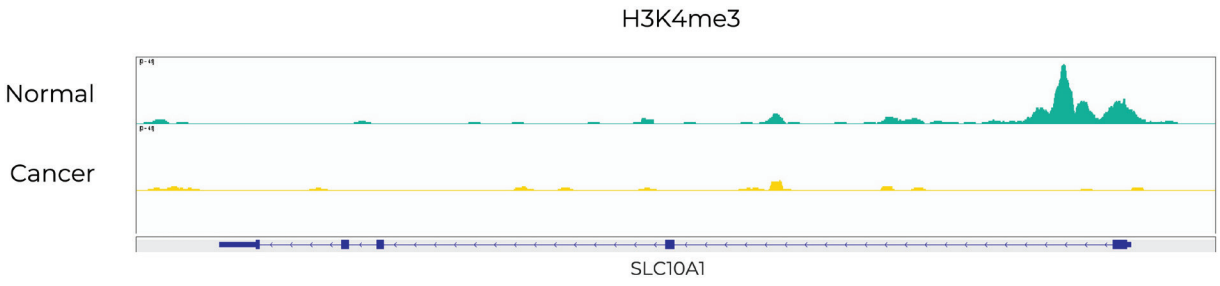
Description:

Chromatin Immunoprecipitation Sequencing (ChIP-Seq) is a technique that combines chromatin immunoprecipitation with the quantitative power and genome-wide coverage of Next-Generation Sequencing. It is a powerful tool for genome-wide mapping of DNA interactions with transcription factors, histone modifications, and chromatin binding proteins and is essential for understanding the effect of DNA-protein interactions on gene regulation.

With the ChIP-Seq service from Zymo Research, you can either perform the ChIP assay yourself and send us the enriched DNA for library construction and Next-Gen Sequencing, or we can process your samples using our proprietary chromatin shearing and enrichment procedures. We also perform the bioinformatics and statistical analyses, and send you the publication-ready results.

1. Sample Preparation
2. Chromatin Shearing
3. Perform ChIP
4. ChIP DNA QC
5. Construct ChIP-Seq Libraries
6. Post-Library QC
7. NGS using an Illumina HiSeq™
8. Comprehensive Bioinformatics Analysis
9. Custom Report





ATAC-Seq

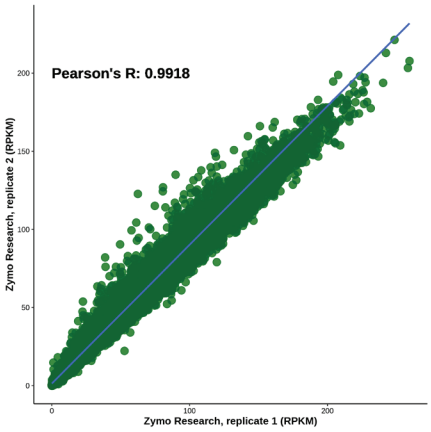
Highlights:

- **Robust Detection:** Proprietary technology reduces mitochondrial contamination and duplicate reads, providing higher coverage on open chromatin regions.
- **Highly Consistent:** Reproducible and highly consistent from both fresh and frozen sample types.
- **All-in-One Option:** Full service available from nuclei isolation to bioinformatics analysis.

Description:

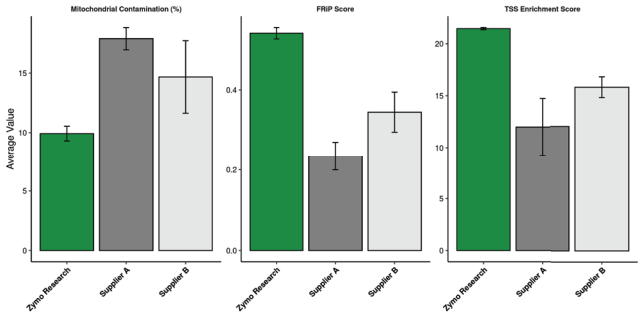
Assay for Transposase Accessible Chromatin with high-throughput sequencing (ATAC-Seq) is a quick and convenient method to gather genomic information from open chromatin regions. ATAC-Seq provides insight to both open and inaccessible chromatin regions, making it an extremely valuable tool for vast functional epigenetic studies.

Obtain Reproducible and Consistent Results



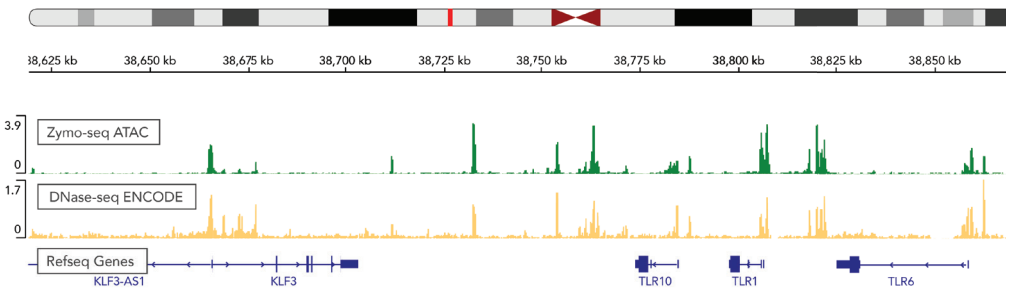
Replicate correlation with Pearson's R consistently greater than 0.95

Robust Detection for the Best Results



Zymo Research ATAC-Seq technology repeatedly shows the lowest mitochondrial contamination, highest FRiP scores, and highest Transcription Start Sight Enrichment scores against other technologies.

Zymo-Seq ATAC Peaks Highly Match DNase I Peaks



Browser tracks depicting GM12878 ATAC-Seq assay using the Zymo-Seq™ ATAC Library Kit. Overlapping peaks were identified by DNase seq in the ENCODE project.

16S/ITS Amplicon Sequencing

Highlights:

- **Quick Turnaround:** From sample collection to report in as little as 1 week.
- **Species-Level Resolution:** We provide species-level resolution with 16S sequencing while others normally restrict to genus.
- **Unbiased Microbial Lysis:** Our DNA extraction methods are validated unbiased for microbiome profiling.
- **Absolute Quantification:** 16S/ITS copy number measurement for each species along with standard percentage measurement.

Description:

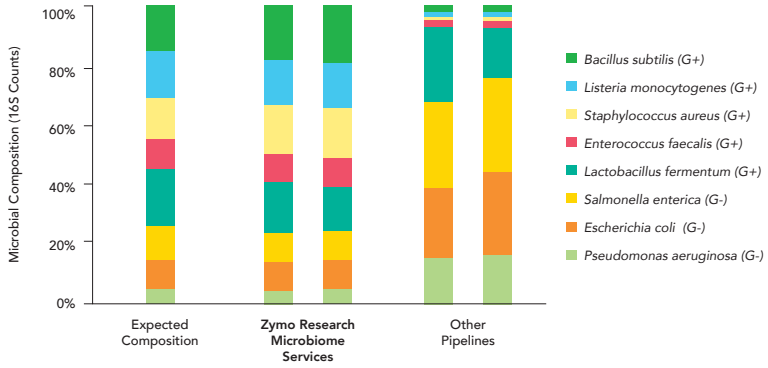
16S/ITS sequencing uses PCR to selectively amplify certain regions from different bacteria or fungi and then sequences the amplicons. The taxonomy identification is achieved by comparing the amplicon sequences to reference 16S/ITS sequence databases. 16S/ITS sequencing is generally considered simpler and more cost-effective than metagenomic sequencing, and is the better choice for certain samples that contain microbes with unknown genomes (e.g. soil and water samples).

16S/ITS sequencing can achieve close to zero false positives in taxonomy identification and can differentiate even single-nucleotide variation in amplicon sequences.

Species-Level Resolution

By combining sequence-analysis algorithm, DADA2, and a well-curated 16S reference database, we can provide species-level resolution with regular Illumina® sequencing of different 16S regions, e.g. V3-V4, V1-V2 and V1-V3.

Species	16S Pipeline (Zymo Research)	Competitors
Listeria monocytogenes	✓	×
Staphylococcus aureus	✓	✓
Enterococcus faecalis	✓	×
Lactobacillus fermentum	✓	×
Escherichia coli	✓	×
Salmonella enterica	✓	×
Pseudomonas aeruginosa	✓	×
Bacillus subtilis	×	×
Species-level resolution	Yes	No



Unbiased Microbial Lysis

Many service providers use DNA extraction kits that are not validated for microbiome profiling, which can result in massive skew in the final profile. Our DNA extraction step is validated unbiased using the ZymoBIOMICS™ Microbial Community Standard. The standard is used as a positive control in every run.

illumina CERTIFIED SERVICE PROVIDER CSPro®

Shotgun Metagenomic Sequencing

Highlights:

- **Quick Turnaround:** Results from sample to report in as little as 2 weeks.
- **Strain-Level Resolution:** High confidence strain identification through our curated reference database.
- **Comprehensive Bioinformatic Analysis:** Includes bar plots, heatmaps, diversity analysis, gene family & metabolic pathway profiling, identification of virulence genes & antibiotic resistance genes, and statistical group analysis.
- **Minimize False Positives:** Innovative algorithms that minimize the number of false positives.

Description:

Shotgun metagenomic sequencing has widely been used to characterize an assortment of microbiome samples, including those derived from human/animal body sites and environmental samples (e.g. soil, sediments, sludge, water, air, etc.). The use of shotgun sequencing for metagenomics, rather than a targeted microbiome profiling (e.g. 16S/ITS), enables more information to be obtained from a sample. This includes cross-kingdom identification, metabolic function profiling, strain-level differentiation, detection of virulence genes and antibiotic resistance genes.

A well-established workflow with extensive validation is crucial to the success of a metagenomic sequencing project. Building on the top of Zymo Research innovative products, we have established a shotgun metagenomic sequencing service that was optimized thoroughly and validated to ensure unbiased microbiome profiling.

Species	Zymo Research (%)	Service Provider D (%)
Lactobacillus iners	48.9	20.3
Klebsiella michiganensis	46.7	0.5
Candida albicans	1.9	0.1
Enterococcus faecalis	1.7	0.2
Klebsiella oxytoca	0.7	4.1
Coprobacillus sp.	-	48.2
Klebsiella sp.	-	6.7
Beggiatoa sp.	-	7.5
Candidatus Pelagibacter	-	4.5
(k) Bacteria sp.	-	2.6
(f) Enterobacteriaceae	-	1.1
(o) Enterobacterales	-	0.3
Vibrio campbellii	-	0.3
Psychrobacillus sp. FJAT-21963	-	0.3
Vibrio agarivorans	-	0.2
Mycobacterium kansasii	-	0.1
Paeniglutamicibacter antarcticus	-	0.1
Salmonella enterica	-	0.1
181 more taxa	**-**	**2.7**

Accurate Species Identification **False Positives**

Results of two bioinformatics pipelines analyzing the same raw sequence data derived from a vaginal swab sample.

Controlling False Positives

Many other service providers suffer from false positive species identification due to the presence of host DNA in samples and the use of reference microbial genomes contaminated by human genome sequences. The pipeline of service provider D (built on Kraken) reported 202 total taxa from a vaginal swab sample and 197 of these taxa were determined to be false positives. Zymo Research's bioinformatic pipeline is able to accurately identify 5 taxa in the sample.

illumina CSPro CERTIFIED SERVICE PROVIDER

Full-Length 16S Sequencing

Highlights:

- **Unrivaled Species Resolution:** Resolve the full 16S rRNA gene with PacBio HiFi sequencing and our bioinformatic analysis.
- **Unbiased Sample Preparation:** Standardized procedures with rigorous QC with Microbial Standards provide accurate and reliable data.
- **Quick Turnaround Time:** Receive Full-Length 16S sequencing results in as little as 3 weeks.

Description:

With the introduction of long-read sequencing, researchers can now leverage the complete taxonomy resolution power of the full 16S rRNA gene. Full-length 16S sequencing finds applications in various fields like microbiology, environmental science, medicine, and agriculture. It's used in studying gut microbiomes, identifying pathogens, assessing soil or water microbial diversity, and more. As a Certified PacBio Provider, Zymo Research ensures the meticulous handling of your samples.

A Better Way to Resolve Closely Related Species

Bacteria species	Full-length 16S	V1-V3 (short read)	V3-V4 (short read)	V4 (short read)
Bacillus subtilis		*Bacillus mojavensis-subtilis*	*Bacillus sp.*	*Bacillus sp.*
Listeria monocytogenes			*Listeria sp.*	*Listeria sp.*
Enterococcus faecalis				*Enterococcus sp.*
Lactobacillus fermentum				
Escherichia coli				*Escherichia coli-fergusonii-vulneris*
Salmonella enterica				*Enterobacteriaceae sp.*
Pseudomonas aeruginosa				*Pseudomonadales sp.*
Staphylococcus aureus	*Staphylococcus argenteus-aureus*	*Staphylococcus argenteus-aureus*	*Staphylococcus argenteus-aureus-simiae*	*Staphylococcus sp.*

Fully Resolved to Species Level **Partially Resolved**

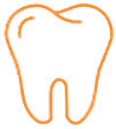
Full-length 16S sequencing was able to distinguish closely related species by looking at the whole 16S rRNA gene, as compared to traditional snapshots of smaller regions with short read (V4, V3-V4, V1-V3, V1-V2 and V4-V5).

Versatile Expertise for Diverse Samples

Fecal

Soil

Women's Health



Oral

Environmental

Zymo Research scientists have worked with 1,000's of diverse samples

PacBio **PACBIO CERTIFIED SERVICE PROVIDER**

www.zymoresearch.com | info@zymoresearch.com | tel: 1-(949) 679-1190 | toll-free: 1-(888) 882-9682 | fax: 1-(949) 266-9452

Long-Read Metagenomic Sequencing & Assembly

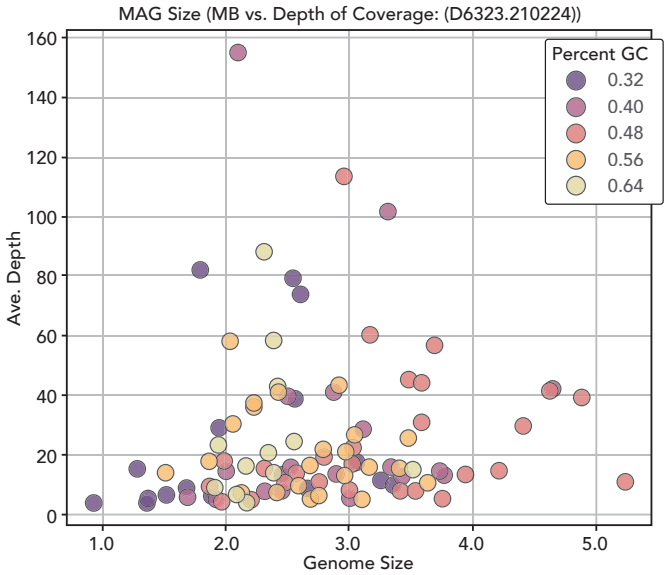
Highlights:

- **Comprehensive Metagenomic Assembly Analysis:** Sequence assembly, binning, taxonomy assignment, composition profiling, etc.
- **Unbiased High Molecular Weight DNA Extraction:** HMW DNA from DNA extraction with mechanical microbial lysis.
- **Powered by PacBio HiFi Sequencing:** Entrust your samples to PacBio Certified Provider.

Description:

It is now possible to accurately reconstruct complete genomes of individual microorganisms present in microbial communities. Metagenomic assembly encompasses two key facets: wet-lab procedures, involving DNA extraction, library preparation, and sequencing, and dry-lab tasks, which include read quality enhancement, DNA sequence assembly, contig/scaffold binning, taxonomy annotation, gene prediction, and gene annotation. Long-Read Assembly is indispensable when the research goal extends beyond taxonomy analysis to encompass genome reconstruction, comprehensive gene retrieval, and organism-specific pathway exploration.

One Hundred High-Quality MAGs from Fecal Reference Assembled by PacBio HiFi Sequencing



HiFi Reads >Q20	Mean Read Length	High-Quality MAGs
1,792,146 reads	10,318 bp	100 MAGs

In this study, DNA from ZymoBIOMICS™ Fecal Reference (D6323) was extracted and sequenced using PacBio HiFi Sequencing. The assembly of this dataset produced 100 high-quality metagenome assembled genomes (MAGs) using our bioinformatics pipeline.

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Metatranscriptomics Sequencing

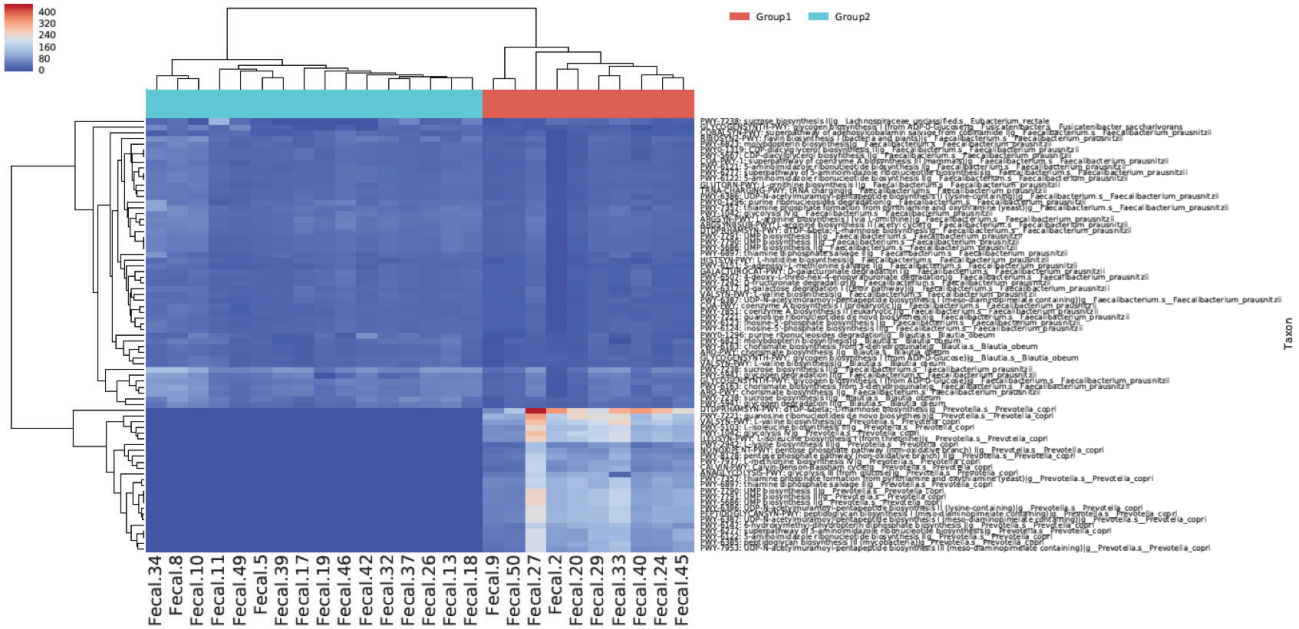
Highlights:

- **Unbiased High Quality RNA Extraction:** Ensure true profile representation for reliable analysis.
- **Efficient rRNA Depletion:** Enhance assay sensitivity and resolution by depleting noncoding host and bacterial ribosomal RNA (rRNA) from complex microbial samples.
- **Species-level Metabolic Pathway Detection:** Our robust bioinformatic pipeline confidently identify abundant functional pathways to species-level resolution.
- **Complete Multi-Kingdom Profiling:** Detect RNA from any kingdom (Bacteria, Archaea, Eukaryote, and RNA Viruses).

Description:

By analyzing the RNA transcripts present in a sample, metatranscriptomics provides researchers with a comprehensive understanding of the functional dynamics and metabolic activities within complex microbial ecosystems. Compared to metagenomics, which focuses on the DNA content of microbial communities, metatranscriptomics offers a dynamic and real-time view of microbial activity, providing a deeper understanding of ecosystem dynamics, microbial response to environmental changes, and the functional roles of individual species within a community. This advantages make metatranscriptomics a more powerful approach for studying complex microbial systems.

Metabolic Pathway and Gene Expression Analysis



illumina CERTIFIED SERVICE PROVIDER CSPro®

Complete & Custom Solutions for Any Industrial Partners

Highlights:

- **Complete Microbiome Solutions:** From sample collection to bioinformatic analysis and report.
- **Microbiome Expertise:** Partner with our dedicated team of microbiome experts who ensure the highest quality data.
- **Versatile Workflow:** Benefit from our flexible and modular workflow with extensive customization options.
- **Scalability with fast TAT:** Utilize our high-throughput automation platforms for rapid scalability and fast turnaround time, ensuring data consistency and reliability.

Description:

Discover a comprehensive and tailored solution for industrial partners at Zymo Research, from sample collection to advanced bioinformatic analysis. Our flexible workflows and extensive customization options ensure adaptability to diverse research needs and experimental conditions. With years of experience, we provide unparalleled insights into complex microbial communities. Additionally, our scalable infrastructure guarantees rapid turnaround times, enabling timely delivery of results without compromising quality.

Complement Consultation with our team of experts

High throughput sample preparation

State-of-art sequencing technology

PacBio PACBIO CERTIFIED SERVICE PROVIDER

Custom Manufacturing & OEM Solutions That Meet Your Needs

Zymo Research is more than just a manufacturer. It is a global, vertically integrated, research-driven biotechnology company. We are your innovation partner motivated to collaborate with you to create custom manufacturing solutions tailored to your needs. Whether it's sample preservation, nucleic acid extraction, library prep, epigenetics, microbiome analysis, NGS-based applications, or entire custom workflows, Zymo Research experts work closely with you to bring your vision to life.

Sample Collection Devices & Kits

OEM/Private Label

Bulk Reagents

Custom Packaging

> We recently collaborated with the team at Zymo Research Corp. on a specialty project for NASA. The team members were responsive, intelligent, and a pleasure to work with.
> — Charm Sciences, Inc.

> Working with Zymo Research has been a pleasure, from the positive attitude of the staff to the high quality of the products. The staff was very helpful and supportive during the entire process of our collaboration on microbiome reference standards... We are very happy with Zymo Research as a partner and look forward to a long and productive partnership.
> — The BioCollective, LLC

Why Zymo Research Custom Manufacturing Solutions?

Trusted & Quality Manufacturer

- ✓ ISO 9001 manufacturing facility
- ✓ Products manufactured in the USA
- ✓ In-house formulation, quality assurance, and testing
- ✓ Reliable supply chain from US facilities
- ✓ Global distribution centers
- ✓ ISO 13485 & FDA registered partners available (Blue Life Solutions, LLC.)

White-Glove Support & Custom-Tailored Solutions

- ✓ Bulk dispensing
- ✓ Custom aliquoting of components and prefilling of plates
- ✓ Custom labeling and packaging
- ✓ Confidentiality
- ✓ Flexibility in pricing and customization
- ✓ OEM provider of reagents, magnetic binding beads, and plastic
- ✓ Low minimum order quantities available
- ✓ Proof of concept

We look forward to partnering with you!

Partnering with Zymo Research on a custom manufacturing solution means gaining access to our Development and Manufacturing teams with decades of experience. We listen to your needs and quickly leverage our synergies. We work with you at any step in the development process to get your product to market as quickly and efficiently as possible.

To create a custom soluton with us, contact Zymo Research's Business Development team at **busdev@zymoresearch.com.**

DNA Clean-up

Product Chart

	DNA Clean & Concentrator®-5	ZR-96 DNA Clean & Concentrator®-5	DNA Clean & Concentrator®-25	DNA Clean & Concentrator®-100	DNA Clean & Concentrator®-500	ZR-96 DNA Clean-up Kit™	Oligo Clean & Concentrator™	ZR-96 Oligo Clean & Concentrator™	*Select-a-Size* DNA Clean & Concentrator®	*Select-a-Size* DNA Clean & Concentrator® MagBead Kit
Specifications										
Format	Spin-Column	96-Well	Spin-Column	Spin-Column	Spin-Column	96-Well	Spin-Column	96-Well	Spin-Column	Magbead
Binding Capacity	5 µg	5 µg	25 µg	100 µg	500 µg	5 µg	5 µg	5 µg	3 µg	10 µg
Elution Volume	≥ 6 µl	≥ 10 µl	≥ 25 µl	≥ 150 µl	≥ 2 ml	≥ 30 µl	≥ 6 µl	≥ 10 µl	≥ 10 µl	≥ 10 µl
Processing Time	2 min.	15 min.	2 min.	20 min.	20 min.	20 min.	2 min.	20 min.	7 min.	10 min.
Applications										
cDNA/ssDNA Purification	•	•	•	•	•	•	•	•		
M13 Phage DNA	•	•	•	•	•	•				
PCR Clean-up	•	•	•	•	•	•			•	•
Enzyme Removal	•	•	•	•	•	•	•	•	•	•
dNTP/Dye Removal	•	•	•	•	•	•	•	•	•	•
Probe Purification	•	•	•	•	•	•	•	•	•	•
DNA/RNA Oligo Clean-up							•	•		
High Molecular Weight DNA Clean-up										•
Size Selection (eg. Library Prep, primer dimer removal)									•	•
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DNA Clean-up

Product Chart

	Genomic DNA Clean & Concentrator®-10	Genomic DNA Clean & Concentrator®-25	ZR-96 Genomic DNA Clean & Concentrator®-5	ZR DNA Sequencing Clean-up Kit™	ZR-96 DNA Sequencing Clean-up Kit™	OneStep™ PCR Inhibitor Removal Kit	OneStep-96™ PCR Inhibitor Removal Kit	Zymoclean™ Gel DNA Recovery Kit	ZR-96 Zymoclean™ Gel DNA Recovery Kit	Zymoclean™ Large Fragment DNA Recovery Kit	DNA Clean & Concentrator® MagBead Kit
Specifications											
Format	Spin-Column	Spin-Column	96-Well	Spin-Column	96-Well	Spin-Column	96-Well	Spin-Column	96-Well	Spin-Column	Magnetic Bead
Binding Capacity	10 µg	25 µg	5 µg	5 µg	5 µg	No DNA/RNA Binding	No DNA/RNA Binding	5 µg	5 µg	10 µg	4 µg
Elution Volume	≥ 10 µl	≥ 35 µl	≥15 µl	≥ 6 µl	≥ 15 µl	50 - 200 µl	50 - 100 µl	≥ 6 µl	≥ 15 µl	≥ 10 µl	≥ 30 µl
Processing Time	5 min.	5 min.	20 min.	2 min.	10 min.	5 min.	10 min.	15 min.	30 min.	15 min.	30 min.
Applications											
PCR Clean-up	•	•	•								•
Enzyme Removal	•	•	•	•	•						•
dNTP/Dye Removal	•	•	•	•	•						•
Probe Purification											•
High Molecular Weight DNA Clean-up	•	•	•							•	•
Sequencing DNA Clean-up				•	•						
Dye Terminator Removal				•	•						
Removal of Polyphenolic Inhibitors						•	•				
DNA From Agarose Gel Slices								•	•	•	
Page Number	86	86	87	88	88	89	89	90	90	91	83

Plasmid DNA Purification

Product Chart

	ZymoPURE™ Plasmid Miniprep Kit	ZymoPURE™ II Plasmid Midiprep Kit	ZymoPURE™ II Plasmid Maxiprep Kit	ZymoPURE™ II Plasmid Gigaprep Kit	ZymoPURE-Express™ Plasmid Midiprep Kit	ZymoPURE™ 96 Plasmid Miniprep Kit
Specifications						
Format	Spin-Column	Spin-Column	Spin-Column	Spin-Column	Spin-Column	96-Well
Elution Volume	≥ 25 µl	≥ 150 µl	≥ 300 µl	≥ 3 ml	≥ 150 µl	≥ 125 µl
Processing Time	15 min.	≤ 18 min.	≤ 18 min.	≤ 45 min.	15 min.	≤ 60 min
Culture Input	5 ml	50 ml	150 ml	2.5 L	25 ml	5 ml
DNA Yield	up to 100 µg	up to 1.2 mg	up to 3 mg	up to 25 mg	up to 1.2 mg	up to 100 µg
Endotoxins	≤ 1 EU/µg	≤ 0.025 EU/µg	≤ 0.025 EU/µg	≤ 0.025 EU/µg	≤ 1.0 EU/µg	≤ 1.0 EU/µg
Applications						
For Use In Transfection	•	•	•	•	•	•
For Use in Highly Sensitive Applications	•	•	•	•	•	•
Pellet-free (Direct From Culture)					•	
Plasmid Recovery From *E. coli*	•	•	•	•	•	•
Large Plasmid Recovery From *E. coli*	•	•	•	•	•	•
Page Number	50	49	49	49	51	50

Plasmid DNA Purification

Product Chart

	Zyppy® Plasmid Miniprep Kit	Zyppy® -96 Plasmid Miniprep Kit	Zyppy® -96 Plasmid MagBead Miniprep	ZR Plasmid Miniprep™ - Classic	ZR BAC DNA Miniprep Kit	Zymoprep™ Yeast Plasmid Miniprep I	Zymoprep™ Yeast Plasmid Miniprep II	Zymoprep™-96 Yeast Plasmid Miniprep
Specifications								
Format	Spin-Column	96-Well	Magnetic Beads	Spin-Column	Spin-Column	Isopropanol Precipitation	Spin-Column	96-Well
Elution Volume	≥ 30 µl	≥ 30 µl	≥ 30 µl	≥ 30 µl	≥ 10 µl	≥ 35 µl	≥ 10 µl	≥ 10 µl
Processing Time	8 min.	45 min.	1 hr.	15 min.	15 min.	30 min.	25 min.	≤ 60 min
Culture Input	600 µl - 3 ml	750 µl	750 µl	up to 5 ml	up to 500 µl - 5 ml	≤ 1.5 ml	≤ 1.5 ml	≤ 1.5 ml
DNA Yield	up to 25 µg	up to 5 µg	up to 5 µg	up to 25 µg	up to 10 µg	0.01 - 0.3 ng	0.01 - 0.3 ng	0.01 - 0.3 ng
Endotoxins	< 50 EU/µg	< 50 EU/µg	< 50 EU/µg	< 50 EU/µg	< 50 EU/µg	-	-	-
Applications								
For Use In Transfection	•	•	•	•	•			
Pellet-free (Direct from Culture)	•	•	•					
Plasmid Recovery from *E. coli*	•	•	•	•	•			
Large Plasmid Recovery from *E. coli*					•			
Plasmid Recovery from Yeast						•	•	•
Page Number	55	55	53	52	52	267	267	267

Genomic DNA Purification

Product Chart

	Quick-DNA™ Microprep Plus	*Quick*-DNA™ Miniprep Plus	*Quick*-DNA™ Midiprep Plus	*Quick*-DNA™ 96 Plus Kit	*Quick*-DNA™ Magbead Plus Kit	*Quick*-DNA™ Microprep Kit	*Quick*-DNA™ Miniprep Kit	*Quick*-DNA™ 96 Kit	*Quick*-DNA™ HMW MagBead Kit
Specifications									
Format	Spin-Column	Spin-Column	Spin-Column	96-Well	Magbead	Spin Column	Spin-Column	96-Well	Magbead
Binding Capacity	5 µg	25 µg	125 µg	5 µg	10 µg	5 µg	25 µg	5 µg	10 µg
Elution Volume	≥ 10 µl	≥ 35 µl	≥ 200 µl	≥ 15 µl	≥ 50 µl	≥ 10 µl	≥ 50 µl	≥ 30 µl	50 µl
Processing Time	20 min.	20 min.	30 min.	45 min.	1 hr.	15 min.	15 min.	25 min.	1 hr.
Applications/Samples									
Cultured Cells	•	•	•	•	•	•	•	•	•
Buccal Cells/Swabs/Saliva	•	•	•	•	•	•	•	•	•
Whole Blood	•	•	•	•	•	•	•	•	•
Semen	•	•	•	•	•	•	•	•	•
Fresh/Frozen Soft Tissue	•	•	•	•	•	•	•	•	•
Tail Snips/Ear Punches	•	•	•	•	•				
Hair, Nails, Feathers, & Bone	•	•	•	•	•				
FFPE Tissue	•	•	•	•	•				
Tissue Sections on Slides									
Mitochondria	•	•	•	•	•	•	•	•	•
Viral DNA	•	•	•	•	•	•	•	•	•
Plasma/Serum -Cell Free DNA									
Urine -Cell Free & Cellular DNA									
Urine Sediment	•	•	•	•	•				
Cerebrospinal Fluid	•	•	•	•	•	•	•	•	•
Amniotic Fluid	•	•	•	•	•	•	•	•	•
Microbes previously lysed with enzymes or mechanical methods	•	•	•	•	•	•	•	•	•
Fungi Susceptible to Yeast Lytic Enzyme									
Page Number	61	61	61	61	61	61	61	61	62

Genomic DNA Purification

Product Chart

	Quick-DNA™ Urine Kit	*Quick*-cfDNA™ Serum & Plasma Kit	*Quick*-DNA™ FFPE Miniprep Kit	Pinpoint® Slide DNA Isolation System	YeaStar™ Genomic DNA Kit	*Quick*-DNA™ Viral Kit	*Quick*-DNA™ Viral 96 Kit	MAGicBead™ cfDNA Isolation Kit
Specifications								
Format	Spin-Column	Spin-Column	Spin-Column	Spin-Column	Spin-Column	Spin-Column	96-Well	Magbead
Binding Capacity	5 µg	≤100ng	25 µg	5 µg	20 µg	5 µg	5 µg	100 ng
Elution Volume	≥ 10 µl	≥ 35 µl	≥ 25 µl	≥ 10 µl	≥ 60 µl	≥ 6 µl	≥ 10 µl	≥ 15 µl
Processing Time	15 min.	varies	1 hr.	5 hr.	1.5 hr.	15 min.	25 min.	1-1.5 hr.
Applications/Samples								
Cultured Cells						•	•	
Buccal Cells/Swabs/Saliva						•	•	
Whole Blood						•	•	
Semen						•	•	
Fresh/Frozen Solid Tissue			•					
Tail Snips/Ear Punches								
Hair, Nails, Feathers, & Bones								
FFPE Tissue			•	•				
Tissue Sections on Slides				•				
Mitochondria								
Viral DNA						•	•	
Plasma/Serum -Cell Free DNA		•				•	•	•
Urine -Cell Free & Cellular DNA	•							
Urine Sediment	•					•	•	
Cerebrospinal Fluid		•				•	•	•
Amniotic Fluid		•				•	•	•
Microbes previously lysed with enzymes or mechanical methods								
Fungi Susceptible to Yeast Lytic Enzyme					•			
Page Number	65	66	63	64	268	67	67	66

Environmental DNA Purification

Product Chart

	Quick-DNA™ Fecal/Soil Microbe Microprep Kit	*Quick*-DNA™ Fecal/Soil Microbe Miniprep Kit	*Quick*-DNA™ Fecal/Soil Microbe Midiprep Kit	*Quick*-DNA™ Fecal/Soil Microbe 96 Kit	*Quick*-DNA™ Fungal/Bacterial Microprep Kit	*Quick*-DNA™ Fungal/Bacterial Miniprep Kit	*Quick*-DNA™ Fungal/Bacterial Midiprep Kit	*Quick*-DNA™ Fungal/Bacterial 96 Kit	*Quick*-DNA™ Fecal/Soil Microbe 96 Magbead Kit
Specifications									
ZR BashingBead™ Lysis	•	•	•	•	•	•	•	•	•
Format	Spin-Column	Spin-Column	Spin-Column	96-Well	Spin-Column	Spin-Column	Spin-Column	96-Well	Magbead
Binding Capacity	5 µg	25 µg	125 µg	5 µg	5 µg	25 µg	125 µg	5 µg	25 µg
Elution Volume	≥ 20 µl	≥ 50 µl	≥ 150 µl	≥ 50 µl	≥ 10 µl	≥ 35 µl	≥ 150 µl	≥ 25 µl	37.5 µl
Removal of Humic, Fulvic, and Polyphenolic Substances	•	•	•	•					•
Processing Time	20 min.	20 min.	25 min.	50 min.	15 min.	15 min.	20 min.	40 min.	2 hr.
Applications									
Environmental Sources									
Air	•	•	•	•					•
Water	•	•	•	•					•
Soil	•	•	•	•					•
Sediment	•	•	•	•					•
Sludge	•	•	•	•					•
Feces	•	•	•	•					•
Microorganisms									
Bacteria	•	•	•	•	•	•	•	•	•
Fungi	•	•	•	•	•	•	•	•	•
Algae	•	•	•	•	•	•	•	•	•
Protists	•	•	•	•	•	•	•	•	•
Tough-to-Lyse Tissues									
Soft Tissues	some	some	some	some	some	some	some	some	some
Page Number	72	72	72	72	73	73	73	73	72

Environmental DNA Purification

Product Chart

	Quick-DNA™ Plant/Seed Miniprep Kit	*Quick*-DNA™ Plant/Seed 96 Kit	*Quick*-DNA™ Tissue / Insect Microprep Kit	*Quick*-DNA™ Tissue / Insect DNA Miniprep Kit	*Quick*-DNA™ Tissue / Insect 96 Kit
Specifications					
ZR BashingBead™ Lysis	•	•	•	•	•
Format	Spin-Column	96-Well	Spin-Column	Spin-Column	96-Well
Binding Capacity	25 µg	5 µg	5 µg	25 µg	5 µg
Elution Volume	≥ 50 µl	≥ 50 µl	≥ 10 µl	≥ 35 µl	≥ 25 µl
Removal of Humic, Fulvic, and Polyphenolic Substances	•	•			
Processing Time	20 min.	50 min.	15 min.	15 min.	40 min.
Applications					
Tough-to-Lyse Tissues					
Soft Tissues			•	•	•
Solid Tissues (Food)			•	•	•
Tough-to-Lyse Tissues			•	•	•
Tough-to-Lyse Organisms			•	•	•
Insects/Arthropods			•	•	•
Plant Material	•	•			
Seeds	•	•			
Fruit	•	•			
Page Number	75	75	74	74	74

RNA Clean-up

Product Chart

	RNA Clean & Concentrator™ -5	RNA Clean & Concentrator™ -25	RNA Clean & Concentrator™ -100	RNA Clean & Concentrator™-96	RNA Clean & Concentrator™ Magbead	Zymoclean™ Gel RNA Recovery Kit	ZR small-RNA™ PAGE Recovery Kit	OneStep™ PCR Inhibitor Removal Kit	OneStep™ -96 PCR Inhibitor Removal Kit
Specifications									
Format	Spin-Column	Spin-Column	Spin-Column	96-Well	Magnetic Bead	Spin-Column	Spin-Column	Spin-Column	96-Well
Binding Capacity	10 µg	50 µg	1 mg	10 µg	10 µg	10 µg	10 µg	No DNA/RNA Binding	
Elution Volume	≥ 6 µl	≥ 25 µl	≥ 100 µl	≥ 10 µl	≥ 15 µl	≥ 6 µl	≥ 6 µl	50 - 200 µl	50 - 100 µl
Processing Time	5 min.	5 min.	15 min.	20 min.	30 min.	30 min.	45 min.	5 min.	10 min.
Applications									
RNA Clean-up	•	•	•	•	•				
DNA-free RNA	•	•	•	•	•				
Enzyme Removal	•	•	•	•	•				
Nucleotide/Dye Removal	•	•	•	•	•				
Small-RNA/Probe Purification	•	•	•	•	•				
RNA From Agarose Gel Slices						•			
RNA From Polyacrylamide Gel Slices							•		
Removal of Polyphenolic RT Inhibitors								•	•
Page Number	123	123	123	123	123	124	124	89	89

RNA Isolation

Product Chart

	Direct-zol™ RNA Microprep Kit	Direct-zol™ RNA Miniprep Kit	Direct-zol™ RNA Miniprep Plus Kit	Direct-zol™ 96 RNA Kit	Direct-zol™ 96 MagBead RNA Kit	*Quick*-RNA™ Microprep Kit	*Quick*-RNA™ Miniprep Kit	*Quick*-RNA™ Miniprep Plus Kit	*Quick*-RNA™ Midiprep Kit	*Quick*-RNA™ 96 Kit	*Quick*-RNA MagBead™	*Quick*-RNA™ Whole Blood Kit
Specifications												
Format	Spin-Column	Spin-Column	Spin-Column	96-Well	Magnetic Bead	Spin-Column	Spin-Column	Spin-Column	Spin-Column	96-Well	Mganetic Bead	Spin-Coumn
Binding Capacity	10 µg	50 µg	100 µg	10 µg	10 µg	10 µg	100 µg	100 µg	1 mg	10 µg	15 µg RNA	10 µg
Elution Volume	≥ 6 µl	≥ 25 µl	≥ 50 µl	≥ 10 µl	≥ 50 µl	≥ 6 µl	≥ 50 µl	≥ 50 µl	≥ 200 µl	≥ 25 µl	50 µg	≥ 6 µ
Processing Time	7 min.	7 min.	7 min.	30 min.	2 hr.	7 min.	7 min.	7 min.	7 min.	30 min.	2 hr.	45 min.
Features												
Isolation from TRIzol®, TRI Reagent®, etc.	•	•	•	•	•							
Non-Organic RNA Extraction						•	•	•	•	•	•	
Viral Inactivation	•	•	•	•	•			•			•	
Small RNA Purification (miRNA)	•	•	•	•	•	•	•	•	•	•	•	
DNA/RNA Shield™ Compatible	•	•	•	•	•	•	•	•	•	•	•	
Applications												
Fresh/Frozen Soft Tissue	•	•	•	•	•	•	•	•	•	•	•	
Cultured Cells	•	•	•	•	•	•	•	•	•	•	•	
Buccal Cells/Swabs	•	•	•	•	•	•	•	•	•	•	•	
Buffy Coat	•	•	•	•	•	•	•	•	•	•	•	•
Whole Blood	•	•	•	•	•			•			•	•
Plasma/Serum	•	•	•	•	•			•			•	•
Virus	•	•	•	•	•			•			•	
Biological Fluids	•	•	•	•	•	•	•	•	•	•	•	
Page Number	109	109	109	109	110	112	112	113	112	112	114	116

RNA Isolation

Product Chart

	Quick-RNA™ Viral Kit	*Quick*-RNA™ Viral 96 Kit	ZR Urine RNA Isolation Kit™	Pinpoint™ Slide RNA Isolation System I Kit	Pinpoint™ Slide RNA Isolation System II Kit	*Quick*-RNA™ FFPE Kit	*Quick*-cfRNA™ Serum & Plasma Kit	YeaStar™ RNA Kit
Specifications								
Format	Spin-Column	96-Well	Spin-Column	Spin-Column	Spin-Column	Spin-Column	Spin-Column	Spin-Column
Binding Capacity	10 µg	10 µg	10 µg	10 µg	10 µg	50 µg	1-100 ng/ml plasma	100 µg
Elution Volume	≥ 6 µl	≥ 10 µl	≥ 6 µl	≥ 6 µl	≥ 6 µl	≥ 25 µl	15 µl	≥ 35 µl
Processing Time	6 min.	15 min.	15 min.	1.5 hr.	6.5 hr.	1.5 hr.	2 hr.	1 hr.
Applications								
Frozen Tissue Sections				•				
Fixed Tissue Sections					•	•		
Buccal Cells/Swabs	•	•						
Plasma/Serum	•	•					•	
Urine			•					
Virus	•	•						
Microvesicles			•				•	
Exosomes			•				•	
Fungi Susceptible to Yeast Lytic Enzyme								•
Page Number	115	115	117	117	117	118	119	269

Environmental RNA Purification

Product Chart

	Quick-RNA™ Fecal/Soil Microbe Microprep Kit	*Quick*-RNA™ Fungal/Bacterial Microprep Kit	*Quick*-RNA™ Fungal/Bacterial Miniprep Kit	*Quick*-RNA™ Tissue & Insect Microprep Kit	*Quick*-RNA™ Plant Miniprep Kit
Specifications					
Format	Spin-Column	Spin-Column	Spin-Column	Spin-Column	Spin-Column
Binding Capacity	10 µg	10 µg	50 µg	10 µg	50 µg
Elution Volume	≥ 6 µl	≥ 6 µl	≥ 25 µl	≥ 6 µl	≥ 25 µl
Removal of Polyphenolic RT Inhibitors	•				•
Processing Time	15 min.	15 min.	15 min.	15 min.	15 min.
Applications					
Soil	•				
Sediment	•				
Sludge	•				
Feces	•				
Bacteria	•	•	•		
Fungi	•	•	•		
Algae	•	•	•		
Protists	•	•	•		
Food		•	•	•	
Soft Tissues				•	
Tough-to-Lyse Tissues				•	
Tough-to-Lyse Organisms				•	
Insects/Arthropods				•	
Plant Material					•
Seeds					•
Fruit					•
Page Number	121	121	121	122	122

DNA/RNA Co-Purification

Product Chart

	Quick-DNA/RNA™ Miniprep Kit	ssDNA/RNA Clean & Concentrator™	*Quick*-DNA/RNA™ Viral Kit	*Quick*-DNA/RNA™ Viral 96 Kit	*Quick*-DNA/RNA™ Viral Magbead
Specifications					
Format	Spin-Column	Spin-Column	Spin-Column	96-Well	Magbead
Binding Capacity	100 µg DNA 50 µg RNA	10 µg	50 µg DNA/RNA	10 µg	5 µg
Elution Volume	≥ 50 µl DNA ≥ 25 µl RNA	≥ 6 µl	≥ 35 µl	≥ 10 µl	≥ 15 µl
Processing Time	15 min.	10 min.	5 min.	15 min.	35 min.
Applications					
Parallel Purification	•				
Co-Purification		•	•	•	•
Fresh/Frozen Soft Tissue	•				•
Fresh/Frozen Solid Tissue	limited				•
Bacteria	limited				•
Yeast	limited				•
Buffy Coat	•				•
Cultured Cells	•				
Small RNA	•	•			
Probe Purification		•			
Whole Blood (≤ 50 µl)			•	•	•
Plasma/Serum			•	•	•
Virus			•	•	•
Swabs	•		•	•	•
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DNA/RNA Co-Purification

Product Chart

	Quick™-DNA/RNA Microprep Plus Kit	*Quick*™-DNA/RNA Miniprep Plus Kit	*Quick*™-DNA/RNA Magbead Kit	*Quick*™-DNA/RNA Blood Tube Kit	*Quick*™-DNA/RNA FFPE Kit	ZymoBIOMICS® DNA/RNA Miniprep Kit	ZymoBIOMICS® Magbead DNA/RNA Kit	*Quick*™-DNA/RNA Pathogen Kit	*Quick*™-DNA/RNA Pathogen Magbead Kit	*Quick*-cfDNA/cfRNA™ Serum & Plasma Kit
Specifications										
Format	Spin-Column	Spin-Column	Magbead	Spin-Column	Spin-Column	Spin-Column	Magbead	Spin-Column	Magbead	Spin-Column
Binding Capacity	5 µg DNA/ 10 µg RNA	100 µg	15 µg	50 µg DNA 100 µg RNA	50 µg	100 µg	15 µg	50 µg	10 µg	1-100 ng/ml plasma
Elution Volume	≥ 6 µl	≥ 50 µl	≥ 50 µl	≥ 50 µl	≥ 25 µl	≥ 50 µl	≥ 50 µl	≥ 25 µl	≥ 50 µl	≥ 6 ml
Processing Time	15 min.	15 min.	60 min.	50 min.	90 min.	25 min.	45 min.	10 min.	35 min.	2 hr 30 min.
Applications										
Parallel Purification	•	•	•	•	•	•	•			•
Co-Purification			•		•	•	•	•	•	•
Fresh/Frozen Soft Tissue	•	•	•					•	•	
Fresh/Frozen Solid Tissue	limited	limited	limited					•	•	
Bacteria	limited	limited	limited			•	•	•	•	
Yeast	limited	limited	limited			•	•	•	•	
Buffy Coat	•	•	•					•	•	
Cultured Cells	•	•	•							
Liquid Biopsies	•	•	•					•	•	•
Small RNA	•	•	•	•	•	•	•			•
Whole Blood (<50 ul)	•	•	•	•				•	•	
Blood Tube (< 3 ml)				•						
Plasma/Serum										•
Virus								•	•	
Plants	limited	limited	limited					•	•	
Insects	limited	limited	limited					•	•	
Soil	limited	limited	limited			•	•			
Swabs	•	•	•			•	•	•	•	
Feces	limited	limited	limited			•	•			
FFPE	limited	limited	limited		•					
Water	limited	limited	limited			•	•			
Urine	limited	limited	limited							•
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Sample Collection Preservation - Devices

Product Chart

	DNA/RNA Shield™ -Blood Collection Tube	DNA/RNA Shield™ -Fecal Collection Tube	DNA/RNA Shield™ -Lysis Tube (Microbe + Tissue)	DNA/RNA Shield™ Collection Tube w/ Swab	DNA/RNA Shield™ SafeCollect™ Saliva Collection Kit	DNA/RNA Shield™ SafeCollect™ Swab Collection Kit	BunnyWipe™ Fecal Sample Collector
Specifications							
Format	Evacuated Blood Tube	Fecal Collection Tube with Scoop	Lysis Tube	Collection Tube & Sterile Swab	Collection Tube, Funnel & Piercing Cap	Collection Tube & Sterile Swab	Flushable Wipe
Bottle or Tube Size	16 x 100 mm	20 x 76 mm tube	2 ml tube (0.1 & 0.5 mm or 2.0 mm Beads)	12 x 80 mm screwcap tube	15 x 92 mm screwcap tube	15 x 92 mm screwcap tube	102 mm x 102 mm wipe
Tube Fill	6 ml	9 ml	1 ml	1 ml & 2 ml	2 ml	1 ml & 2 ml	N/A
Uses							
Blood	•			•		•	
Fecal		•	•	•		•	•
Swab			•	•		•	
Environmental		•	•	•		•	
Pathogen			•	•		•	
Tissue & Insect			•	•		•	
Urine							
Saliva				•	•	•	
Skin							
Applications							
Microbiomic Analysis	•	•	•	•	•	•	•
Gene Expression Analysis	•	•	•	•	•	•	•
Pathogen Detection	•	•	•	•	•	•	•
miRNA Analysis	•	•	•	•	•	•	•
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Sample Collection Preservation - Devices

Product Chart

	DNA/RNA Shield™ Reagent	DNA/RNA Shield™ Reagent (2X concentrate)	DNA/RNA Shield™ DirectDetect™ Reagent	Wastewater Stabilization Buffer™	Urine Conditioning Buffer™ (UCB™)	Urine Conditioning Buffer Plus™ (UCB+™)
Specifications						
Format	Reagent	Reagent	Reagent	Reagent	Reagent	Reagent
Bottle Fill	50 or 250 ml	25 or 125 ml	50 ml	140 ml	8 or 140 ml	8 or 140 ml
Uses						
Blood	•	•				
Fecal	•	•				
Swab	•	•	•			
Environmental	•	•		•		
Pathogen	•	•				
Tissue & Insect	•	•				
Urine					•	•
Applications						
Microbiomic Analysis	•	•	•	•	•	•
Gene Expression Analysis	•	•	•	•	•	•
Pathogen Detection	•	•	•	•	•	•
miRNA Analysis	•	•	•	•	•	•
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Microbiomics

Product Chart

	ZymoBIOMICS® Microbial Community Standard	ZymoBIOMICS® Microbial Community DNA Standard	ZymoBIOMICS® Microbial Community DNA Standard	ZymoBIOMICS® Microbial Community Standard II (Log Distribution)	ZymoBIOMICS® Microbial Community DNA Standard II (Log Distribution)
Specifications					
Size	10 preps	200 ng	2,000 ng	10 preps	220 ng
Storage solution	DNA/RNA Shield™	10 mM Tris-HCl and 0.1 mM EDTA, pH 8.0		DNA/RNA Shield™	10 mM Tris-HCl and 0.1 mM EDTA, pH 8.0
Impurity level	< 0.01% foreign microbial DNA				
Source					
A mixture of ten inactivated microorganisms (bacterial and fungal)	•			•	
A mixture of genomic DNA from ten microbial strains		•	•		•
Applications					
Assessment of bias that comes from DNA Extraction protocol and all other downstream steps	•			•	
Assessment of bias within library preparation and 16S rRNA sequencing		•	•		•
Assessment of bias within library preparation and whole genome sequencing		•	•		•
Assessment of detection limit of workflows due to logrithmic distribution				•	•
Assessment of profiling accuracy across a broad range of abundance				•	•
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Microbiomics

Product Chart

	ZymoBIOMICS® DNA Microprep Kit	ZymoBIOMICS® DNA Miniprep Kit	ZymoBIOMICS® 96 DNA Kit	ZymoBIOMICS® 96 MagBead Kit	ZymoBIOMICS® RNA Miniprep Kit	ZymoBIOMICS® DNA/RNA Miniprep Kit
Specifications						
Format	Spin-Column	Spin-Column	96-Well	96-Well	Spin-Column	Spin-Column
Binding Capacity	5 µg	25 µg	5 µg	5-20 µg	100 µg	100 µg
Elution Volume	≥10 µl	≥ 50 µl	≥ 20 µl	≥ 50 µl	≥ 50 µl	≥ 50 µl
Processing Time	20 min.	20 min.	45 min.	90 min.	20 min.	20 min.
Features						
Unbiased Lysis of Diverse Microbial Communities	•	•	•	•	•	•
Low Bioburden	•	•	•	•	•	•
PCR Inhibitor Removal Technology	•	•	•	•	•	•
Applications						
Fecal	•	•	•	•	•	•
Soil	•	•	•	•	•	•
Water	•	•	•	•	•	•
Biofilm	•	•	•	•	•	•
Swabs	•	•	•	•	•	•
Biological Fluids	•	•	•	•	•	•
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Index by Catalog Number

Cat No.	Product	Size	Page
A1001-5	Ampicillin Sodium	5 ml	286
A1001-25	Ampicillin Sodium	5 x 5 ml	286
A1002-5	Chloramphenicol	5 ml	286
A1002-25	Chloramphenicol	5 x 5 ml	286
A1003-5	Kanamycin Sulfate	5 ml	286
A1003-25	Kanamycin Sulfate	5 x 5 ml	286
A1004-5	Tetracycline Hydrochloride	5 ml	286
A1004-25	Tetracycline Hydrochloride	5 x 5 ml	286
A2001-1	500x L-Arabinose	1 ml	287
A2001-10	500x L-Arabinose	10 x 1 ml	287
A3002-15	Anti-5-Methylcytosine (clone 7D21)	0.5 µg/15 µl	200
A3002-30	Anti-5-Methylcytosine (clone 7D21)	0.5 µg/30 µl	200
A3002-50	Anti-5-Methylcytosine (clone 7D21)	0.5 µg/50 µl	200
A3002-200	Anti-5-Methylcytosine (clone 7D21)	0.5 µg/200 µl	200
A4001-25	Anti-5-Hydroxymethylcytosine Polyclonal Antibody	25 µg/25 µl	201
A4001-50	Anti-5-Hydroxymethylcytosine Polyclonal Antibody	50 µg/50 µl	201
A4001-200	Anti-5-Hydroxymethylcytosine Polyclonal Antibody	200 µg/200 µl	201
C1001-50	Collection Tubes (2 ml)	50 pack	297
C1001-500	Collection Tubes (2 ml)	500 pack	297
C1001-1000	Collection Tubes (2 ml)	1,000 pack	297
C1002-25	Zymo-Spin™ IC-XL	25 pack	292
C1002-50	Zymo-Spin™ IC-XL	50 pack	292
C1003-50	Zymo-Spin™ I Columns	50 pack	292
C1003-250	Zymo-Spin™ I Columns	250 pack	292
C1004-50	Zymo-Spin™ IC Columns	50 pack	292
C1004-250	Zymo-Spin™ IC Columns	250 pack	292
C1005-50	Zymo-Spin™ III Columns	50 pack	293
C1005-250	Zymo-Spin™ III Columns	250 pack	293
C1006-50-F	Spin-Away™ Filters	50 pack	Online
C1006-50-G	Zymo-Spin™ IIICG Columns	50 pack	294
C1006-250-F	Spin-Away™ Filters	250 pack	Online
C1006-250-G	Zymo-Spin™ IIICG Columns	250 pack	294
C1007-50	Zymo-Spin™ IV Columns	50 pack	294
C1007-250	Zymo-Spin™ IV Columns	250 pack	294
C1008-50	Zymo-Spin™ II Columns	50 pack	293
C1008-250	Zymo-Spin™ II Columns	250 pack	293
C1009-20	ZRC-GF Filter™	20 pack	297
C1009-50	ZRC-GF Filter™	50 pack	297
C1011-50	Zymo-Spin™ IIC Columns	50 pack	293
C1011-250	Zymo-Spin™ IIC Columns	250 pack	293
C1012-25	Zymo-Spin™ V Columns	25 pack	294
C1012-50	Zymo-Spin™ V Columns	50 pack	294
C1013-10	Zymo-Spin™ VI Columns	10 pack	295
C1013-20	Zymo-Spin™ VI Columns	20 pack	295
C1014-50	Zymo-Spin™ IB Columns	50 pack	292
C1014-250	Zymo-Spin™ IB Columns	250 pack	292

Cat No.	Product	Size	Page
C1015-25	Zymo-Spin™ IC-S Columns	25 pack	292
C1015-50	Zymo-Spin™ IC-S Columns	50 pack	292
C1016-25	Zymo-Spin™ V Columns with Reservoir	25 pack	295
C1016-50	Zymo-Spin™ V Columns with Reservoir	50 pack	295
C1017-10	Zymo-Spin™ VI Columns with Zymo Maxi Filter™	10 pack	296
C1017-20	Zymo-Spin™ VI Columns with Zymo Maxi Filter™	20 pack	296
C1018-10	Zymo-Spin™ VI Columns with Reservoir	10 pack	296
C1018-20	Zymo-Spin™ VI Columns with Reservoir	20 pack	296
C1019-50	Zymo-Spin™ IIN Columns	50 pack	293
C1019-250	Zymo-Spin™ IIN Columns	250 pack	293
C1021-25	Zymo-Spin™ V-E Columns with Zymo Midi Filter™	25 pack	296
C1024-25	Zymo-Spin™ V-E Columns	25 pack	294
C1024-50	Zymo-Spin™ V-E Columns	50 pack	294
C1025-50	2.0 mL V-bottom Clear Tube, with caps	50 pack	298
C1025-500	2.0 mL V-bottom Clear Tube, with caps	500 pack	298
C1026-50	2.0 mL V-bottom Amber Tube, with caps	50 pack	298
C1026-500	2.0 mL V-bottom Amber Tube, with caps	500 pack	298
C1027-50	2.0 mL U-bottom Clear Tube, with caps	50 pack	298
C1027-500	2.0 mL U-bottom Clear Tube, with caps	500 pack	298
C1028-50	2.0 mL U-bottom Amber Tube, with caps	50 pack	298
C1028-500	2.0 mL U-bottom Amber Tube, with caps	500 pack	298
C1029-25	Zymo-Spin V-E Columns w/ 15 ml Conical Reservoir	25 pack	Online
C1030	96 Elution Plate (V-Bottom, 200 ml)	2 plates	Online
C1030-50	96 Elution Plate (V-Bottom, 200 ml)	50 plates	Online
C1031-25	15 ml Conical Reservoir	25 pack	297
C1032-25	50 ml Conical Reservoir	25 pack	297
C1033-5	600 ml Reservoir	5 pack	297
C1036-5	ZymoPURE™ Syringe Filter and Plunger Set	5 pack	296
C1038-1	ZymoPURE™ Giga Filter	1 pack	297
C1040-5	Zymo-Spin™ III-P with 15 ml and 50 ml Reservoir	5 pack	295
C1042-5	Zymo-Spin™ V-P with 15 ml and 50 ml Reservoir	5 pack	295
C1044-5	Zymo-Spin™ VI-P	5 pack	295
C1052-50	Sterile Collection Swab	20 mm	37
C1053-50	Sterile Collection Swab	80 mm	37
C1057-50	Zymo-Spin™ III-F	50 pack	294
C1058-50	Zymo-Spin™ III-HRC	50 pack	294

Cat No.	Product	Size	Page
C1080-5	Zymo-Spin™ VI-PX	5 pack	295
C1082-5	Zymo-Spin™ V-PX with 15 ml and 50 ml Reservoir	5 pack	296
C1083-5	Zymo-Spin™ V-PS with 15 ml and 50 ml Reservoir	5 pack	296
C1086-50	Zymo-Spin™ II-PX	50 pack	293
C1102-25	Zymo-Spin™ IIC-XL Columns	25 pack	293
C1102-50	Zymo-Spin™ IIC-XL Columns	50 pack	293
C2001	Silicon-A™ Plate	2 plates	300
C2001-50	DNase/RNase-free Tubes (1.5 ml)	50 tubes	297
C2001-100	DNase/RNase-free Tubes (1.5 ml)	100 tubes	297
C2002	Collection Plate	2 plates	301
C2003	Elution Plate	2 plates	302
C2004	Zymo-Spin™ I-96 Plate (deep-well)	2 plates	300
C2004-SW	Zymo-Spin™ I-96 Plate (shallow-well)	2 plates	300
C2005	96-Well PCR / Conversion Plate with Cover Foil	2 plates/foils	302
C2006	Zymo-Spin™ IB-96 Plate (shallow-Well)	2 plates	300
C2007-2	96-Well Plate Cover Foil	2 foils	303
C2007-4	96-Well Plate Cover Foil	4 foils	Online
C2007-6	96-Well Plate Cover Foil	6 foils	303
C2007-8	96-Well Plate Cover Foil	8 foils	Online
C2007-12	96-Well Plate Cover Foil	12 foils	Online
C2007-24	96-Well Plate Cover Foil	24 foils	Online
C2008	96-Well PCR / Conversion Plate	2 plates	302
C2009	Silicon-A™-HRC Plate	2 plates	Online
C2010	Zymo-Spin™ I-96-XL Plate	2 plates	300
C2011-2	Air Permeable Sealing Cover	2 pack	Online
C2011-4	Air Permeable Sealing Cover	4 pack	Online
C2011-8	Air Permeable Sealing Cover	8 pack	Online
C2012	Zymo-Spin 384 Well Plate	2 pack	Online
C2015	96-Well 2.0 mL Deep Well Plate	2 plates	302
C2015-50	96-Well 2.0 mL Deep Well Plate	50 plates	302
C2018-5	96 Deep Well Plate (V-Bottom 2.2 ml)	5 plates	302
C2018-50	96 Deep Well Plate (V-Bottom 2.2 ml)	50 plates	302
C2019	96 Tip Combs (For V-Bottom Deep Well Plate)	2 combs	303
C2019-100	96 Tip Combs (For V-Bottom Deep Well Plate)	100 combs	303
C2020	96-Well ELISA Plate (12 x 8-well strips)	1 plate	Online
C2022	ZymoPURE™ Filter Plate	2 x 96-well plate	301
C2023	Zymo-Spin P-96 Plate	2 x 96-well plate	301
C2024	Wash Plate	2 x 96-well plate	301
D1000	dNTP Mix [10 mM]	500 µl	217
D1000-1	dNTP Mix [10 mM]	100 µl	217
D1005	dATP [100 mM]	250 µl	217

Cat No.	Product	Size	Page
D1010	dTTP [100 mM]	250 µl	217
D1015	dGTP [100 mM]	250 µl	217
D1020	dCTP [100 mM]	250 µl	217
D1030	5-Methylcytosine dNTP Mix [10 mM]	250 µl	217
D1035	5-Methyl dCTP [10 mM]	100 µl	217
D2001	Zymoprep™ Yeast Plasmid Miniprep I	100 preps	267
D2001-1-15	Solution 1, Digestion Buffer	15 ml	Online
D2001-2-15	Solution 2, Lysis Buffer	15 ml	Online
D2001-3-15	Solution 3, Neutralizing Buffer	15 ml	Online
D2002	YeaStar™ Genomic DNA Kit	40 preps	268
D2002-1	YD Digestion Buffer	4.8 ml	Online
D2002-2	YD Lysis Buffer	4.8 ml	Online
D2004	Zymoprep™ Yeast Plasmid Miniprep II	50 preps	267
D2004-1-10	Solution 1, Digestion Buffer	10 ml	Online
D2004-2-10	Solution 2, Lysis Buffer	10 ml	Online
D2004-3-20	Solution 3, Neutralizing Buffer	20 ml	Online
D2005	Zymoprep™ Yeast Plasmid Miniprep Kits	2 x 96 preps	267
D2006	Zymoprep™ Yeast Plasmid Miniprep Kits	4 x 96 preps	267
D2007	Zymoprep™ Yeast Plasmid Miniprep Kits	8 x 96 preps	267
D3001	Pinpoint® Slide DNA Isolation System	50 preps	64
D3001-1	Pinpoint® Solution	1 ml	Online
D3001-2-5	Proteinase K	5 mg	282
D3001-2-20	Proteinase K	20 mg	282
D3001-2-60	Proteinase K	60 mg	282
D3001-2-125	Proteinase K	125 mg	282
D3001-3	Pinpoint® Extraction Buffer	2.5 ml	Online
D3001-4	Pinpoint® Binding Buffer	6 ml	Online
D3001-5	Pinpoint® Wash Buffer	2.4 ml	Online
D3004-1-100	Genomic Lysis Buffer	100 ml	Online
D3004-1-150	Genomic Lysis Buffer	150 ml	Online
D3004-1-200	Genomic Lysis Buffer	2 x 100 ml	Online
D3004-1-250	Genomic Lysis Buffer	250 ml	Online
D3004-2-50	g-DNA Wash Buffer	50 ml	Online
D3004-2-100	g-DNA Wash Buffer	100 ml	Online
D3004-2-200	g-DNA Wash Buffer	200 ml	Online
D3004-2-250	g-DNA Wash Buffer	250 ml	Online
D3004-2-400	g-DNA Wash Buffer	4 x 100 ml	Online
D3004-4-1	DNA Elution Buffer	1 ml	Online
D3004-4-4	DNA Elution Buffer	4 ml	Online
D3004-4-10	DNA Elution Buffer	10 ml	Online
D3004-4-16	DNA Elution Buffer	16 ml	Online
D3004-4-50	DNA Elution Buffer	50 ml	Online
D3004-5-15	DNA Pre-wash Buffer	15 ml	Online
D3004-5-30	DNA Pre-wash Buffer	30 ml	Online
D3004-5-50	DNA Pre-wash Buffer	50 ml	Online

Cat No.	Product	Size	Page
D3004-5-250	DNA Pre-wash Buffer	250 ml	Online
D3008	Zymo-Seq UDI Primer Set	12 indexes	Online
D3010	*Quick*-DNA™ 96 Kit	2 x 96 preps	61
D3011	*Quick*-DNA™ 96 Kit	4 x 96 preps	61
D3012	*Quick*-DNA™ 96 Kit	10 x 96 preps	61
D3015	*Quick*-DNA™ Viral Kit	50 preps	67
D3015-1-50	Viral DNA Buffer	50 ml	Online
D3016	*Quick*-DNA™ Viral Kit	200 preps	67
D3016-1-100	Viral DNA Buffer	100 ml	Online
D3017	*Quick*-DNA™ Viral 96 Kit	2 x 96 preps	67
D3018	*Quick*-DNA™ Viral 96 Kit	4 x 96 preps	67
D3020	*Quick*-DNA™ Microprep Kit	50 preps	61
D3021	*Quick*-DNA™ Microprep Kit	200 preps	61
D3024	*Quick*-DNA™ Miniprep Kit (capped)	50 preps	61
D3025	*Quick*-DNA™ Miniprep Kit (capped)	200 preps	61
D3061	*Quick*-DNA™ Urine Kit	50 preps	65
D3061-1-8	Urine Conditioning Buffer™ (UCB™)	8 ml	39
D3061-1-140	Urine Conditioning Buffer™ (UCB™)	140 ml	39
D3062	Urine Collection Kit	10 pack	35
D3062-1	Urine Collection Cup	10 pack	37
D3067	*Quick*-DNA™ FFPE Kit	50 preps	63
D4001	Zymoclean™ Gel DNA Recovery Kit (uncapped columns)	50 preps	90
D4001T	Zymoclean™ Gel DNA Recovery Kit (uncapped columns)	10 preps	90
D4001-1-50	ADB (Agarose Dissolving Buffer)	50 ml	Online
D4001-1-100	ADB (Agarose Dissolving Buffer)	100 ml	Online
D4002	Zymoclean™ Gel DNA Recovery Kit (uncapped columns)	200 preps	90
D4003	DNA Clean & Concentrator®-5 (uncapped columns)	50 preps	82
D4003T	DNA Clean & Concentrator®-5 (uncapped columns)	10 preps	82
D4003-1-L	DNA Binding Buffer	50 ml	Online
D4003-1-25	DNA Binding Buffer	25 ml	Online
D4003-2-6	DNA Wash Buffer	6 ml	Online
D4003-2-24	DNA Wash Buffer	24 ml	Online
D4003-2-48	DNA Wash Buffer	48 ml	Online
D4004	DNA Clean & Concentrator®-5 (uncapped columns)	200 preps	82
D4004-1-L	DNA Binding Buffer	100 ml	Online
D4005	DNA Clean & Concentrator®-25 (uncapped columns)	50 preps	82
D4006	DNA Clean & Concentrator®-25 (uncapped columns)	200 preps	82
D4007	Zymoclean™ Gel DNA Recovery Kit (capped columns)	50 preps	90
D4008	Zymoclean™ Gel DNA Recovery Kit (capped columns)	200 preps	90
D4010	Genomic DNA Clean & Concentrator®-10	25 preps	86
D4011	Genomic DNA Clean & Concentrator®-10	100 preps	86
D4012	DNA Clean & Concentrator® Magbead Kit	100 preps	83
D4013	DNA Clean & Concentrator®-5 (capped columns)	50 preps	82
D4014	DNA Clean & Concentrator®-5 (capped columns)	200 preps	82
D4015	ZR Plasmid Miniprep™-Classic	100 preps	52
D4016	ZR Plasmid Miniprep™-Classic	400 preps	52
D4017	ZR-96 DNA Clean-up Kit™	2 x 96 preps	83
D4018	ZR-96 DNA Clean-up Kit™	4 x 96 preps	83
D4019	Zyppy® Plasmid Miniprep Kit	100 preps	55
D4020	Zyppy® Plasmid Miniprep Kit	400 preps	55
D4021	ZR-96 Zymoclean™ Gel DNA Recovery Kit	2 x 96 preps	90
D4022	ZR-96 Zymoclean™ Gel DNA Recovery Kit	4 x 96 preps	90
D4023	ZR-96 DNA Clean & Concentrator®-5	2 x 96 preps	82
D4024	ZR-96 DNA Clean & Concentrator®-5	4 x 96 preps	82
D4027-1-10	Buffer P1	10 ml	Online
D4027-1-20	Buffer P1	20 ml	Online
D4027-1-80	Buffer P1	80 ml	Online
D4027-1-160	Buffer P1	160 ml	Online
D4027-1-320	Buffer P1	320 ml	Online
D4027-2-10	Buffer P2	10 ml	Online
D4027-2-20	Buffer P2	20 ml	Online
D4027-2-80	Buffer P2	80 ml	Online
D4027-2-160	Buffer P2	160 ml	Online
D4027-2-250	Buffer P2	250 ml	Online
D4027-2-320	Buffer P2	320 ml	Online
D4027-3-12	Buffer P3	12 ml	Online
D4027-3-50	Buffer P3	50 ml	Online
D4027-3-220	Buffer P3	220 ml	Online
D4027-3-440	Buffer P3	440 ml	Online
D4027-4-6	Plasmid Wash Buffer (concentrate)	6 ml	Online
D4027-4-12	Plasmid Wash Buffer (concentrate)	12 ml	Online
D4027-4-24	Plasmid Wash Buffer (concentrate)	24 ml	Online
D4027-4-48	Plasmid Wash Buffer (concentrate)	48 ml	Online
D4029	DNA Clean & Concentrator®-100	25 preps	83
D4030	DNA Clean & Concentrator®-100	50 preps	83
D4031	DNA Clean & Concentrator®-500	10 preps	83
D4032	DNA Clean & Concentrator®-500	20 preps	83
D4033	DNA Clean & Concentrator®-25 (capped columns)	50 preps	82
D4034	DNA Clean & Concentrator®-25 (capped columns)	200 preps	82
D4036	Zyppy® Plasmid Miniprep Kit	50 preps	55
D4036-1-6	7X Lysis Buffer	6 ml	Online
D4036-1-12	7X Lysis Buffer	12 ml	Online

Cat No.	Product	Size	Page
D4036-1-30	7X Lysis Buffer	30 ml	Online
D4036-1-48	7X Lysis Buffer	48 ml	Online
D4036-1-60	7X Lysis Buffer	60 ml	Online
D4036-2-20	Neutralization Buffer	20 ml	Online
D4036-2-40	Neutralization Buffer	40 ml	Online
D4036-2-160	Neutralization Buffer	160 ml	Online
D4036-2-200	Neutralization Buffer	200 ml	Online
D4036-3-6	Endo-Wash Buffer	6 ml	Online
D4036-3-15	Endo-Wash Buffer	15 ml	Online
D4036-3-30	Endo-Wash Buffer	30 ml	Online
D4036-3-60	Endo-Wash Buffer	60 ml	Online
D4036-3-120	Endo-Wash Buffer	120 ml	Online
D4036-3-240	Endo-Wash Buffer	240 ml	Online
D4036-4-6	Zyppy® Wash Buffer	6 ml	Online
D4036-4-12	Zyppy® Wash Buffer	12 ml	Online
D4036-4-24	Zyppy® Wash Buffer	24 ml	Online
D4036-4-48	Zyppy® Wash Buffer	48 ml	Online
D4036-5-5	Zyppy® Elution Buffer	5 ml	Online
D4036-5-10	Zyppy® Elution Buffer	10 ml	Online
D4036-5-20	Zyppy® Elution Buffer	20 ml	Online
D4036-5-30	Zyppy® Elution Buffer	30 ml	Online
D4036-5-60	Zyppy® Elution Buffer	60 ml	Online
D4036-5-100	Zyppy® Elution Buffer	100 ml	Online
D4037	Zyppy® Plasmid Miniprep Kit	800 preps	55
D4041	Zyppy® 96 Plasmid Miniprep Kit	2 x 96 preps	55
D4041-1-30	Deep Blue Lysis Buffer	30 ml	Online
D4041-1-48	Deep Blue Lysis Buffer	48 ml	Online
D4041-4-100	Neutralization/Clearing Buffer	100 ml	Online
D4041-4-200	Neutralization/Clearing Buffer	200 ml	Online
D4042	Zyppy® 96 Plasmid Miniprep Kit	4 x 96 preps	55
D4043	Zyppy® 96 Plasmid Miniprep Kit	8 x 96 preps	55
D4045	Zymoclean™ Large Fragment DNA Recovery Kit	25 preps	91
D4046	Zymoclean™ Large Fragment DNA Recovery Kit	100 preps	91
D4048	ZR BAC DNA Miniprep Kit	25 preps	52
D4049	ZR BAC DNA Miniprep Kit	100 preps	52
D4050	ZR DNA Sequencing Clean-up Kit™	50 preps	88
D4050-1-14	Sequencing Binding Buffer	14 ml	Online
D4050-1-55	Sequencing Binding Buffer	55 ml	Online
D4050-1-500	Sequencing Binding Buffer	500 ml	Online
D4050-2-20	Sequencing Wash Buffer	20 ml	Online
D4050-2-70	Sequencing Wash Buffer	70 ml	Online
D4050-2-500	Sequencing Wash Buffer	500 ml	Online
D4051	ZR DNA Sequencing Clean-up Kit™	200 preps	88
D4052	ZR-96 DNA Sequencing Clean-up Kit™	2 x 96 preps	88
D4053	ZR-96 DNA Sequencing Clean-up Kit™	4 x 96 preps	88

Cat No.	Product	Size	Page
D4054	ZR Plasmid Miniprep™-Classic	800 preps	51
D4060	Oligo Clean & Concentrator™	50 preps	84
D4060-1-10	Oligo Binding Buffer	10 ml	Online
D4060-1-40	Oligo Binding Buffer	40 ml	Online
D4061	Oligo Clean & Concentrator™	200 preps	84
D4062	ZR-96 Oligo Clean & Concentrator™	2 x 96 preps	84
D4063	ZR-96 Oligo Clean & Concentrator™	4 x 96 preps	84
D4064	Genomic DNA Clean & Concentrator®-25	25 preps	86
D4065	Genomic DNA Clean & Concentrator®-25	100 preps	86
D4066	ZR-96 Genomic DNA Clean & Concentrator®-5	2 x 96 preps	87
D4067	ZR-96 Genomic DNA Clean & Concentrator®-5	4 x 96 preps	87
D4068	*Quick*-DNA™ Miniprep Plus Kit	50 preps	61
D4068T	*Quick*-DNA™ Miniprep Plus Kit	10 preps	61
D4069	*Quick*-DNA™ Miniprep Plus Kit	200 preps	61
D4070	*Quick*-DNA™ 96 Plus Kit	2 x 96 preps	61
D4071	*Quick*-DNA™ 96 Plus Kit	4 x 96 preps	61
D4074	*Quick*-DNA™ Microprep Plus Kit	50 preps	61
D4075	*Quick*-DNA™ Midiprep Plus Kit	25 preps	61
D4076	*Quick*-cfDNA™ Serum & Plasma Kit	50 preps	66
D4076-A	*Quick*-cfDNA™ Serum & Plasma Buffer Set	Refill	66
D4080	*Select-a-Size*™ DNA Clean & Concentrator®	25 preps	85
D4081	*Quick*-DNA™ Magbead Plus Kit	1 x 96 preps	61
D4082	*Quick*-DNA™ Magbead Plus Kit	4 x 96 preps	61
D4084	*Select-a-Size*™ DNA Clean & Concentrator® MagBead Kit	10 ml	85
D4085	*Select-a-Size*™ DNA Clean & Concentrator® MagBead Kit	50 ml	85
D4086	MAGicBead™ cfDNA Isolation Kit	2 ml x 50 preps	66
D4086	MAGicBead™ cfDNA Isolation Kit	Custom	66
D4086-1-25	MAGicBead™ cfDNA Digestion Buffer	25 ml	Online
D4086-2-25	MAGicBead™ cfDNA Binding Buffer	25 ml	Online
D4100	Zyppy® 96 Plasmid MagBead Miniprep Kit	2 x 96 preps	53
D4100-1-10	MagClearing Beads	10 ml	Online
D4100-1-20	MagClearing Beads	20 ml	Online
D4100-1-40	MagClearing Beads	40 ml	Online
D4100-2-6	MagBinding Beads	6 ml	298
D4100-2-8	MagBinding Beads	8 ml	298
D4100-2-12	MagBinding Beads	12 ml	298
D4100-2-16	MagBinding Beads	16 ml	298
D4100-2-24	MagBinding Beads	24 ml	298
D4101	Zyppy® 96 Plasmid MagBead Miniprep Kit	4 x 96 preps	53
D4102	Zyppy® 96 Plasmid MagBead Miniprep Kit	8 x 96 preps	53

Cat No.	Product	Size	Page
D4200	ZymoPURE™ II Plasmid Midiprep Kit	25 preps	49
D4201	ZymoPURE™ II Plasmid Midiprep Kit	50 preps	49
D4202	ZymoPURE™ II Plasmid Maxiprep Kit	10 preps	49
D4203	ZymoPURE™ II Plasmid Maxiprep Kit	20 preps	49
D4204	ZymoPURE™ II Plasmid Gigaprep Kit	5 preps	49
D4208T	ZymoPURE™ Plasmid Miniprep Kit	10 preps	50
D4209	ZymoPURE™ Plasmid Miniprep Kit	50 preps	50
D4210	ZymoPURE™ Plasmid Miniprep Kit	100 preps	50
D4211	ZymoPURE™ Plasmid Miniprep Kit	400 preps	50
D4212	ZymoPURE™ Plasmid Miniprep Kit	800 preps	50
D4213	ZymoPURE-Express™ Plasmid Midiprep Kit	25 preps	51
D4214	ZymoPURE™ 96 Plasmid Miniprep Kit	2 x 96 preps	50
D4215	ZymoPURE™ 96 Plasmid Miniprep Kit	4 x 96 preps	50
D4300	ZymoBIOMICS® DNA Miniprep Kit	50 preps	169
D4300T	ZymoBIOMICS® DNA Miniprep Kit	5 preps	169
D4301	ZymoBIOMICS® DNA Microprep Kit	50 preps	169
D4302	ZymoBIOMICS® 96 MagBead DNA Kit	2 x 96 preps	171
D4302-E	ZymoBIOMICS® 96 MagBead DNA Kit	2 x 96 preps	171
D4303	ZymoBIOMICS® 96 DNA Kit	2 x 96 preps	169
D4304	ZymoBIOMICS® DNA Miniprep Kit	50 preps	169
D4306	ZymoBIOMICS® 96 MagBead DNA Kit	2 x 96 preps	171
D4306-E	ZymoBIOMICS® 96 MagBead DNA Kit	2 x 96 preps	171
D4307	ZymoBIOMICS® 96 DNA Kit	2 x 96 preps	169
D4308	ZymoBIOMICS® 96 MagBead DNA Kit	2 x 96 preps	171
D4308-E	ZymoBIOMICS® 96 MagBead DNA Kit	2 x 96 preps	171
D4309	ZymoBIOMICS® 96 DNA Kit	2 x 96 preps	169
D4310	HostZERO™ Microbial DNA Kit	50 preps	173
D4311	Load N' Go ZymoBIOMICS® 96 MagBead DNA Kit	96 preps	171
D5001	EZ DNA Methylation™ Kit	50 rxns	194
D5001-1	CT Conversion Reagent (10 conversions)	1 tube	Online
D5001-1-50	CT Conversion Reagent (5 x 10 conversions)	5 tubes	Online
D5001-2	M-Dilution Buffer	1.3 ml	Online
D5001-3	M-Binding Buffer	20 ml	Online
D5001-4	M-Wash Buffer	6 ml	Online
D5001-5	M-Desulphonation Buffer	10 ml	Online
D5001-6	M-Elution Buffer	1 ml	Online
D5002	EZ DNA Methylation™ Kit	200 rxns	194
D5002-2	M-Dilution Buffer	5.2 ml	Online
D5002-3	M-Binding Buffer	80 ml	Online
D5002-4	M-Wash Buffer	24 ml	Online

Cat No.	Product	Size	Page
D5002-5	M-Desulphonation Buffer	40 ml	Online
D5002-6	M-Elution Buffer	4 ml	Online
D5003	EZ-96 DNA Methylation™ Kit (shallow-well)	2 x 96 rxns	194
D5003-1	CT Conversion Reagent (96 conversions)	1 bottle	Online
D5004	EZ-96 DNA Methylation™ Kit (deep-well)	2 x 96 rxns	194
D5005	EZ DNA Methylation-Gold® Kit	50 rxns	194
D5005-2	M-Dilution Buffer	1.5 ml	Online
D5005-3	M-Binding Buffer	30 ml	Online
D5005-6	M-Dissolving Buffer	500 µl	Online
D5006	EZ DNA Methylation-Gold® Kit	200 rxns	194
D5006-2	M-Dilution Buffer	7 ml	Online
D5006-3	M-Binding Buffer	125 ml	Online
D5006-6	M-Dissolving Buffer	1.2 ml	Online
D5007	EZ-96 DNA Methylation-Gold® Kit (shallow-well)	2 x 96 rxns	194
D5007-4	M-Wash Buffer	36 ml	Online
D5007-6	M-Elution Buffer	8 ml	Online
D5008	EZ-96 DNA Methylation-Gold® Kit (deep-well)	2 x 96 rxns	194
D5011	Universal Methylated Human DNA Standard	1 set	208
D5012	Universal Methylated Mouse DNA Standard	1 set	208
D5013	Human WGA Methylated & Non-methylated DNA Set	1 set	206
D5013-1	Human WGA Non-Methylated DNA	5 µg / 20 µl	Online
D5013-2	Human WGA Methylated DNA	5 µg / 20 µl	Online
D5014	Human Methylated & Non-methylated DNA Set	1 set	206
D5014-1	Human HCT116 DKO Non-methylated DNA	5 µg / 20 µl	Online
D5014-2	Human HCT116 DKO Methylated DNA	5 µg / 20 µl	Online
D5015	Bisulfite-Converted Universal Methylated Human DNA Standard	1 set	208
D5016	*E. coli* Non-methylated Genomic DNA	5 µg / 20 µl	208
D5017	Methylated & Non-methylated pUC19 DNA Set	1 set	208
D5018	Human Matched DNA Set	1 set	209
D5018-1	Human Brain DNA	5 µg	Online
D5018-2	Human Spleen DNA	5 µg	Online
D5019	Mouse 5hmC & 5mC DNA Set	1 set	209
D5019-1	Mouse Brain DNA	5 µg	Online
D5019-2	Mouse Kidney DNA	5 µg	Online
D5019-3	Mouse Liver DNA	5 µg	Online
D5019-4	Mouse Thymus DNA	5 µg	Online
D5020	EZ DNA Methlyation-Direct™ Kit	50 rxns	193
D5020-7	M-Solubilization Buffer	4.5 ml	Online
D5020-8	M-Reaction Buffer	1 ml	Online

Cat No.	Product	Size	Page
D5020-9	M-Digestion Buffer (2X)	4 ml	Online
D5021	EZ DNA Methlyation-Direct™ Kit	200 rxns	193
D5021-7	M-Solubilization Buffer	18 ml	Online
D5021-8	M-Reaction Buffer	4 ml	Online
D5021-9	M-Digestion Buffer (2X)	15 ml	Online
D5022	EZ-96 DNA Methylation-Direct™ Kit (shallow-well)	2 x 96 rxns	193
D5023	EZ-96 DNA Methylation-Direct™ Kit (deep-well)	2 x 96 rxns	193
D5024	EZ DNA Methylation -Startup™ Kit	50 rxns	196
D5030	EZ DNA Methylation-Lightning® Kit	50 rxns	192
D5030-E	EZ DNA Methylation-Lightning® Kit	50 rxns	192
D5030T	EZ DNA Methylation-Lightning® Kit	10 rxns	192
D5030-1	Lightning Conversion Reagent	1.5 ml	Online
D5030-5	L-Desulphonation Buffer	10 ml	Online
D5031	EZ DNA Methlyation-Lightning® Kit	200 rxns.	192
D5031-E	EZ DNA Methlyation-Lightning® Kit	200 rxns.	192
D5031-5	L-Desulphonation Buffer	40 ml	Online
D5032	EZ-96 DNA Methylation-Lightning® Kit (shallow-well)	2 x 96 rxns	192
D5032-1	Lightning Conversion Reagent, 1 bottle	15 ml	Online
D5033	EZ-96 DNA Methylation-Lightning® Kit (deep-well)	2 x 96 rxns	192
D5040	EZ-96 DNA Methylation™ MagPrep	4 x 96 rxns	195
D5040-3	M-Binding Buffer	250 ml	Online
D5040-4	M-Wash Buffer	72 ml	Online
D5040-5	M-Desulphonation Buffer	80 ml	Online
D5041	EZ-96 DNA Methylation™ MagPrep	8 x 96 rxns	195
D5041-6	M-Elution Buffer	40 ml	Online
D5042	EZ-96 DNA Methylation-Gold® MagPrep	4 x 96 rxns	194
D5043	EZ-96 DNA Methylation-Gold® MagPrep	8 x 96 rxns	194
D5044	EZ-96 DNA Methylation-Direct™ MagPrep	4 x 96 rxns	193
D5045	EZ-96 DNA Methylation-Direct™ MagPrep	8 x 96 rxns	193
D5046	EZ-96 DNA Methylation-Lightning® MagPrep	4 x 96 rxns	192
D5046-E	EZ-96 DNA Methylation-Lightning® MagPrep	4 x 96 rxns	192
D5046-5	L-Desulphonation Buffer	80 ml	Online
D5047	EZ-96 DNA Methylation-Lightning® MagPrep	8 x 96 rxns	192
D5047-E	EZ-96 DNA Methylation-Lightning® MagPrep	8 x 96 rxns	192
D5049	EZ-96 DNA Methylation-Lightning™ Automation Kit	96 rxns	192
D5101	Methylated-DNA IP Kit	10 rxns	199
D5101-2	Methylated/Non-methylated Control DNA & Primer Set	1 Set	Online
D5101-3-20	MIP Buffer	20 ml	Online

Cat No.	Product	Size	Page
D5101-4-1	DNA Denaturing Buffer	1 ml	Online
D5101-5-6	IP DNA Binding Buffer	6 ml	Online
D5201	ChIP DNA Clean & Concentrator® (uncapped)	50 preps	210
D5201-1-50	ChIP DNA Binding Buffer	50 ml	Online
D5201-1-100	ChIP DNA Binding Buffer	100 ml	Online
D5205	ChIP DNA Clean & Concentrator® (capped)	50 preps	210
D5206	ZR-96 ChIP DNA Clean & Concentrator®	2 x 96 rxns	210
D5207	ZR-96 ChIP DNA Clean & Concentrator®	4 x 96 preps	210
D5209	Zymo-Spin™ ChIP Kit	10 preps	210
D5210	Zymo-Spin™ ChIP Kit	25 preps	210
D5210-1-30	Chromatin Shearing Buffer	30 ml	Online
D5210-2-30	Chromatin Dilution Buffer	30 ml	Online
D5210-3-30	Chromatin Wash Buffer I	30 ml	Online
D5210-4-30	Chromatin Wash Buffer II	30 ml	Online
D5210-5-30	Chromatin Wash Buffer III	30 ml	Online
D5210-6-10	5X Chromatin Elution Buffer	10 ml	Onlne
D5210-7-1	5M NaCl	1 ml	Online
D5220	EZ Nucleosomal DNA Prep Kit	20 preps	211
D5220-1	Micrococcal Nuclease	10 U / 100 µl	281
D5220-2	Nuclei Prep Buffer	50 ml	Online
D5220-3	MN Digestion Buffer	50 ml	Online
D5220-4	5X MN Stop Buffer	6 ml	Online
D5310	*OneStep* qMethyl™ Kit	1 x 96 well	Online
D5310-1	2X Test Reaction PreMix	0.5 ml	Online
D5310-2	2X Reference Reaction PreMix	0.5 ml	Online
D5312	*OneStep* PLUS qMethyl™ Kit	96 rxns	197
D5325	5-mC DNA ELISA Kit	1 x 96 rxns	198
D5325-1-15	5-mC Coating Buffer	15 ml	Online
D5325-1-30	5-mC Coating Buffer	30 ml	Online
D5325-2-250	5-mC ELISA Buffer	250 ml	Online
D5325-3-15	Secondary Antibody	15 µl	Online
D5325-3-30	Secondary Antibody	30 µl	Online
D5325-5-1	Negative Control	50 µl	Online
D5325-5-2	Positive Control	50 µl	Online
D5326	5-mC DNA ELISA Kit	2 x 96 rxns	198
D5405	5-Methylcytosine & 5-Hydroxymethylcytosine DNA Standard Set	1 set	209
D5405-1	Cytosine DNA Standard	2 µg	Online
D5405-2	5-Methylcytosine DNA Standard	2 µg	Online
D5405-3	5-Hydroxymethylcytosine DNA Standard	2 µg	Online
D5425	Quest 5-hmC™ DNA ELISA Kit	1 x 96 rxns	201
D5425-1-15	Coating Buffer	15 ml	Online
D5425-1-30	Coating Buffer	30 ml	Online
D5425-2-30	10X ELISA Buffer	30 ml	Online
D5425-2-60	10X ELISA Buffer	60 ml	Online

Cat No.	Product	Size	Page
D5425-3-100	Anti-DNA HRP Antibody	100 µl	Online
D5425-3-200	Anti-DNA HRP Antibody	200 µl	Online
D5425-4-15	HRP Developer	15 ml	Online
D5425-4-30	HRP Developer	30 ml	Online
D5425-5-1	Control A	4 µg	Online
D5425-5-2	Control B	4 µg	Online
D5425-5-3	Control C	4 µg	Online
D5425-5-4	Control D	4 µg	Online
D5425-5-5	Control E	4 µg	Online
D5425-5-C	Control DNA Set	5 x 40 µl	Online
D5426	Quest 5-hmC™ DNA ELISA Kit	2 x 96 rxns	201
D5458	Zymo-Seq ATAC Library Kit	12 preps	188
D5460	Zymo-Seq RRBS Library Kit	24 preps	186
D5461	Zymo-Seq RRBS Library Kit	48 preps	186
D5462	Zymo-Seq Cell Free DNA WGBS Library Kit	24 preps	184
D5463	Zymo-Seq Cell Free DNA WGBS Library Kit	96 preps	184
D5465	Zymo-Seq WGBS Library Kit	24 preps	185
D5500	Zymo-Seq Methyl Spike-in Control	25 preps	207
D5450	RRHP™ 5-hmC Library Prep Kit	12 preps	202
D5451	RRHP™ 5-hmC Library Prep Kit	25 preps	202
D5455	Pico Methyl-Seq™ Library Prep Kit	10 preps	187
D5456	Pico Methyl-Seq™ Library Prep Kit	25 preps	187
D6001-3-40	BashingBead Buffer	40 ml	Online
D6001-3-150	BashingBead Buffer	150 ml	Online
D6005	*Quick*-DNA™ Fungal/Bacterial Miniprep Kit	50 preps	73
D6006	*Quick*-DNA™ Fungal/Bacterial 96 Kit	2 x 96 preps	73
D6007	*Quick*-DNA™ Fungal/Bacterial Microprep Kit	50 preps	73
D6010	*Quick*-DNA™ Fecal/Soil Microbe Miniprep Kit	50 preps	72
D6010-FM	*Quick*-DNA™ Fecal/Soil Microbe 96 Magbead Kit	2 x 96 preps	72
D6011	*Quick*-DNA™ Fecal/Soil Microbe 96 Kit	2 x 96 preps	72
D6011-FM	*Quick*-DNA™ Fecal/Soil Microbe 96 Magbead Kit	2 x 96 preps	72
D6012	*Quick*-DNA™ Fecal/Soil Microbe Microprep Kit	50 preps	72
D6012-FM	*Quick*-DNA™ Fecal/Soil Microbe 96 Magbead Kit	2 x 96 preps	72
D6015	*Quick*-DNA™ Tissue/Insect Microprep Kit	50 preps	74
D6016	*Quick*-DNA™ Tissue/Insect Miniprep Kit	50 preps	74
D6017	*Quick*-DNA™ Tissue/Insect 96 Kit	2 x 96 preps	74
D6020	*Quick*-DNA™ Plant/Seed Miniprep Kit	50 preps	75
D6021	*Quick*-DNA™ Plant/Seed 96 Kit	2 x 96 preps	75
D6030	*OneStep*™ PCR Inhibitor Removal Kit	50 preps	89
D6035	*OneStep*™-96 PCR Inhibitor Removal Kit	2 x 96 preps	89
D6035-1-30	Prep Solution	30 ml	Online
D6060	*Quick*-DNA™ HMW Magbead Kit	96 preps	62
D6105	*Quick*-DNA™ Fungal/Bacterial Midiprep Kit	25 preps	73
D6110	*Quick*-DNA™ Fecal/Soil Microbe Midiprep Kit	25 preps	72
D6300	ZymoBIOMICS® Microbial Community Standard	10 preps	158
D6305	ZymoBIOMICS® Microbial Community DNA Standard	200 ng	159
D6306	ZymoBIOMICS® Microbial Community DNA Standard	2,000 ng	159
D6310	ZymoBIOMICS® Microbial Community Standard II (Log Distribution)	10 preps	161
D6311	ZymoBIOMICS® Microbial Community DNA Standard II (Log Distribution)	220 ng/20µl	161
D6320	ZymoBIOMICS Spike-in Control I (High Microbial Load)	25 preps	162
D6320-10	ZymoBIOMICS Spike-in Control I (High Microbial Load)	250 preps	162
D6321	ZymoBIOMICS Spike-in Control II (Low Microbial Load)	25 preps	163
D6321-10	ZymoBIOMICS Spike-in Control II (Low Microbial Load)	250 preps	163
D6322	ZymoBIOMICS HMW DNA Standard	5000 ng	164
D6323	ZymoBIOMICS Fecal Reference with TruMatrix™ Technology	10 preps	Online
D6331	ZymoBIOMICS Gut Microbiome Standard	10 preps	160
D6332	ZymoBIOMICS® Oral Microbiome Standard	10 preps	165
D6421	*Quick*-16S™ Plus NGS Library Prep Kits (V3-V4, UDI)	96 rxns	174
D6424	*Quick*-ITS™ Plus NGS Library Prep Kits	96 rxns	174
D6426	*Quick*-ITS™ Plus NGS Library Prep Kit	24 rxns	Online
D6430	*Quick*-16S™ Plus NGS Library Prep Kit (V4) with Index Primer Set	96 rxns	174
D6432	*Quick*-16S™ Plus NGS Library Prep Kit (V4)	384 rxns	Online
D6434	*Quick*-16S™ Plus NGS Library Prep Kit (V1-V2)	96 rxns	174
D6400	*Quick*-16S™ NGS Library Prep Kit	96 rxns	175
D6410	*Quick*-16S™ NGS Library Prep Kit	24 rxns	175
D6440	*Quick*-16S™ Plus NGS Library Prep Kit (V1-V3)	96 rxns	174
D7001	*Quick*-DNA/RNA™ Miniprep Kit	50 preps	130
D7001-1-50	DNA/RNA Lysis Buffer	50 ml	Online
D7001-1-200	DNA/RNA Lysis Buffer	200 ml	Online
D7001-2-25	DNA Prep Buffer	25 ml	Online
D7003	*Quick*-DNA/RNA™ Miniprep Plus Kit	50 preps	130
D7003T	*Quick*-DNA/RNA™ Miniprep Plus Kit	10 preps	130

Cat No.	Product	Size	Page
D7005	*Quick*-DNA/RNA™ Microprep Plus Kit	50 preps	130
D7005T	*Quick*-DNA/RNA™ Microprep Plus Kit	10 preps	130
D7010	ssDNA/RNA Clean & Concentrator™	20 preps	129
D7010-1-10	DNA/RNA Binding Buffer	10 ml	Online
D7010-1-25	DNA/RNA Binding Buffer	25 ml	Online
D7010-1-50	DNA/RNA Binding Buffer	50 ml	Online
D7010-2-10	DNA/RNA Prep Buffer	10 ml	Online
D7010-2-25	DNA/RNA Prep Buffer	25 ml	Online
D7010-3-6	DNA/RNA Wash Buffer (concentrate)	6 ml	Online
D7010-3-12	DNA/RNA Wash Buffer (concentrate)	12 ml	Online
D7010-3-24	DNA/RNA Wash Buffer (concentrate)	24 ml	Online
D7011	ssDNA/RNA Clean & Concentrator™	50 preps	129
D7020	*Quick*-DNA/RNA™ Viral Kit	50 preps	138
D7020-1-25	Viral DNA/RNA Buffer	25 ml	Online
D7020-1-100	Viral DNA/RNA Buffer	100 ml	Online
D7021	*Quick*-DNA/RNA™ Viral Kit	200 preps	138
D7022	*Quick*-DNA/RNA™ Viral 96 Kit	2 x 96-well plate	138
D7023	*Quick*-DNA/RNA™ Viral 96 Kit	4 x 96-well plate	138
E1004	Zymolyase with Storage Buffer	1,000 U	282
E1005	Zymolyase with Storage Buffer	2,000 U	282
E1007T	Zymolyase Ultra	100 U	283
E1007-2	Zymolyase Ultra	2,000 U	283
E1007-10	Zymolyase Ultra	10,000 U	283
E1006	R-Zymolyase with Storage Buffer	1,000 U	263
E1008-30	RNase A	30 mg	280
E1010	DNase I Set	250 U	279
E1011	DNase I Set	1500 U	279
E1012	DNase I Set	5 x 1500 U	279
E1019T	PureRec RNase A (Recombinant)	0.1 mg	280
E1019-5	PureRec RNase A (Recombinant)	5 mg	280
E1019-20	PureRec RNase A (Recombinant)	20 mg	280
E1020-200	PureRec Duplex-Specific Nuclease (DSN)	200 U	Online
E1020-1000	PureRec Duplex-Specific Nuclease (DSN)	1000 U	Online
E2001	ZymoTaq™ DNA Polymerase	50 rxns	281
E2002	ZymoTaq™ DNA Polymerase	200 rxns	281
E2003	ZymoTaq™ PreMix	50 rxns	281
E2004	ZymoTaq™ PreMix	200 rxns	281
E2005	Femto™ Human DNA Quantification Kit	100 rxns	94
E2005-1	Femto™ Human qPCR Premix	Human	Online
E2006	Femto™ Bacterial DNA Quantification Kit	100 rxns	176
E2006-1	Femto™ Bacterial qPCR Premix	Bacterial	Online

Cat No.	Product	Size	Page
E2007	Femto™ Fungal DNA Quantification Kit	100 rxns	94
E2007-1	Femto™ Fungal qPCR Premix	Fungal	Online
E2010	CpG Methylase (M. Sssl)	200 U	214
E2010-2	10X CpG Reaction Buffer	1 ml	Online
E2010-3	20X SAM (S-adenosylmethionine)	200 µl	Online
E2011	CpG Methylase (M. Sssl)	400 U	214
E2016	DNA Degradase™	500 U	278
E2017	DNA Degradase™	2,000 U	278
E2018-50	dsDNA Shearase™ Plus	50 U	278
E2018-200	dsDNA Shearase™ Plus	200 U	278
E2019-50	dsDNA Shearase™ Plus + DCC®-5	50 U + 50 preps	215
E2019-200	dsDNA Shearase™ Plus + DCC®-5	200 U + 200 preps	215
E2020	DNA Degradase Plus™	250 U	278
E2021	DNA Degradase Plus™	1,000 U	278
E2026	5-hmC Glucosyltransferase	100 U	216
E2027	5-hmC Glucosyltransferase	200 U	216
E2030	Atlantis dsDNase	12.5 U	277
E2030-1	Atlantis Digestion Buffer	50 ml	Online
E2050	QuestTaq™ PreMix	50 rxns	Online
E2054	ZymoTaq™ qPCR PreMix	50 rxns	212
E2055	ZymoTaq™ qPCR PreMix	200 rxns	212
F9001-1	5-Fluoroorotic Acid (powder)	1 g	264
F9001-5	5-Fluoroorotic Acid (powder)	5 g	264
F9003	100X 5-Fluoroorotic Acid (liquid)	10 ml	264
H1001	Squisher™-Single	10 pack	306
H1001-50	Squisher™-Single	50 pack	306
H1002-5	Squisher™-8 with 96-Well Block	5 pack & 1 block	306
H1002-20	Squisher™-8 with 96-Well Block	20 pack & 2 blocks	306
H1004-2	Squisher™-96 with 96-Well Block	2 pack & 2 blocks	306
H1004-5	Squisher™-96 with 96-Well Block	5 pack & 5 blocks	306
I1001-5	Isopropyl-β-D-thiogalactopyranoside (IPTG)	5 ml	287
I1001-25	Isopropyl-β-D-thiogalactopyranoside (IPTG)	5 x 5 ml	287
M2001	ZymoMag Protein A	200 µl	Online
M3011	Dual Media Set™ (100 ml EB & 500 ml OB)	1 Set	274
M3012-100	Expansion Broth (EB)	100 ml	274
M3012-500	Expansion Broth (EB)	500 ml	274
M3013-100	Overexpression Broth (OB)	100 ml	274
M3013-500	Overexpression Broth (OB)	500 ml	274
M3015-100	ZymoBroth™	100 ml	254
M3015-500	ZymoBroth™	5 x 100 ml	254
M5001-50	ZR 50 bp DNA Marker™	50 µg / 100 µl	95
M5001-200	ZR 50 bp DNA Marker™	200 µg / 400 µl	95

Cat No.	Product	Size	Page
M5002-50	ZR 100 bp DNA Marker™	50 µg / 100 µl	95
M5002-200	ZR 100 bp DNA Marker™	200 µg / 400 µl	95
M5003-50	ZR 1 kb DNA Marker™	50 µg / 100 µl	95
M5003-200	ZR 1 kb DNA Marker™	200 µg / 400 µl	95
M5004-50	ZR 50 bp DNA Marker™ (ready-to-load)	50 µg / 600 µl	95
M5005-50	ZR 100 bp DNA Marker™ (ready-to-load)	50 µg / 600 µl	95
M5006-50	ZR 1 kb DNA Marker™ (ready-to-load)	50 µg / 600 µl	95
P1001-2	96-Well Block	2 blocks	303
P1001-10	96-Well Block	10 blocks	303
P1002-2	96-Well Block with Cover Foil	2 blocks/foils	303
P1005	ZR-96 MagStand	1 stand	Online
P2001	His-Spin Protein Miniprep™	10 preps	276
P2002	His-Spin Protein Miniprep™	50 preps	276
P2003-1	Zymo-Spin™ PI Columns	50 pack	292
P2003-2	His-Affinity Gel	14 ml	287
P2003-3	His-Binding Buffer	50 ml	Online
P2003-4	His-Wash Buffer	50 ml	Online
P2003-5	His-Elution Buffer	25 ml	Online
P3000-1-10	Biohazard Bag (3" x 5") with Absorbent Pad (2" x 3")	10 pack	Online
R1001-1	YR Digestion Buffer	3.2 ml	Online
R1001-2	YR Lysis Buffer	6.4 ml	Online
R1002	YeaStar™ RNA Kit	40 preps	269
R1003	Pinpoint® Slide RNA Isolation System I	50 preps	117
R1003-2-3	RNA Extraction Buffer	3 ml	Online
R1003-2-12	RNA Extraction Buffer	12 ml	Online
R1003-2-50	RNA Extraction Buffer	50 ml	Online
R1003-2-100	RNA Extraction Buffer	100 ml	Online
R1003-3-6	RNA Wash Buffer	6 ml	Online
R1003-3-12	RNA Wash Buffer	12 ml	Online
R1003-3-24	RNA Wash Buffer	24 ml	Online
R1003-3-48	RNA Wash Buffer	48 ml	Online
R1007	Pinpoint® Slide RNA Isolation System II	50 preps	117
R1007-1	RNA Digestion Buffer	1.2 ml	Online
R1008	*Quick*-RNA™ FFPE Kit	50 preps	118
R1009	*Quick*-DNA/RNA™ FFPE Kit	50 preps	135
R1011	Zymoclean™ Gel RNA Recovery Kit	50 preps	124
R1011-1-50	RAD Buffer (RNA Agarose Dissolving Buffer)	50 ml	Online
R1013	RNA Clean & Concentrator™-5 w/ DNase I	50 preps	123
R1013-2-25	RNA Binding Buffer	25 ml	Online
R1013-2-50	RNA Binding Buffer	50 ml	Online
R1013-2-100	RNA Binding Buffer	100 ml	Online
R1013-2-1000	RNA Binding Buffer	1000 ml	Online

Cat No.	Product	Size	Page
R1014	RNA Clean & Concentrator™-5 w/ DNase I	200 preps	123
R1015	RNA Clean & Concentrator™-5	50 preps	123
R1016	RNA Clean & Concentrator™-5	200 preps	123
R1017	RNA Clean & Concentrator™-25	50 preps	123
R1018	RNA Clean & Concentrator™-25	100 preps	123
R1019	RNA Clean & Concentrator™-100	25 preps	123
R1020-2-12	RNA Pre-wash Buffer	12 ml	Online
R1020-2-25	RNA Pre-wash Buffer	25 ml	Online
R1020-2-50	RNA Pre-wash Buffer	50 ml	Online
R1020-2-100	RNA Pre-wash Buffer	100 ml	Online
R1022-2-50	RBC Lysis Buffer	50 ml	Online
R1022-2-100	RBC Lysis Buffer	100 ml	Online
R1034	*Quick*-RNA™ Viral Kit	50 preps	115
R1034-E	*Quick*-RNA™ Viral Kit - Dx	50 preps	115
R1034-1-50	Viral RNA Buffer	50 ml	Online
R1034-1-100	Viral RNA Buffer	100 ml	Online
R1034-2-6	Viral RNA Wash Buffer (concentrate)	6 ml	Online
R1034-2-24	Viral RNA Wash Buffer (concentrate)	24 ml	Online
R1034-2-48	Viral RNA Wash Buffer (concentrate)	48 ml	Online
R1035	*Quick*-RNA™ Viral Kit	200 preps	115
R1035-E	*Quick*-RNA™ Viral Kit - Dx	200 preps	115
R1038	ZR Urine RNA Isolation Kit™	20 preps	117
R1038-1-20	RNA Extraction Buffer Plus	20 ml	Online
R1038-1-50	RNA Extraction Buffer Plus	50 ml	Online
R1038-2-20	RNA Extraction Buffer Plus	20 ml	Online
R1038-2-50	RNA Extraction Buffer Plus	50 ml	Online
R1039	ZR Urine RNA Isolation Kit™	50 preps	117
R1040	*Quick*-RNA™ Viral 96 Kit	2 x 96 preps	115
R1040-E	*Quick*-RNA™ Viral 96 Kit - Dx	2 x 96 preps	115
R1041	*Quick*-RNA™ Viral 96 Kit	4 x 96 preps	115
R1041-E	*Quick*-RNA™ Viral 96 Kit - Dx	4 x 96 preps	115
R1042	*Quick*-DNA/RNA™ Pathogen Miniprep Kit	50 preps	139
R1043	*Quick*-DNA/RNA™ Pathogen Miniprep Kit	200 preps	139
R1050	*Quick*-RNA™ Microprep Kit	50 preps	112
R1051	*Quick*-RNA™ Microprep Kit	200 preps	112
R1052	*Quick*-RNA™ 96 Kit	2 x 96 preps	112
R1053	*Quick*-RNA™ 96 Kit	4 x 96 preps	112
R1054	*Quick*-RNA™ Miniprep Kit	50 preps	112
R1055	*Quick*-RNA™ Miniprep Kit	200 preps	112
R1056	*Quick*-RNA™ Midiprep Kit	25 preps	112
R1057	*Quick*-RNA™ Miniprep Plus Kit	50 preps	113
R1057T	*Quick*-RNA™ Miniprep Plus Kit	10 preps	113
R1058	*Quick*-RNA™ Miniprep Plus Kit	200 preps	113
R1059	*Quick*-cfRNA™ Serum & Plasma Kit	50 preps	119
R1060-1-50	RNA Lysis Buffer	50 ml	Online
R1060-1-100	RNA Lysis Buffer	100 ml	Online

Cat No.	Product	Size	Page
R1060-2-10	RNA Prep Buffer	10 ml	Online
R1060-2-25	RNA Prep Buffer	25 ml	Online
R1060-2-50	RNA Prep Buffer	50 ml	Online
R1060-2-100	RNA Prep Buffer	100 ml	Online
R1070	ZR small-RNA™ PAGE Recovery Kit	20 preps	124
R1070-1-10	RNA Recovery Buffer	10 ml	Online
R1070-2-20	RNA MAX Buffer	20 ml	Online
R1072	*Quick*-cfDNA/cfRNA™ Serum & Plasma Kit	50 preps	136
R1072-1-150	*Quick*-cfDNA/cfRNA™ Digestion Buffer	150 ml	Online
R1072-2-150	*Quick*-cfDNA/cfRNA™ Binding Buffer	150 ml	Online
R1072-3-20	Cell-free Recovery Buffer	20 ml	Online
R1080	RNA Clean & Concentrator™ 96	2 x 96 preps	123
R1081	RNA Clean & Concentrator™ MagBead Kit	96 preps	123
R1082	RNA Clean & Concentrator™ MagBead (with Dnase I)	96 preps	123
R1090	ZR small-RNA™ Ladder	10 µg	125
R1100-50	DNA/RNA Shield™	50 ml	38
R1100-250	DNA/RNA Shield™	250 ml	38
R1101	DNA/RNA Shield™ - Fecal Collection Tube	10 pack	30
R1101- E	DNA/RNA Shield™ - Fecal Collection Tube - Dx	10 pack	30
R1101-1-10	Feces Catcher	10 pack	36
R1101-2-5	ColOff® (Stool Collection Device)	5 pack	36
R1102	DNA/RNA Shield™ - Collection Tube	50 tubes	34
R1103	DNA/RNA Shield™ - Microbe Lysis Tube	50 tubes	34
R1103-E	DNA/RNA Shield™ - Microbe Lysis Tube	50 tubes	34
R1104	DNA/RNA Shield™ - Microbe Lysis Tube with Swab	50 tubes/ 50 swabs	34
R1105	DNA/RNA Shield™ - Lysis Tube (Tissue)	50 tubes	34
R1106	DNA/RNA Shield™ - Swab & Collection Tube (1 ml fill)	10 pack	31
R1107	DNA/RNA Shield™ - Swab & Collection Tube	50 pack (1 ml fill)	31
R1107-E	DNA/RNA Shield™ - Swab & Collection Tube - Dx	50 pack (1 ml fill)	31
R1108	DNA/RNA Shield™ - Swab & Collection Tube	10 pack (2 ml fill)	31
R1109	DNA/RNA Shield™ - Swab & Collection Tube	50 pack (2 ml fill)	31
R1109-E	DNA/RNA Shield Collection Tube w/ Swab - Dx	50 pack (2 ml fill)	31
R1133-1	Bunny Wipe Fecal Sample Collector	1 wipe	31
R1133-10	Bunny Wipe Fecal Sample Collector	10 wipes	31
R1137	DNA/RNA Shield Fecal Collection Tube (with Beads)	10 pack	30
R1137-E	DNA/RNA Shield Fecal Collection Tube (with Beads)	10 pack	30

Cat No.	Product	Size	Page
R1138	Bunny Wipe with DNA/RNA Shield Fecal Collection Tube	10 pack	31
R1150	DNA/RNA Shield™ - Blood Collection Tube	50 pack	33
R1151	*Quick*-DNA/RNA™ Blood Tube Kit	50 preps	137
R1160	DNA/RNA Shield™ SafeCollect™ Swab Collection Kit	1 kit	32
R1160-E	DNA/RNA Shield™ SafeCollect™ Swab Collection Kit	1 kit	32
R1160-10	DNA/RNA Shield™ SafeCollect™ Swab Collection Kit	1 kit	Online
R1160-50	DNA/RNA Shield™ SafeCollect™ Swab Collection Kit	1 kit	Online
R1161	DNA/RNA Shield™ SafeCollect™ Swab Collection Kit	1 kit	32
R1161-10	DNA/RNA Shield™ SafeCollect™ Swab Collection Kit	10 pack	Online
R1161-50	DNA/RNA Shield™ SafeCollect™ Swab Collection Kit	50 pack	Online
R1161-E	DNA/RNA Shield™ SafeCollect™ Swab Collection Kit	1 kit	32
R1180	DNA/RNA Shield Fecal Collection Kit	1 kit	30
R1200-25	DNA/RNA Shield™ (2X concentrate)	25 ml	38
R1200-125	DNA/RNA Shield™ (2X concentrate)	125 ml	38
R1201	*Quick*-RNA™ Whole Blood Kit	50 preps	116
R1211	DNA/RNA Shield™ SafeCollect™ Saliva Collection Kit	1 kit	32
R1211-E	DNA/RNA Shield™ SafeCollect™ Saliva Collection Kit	1 kit	32
R1211-10	DNA/RNA Shield™SafeCollect™ Saliva Collection Kit	10 pack	Online
R1211-50	DNA/RNA Shield™ SafeCollect™ Saliva Collection Kit	50 pack	Online
R1400	DNA/RNA Shield™ Direct Detect™	50 ml	38
R1400-E	DNA/RNA Shield™ Direct Detect™	50 ml	38
R1401-1	DNA/RNA Shield™ Direct Detect™ Swab Collection Tube	1 kit	35
R1401-1-E	DNA/RNA Shield™ Direct Detect™ Swab Collection Tube	1 kit	35
R1501-140	Wastewater Stabilization Buffer™	140 ml	39
R1502	Urine Conditioning Buffer™ Plus (UCB+™)	8 ml, 140 ml	39
R2001	ZymoBIOMICS® RNA Miniprep Kit	50 preps	170
R2002	ZymoBIOMICS® DNA/RNA Miniprep Kit	50 preps	131
R2010	*Quick*-RNA™ Fungal/Bacterial Microprep Kit	50 preps	121
R2014	*Quick*-RNA™ Fungal/Bacterial Miniprep Kit	50 preps	121
R2024	*Quick*-RNA™ Plant Miniprep Kit	50 preps	122
R2030	*Quick*-RNA™ Tissue/Insect Microprep Kit	50 preps	122
R2040	*Quick*-RNA™ Fecal/Soil Microbe Microprep Kit	50 preps	121
R2040-1-50	S/F RNA Lysis Buffer	50 ml	Online

Cat No.	Product	Size	Page
R2042	Zymo Environ™ Water RNA Kit	50 preps	Online
R2042-1-140	Water Concentrating Buffer	140 ml	Online
R2042-1-8	Water Concentrating Buffer	8 ml	Online
R2044	*Quick*-DNA/RNA™ Water Kit	50 preps	134
R2050	Direct-zol™ RNA Miniprep Kit	50 preps	109
R2050-1-50	TRI Reagent®	50 ml	Online
R2050-1-200	TRI Reagent®	200 ml	Online
R2050-2-40	Direct-zol™ RNA PreWash (concentrate)	40 ml	Online
R2050-2-160	Direct-zol™ RNA PreWash (concentrate)	160 ml	Online
R2051	Direct-zol™ RNA Miniprep Kit+ TRI Reagent®	50 preps	109
R2052	Direct-zol™ RNA Miniprep Kit	200 preps	109
R2053	Direct-zol™ RNA Miniprep Kit + TRI Reagent®	200 preps	109
R2054	Direct-zol™ 96 RNA Kit	2 x 96 preps	109
R2055	Direct-zol™ 96 RNA + TRI Reagent®	2 x 96 preps	109
R2056	Direct-zol™ 96 RNA Kit	4 x 96 preps	109
R2057	Direct-zol™ 96 RNA Kit + TRI Reagent®	4 x 96 preps	109
R2060	Direct-zol™ RNA Microprep Kit	50 preps	109
R2061	Direct-zol™ RNA Microprep Kit + TRI Reagent®	50 preps	109
R2062	Direct-zol™ RNA Microprep Kit	200 preps	109
R2063	Direct-zol™ RNA Microprep + TRI Reagent®	200 preps	109
R2070	Direct-zol™ RNA Miniprep Plus Kit	50 preps	109
R2070T	Direct-zol™ RNA Miniprep Plus Kit	10 preps	Online
R2071	Direct-zol™ RNA Miniprep Plus Kit + TRI Reagent®	50 preps	109
R2072	Direct-zol™ RNA Miniprep Plus Kit	200 preps	109
R2073	Direct-zol™ RNA Miniprep Plus Kit + TRI Reagent®	200 preps	109
R2080-3-4	Direct-zol™ DNA Elution Buffer	50 preps	Online
R2080	Direct-zol™ DNA/RNA Miniprep Kit	50 preps	109
R2080T	Direct-zol™ DNA/RNA Miniprep Kit	10 preps	109
R2081	Direct-zol™ DNA/RNA Miniprep Kit	50 preps	109
R2100	Direct-zol™ 96 MagBead RNA Kit	2 x 96 preps	110
R2100-1-5	Direct-zol™ Binding Buffer	5 ml	Online
R2100-1-10	Direct-zol™ Binding Buffer	10 ml	Online
R2100-1-20	Direct-zol™ Binding Buffer	20 ml	Online
R2100-2-200	Direct-zol™ MagBead PreWash	200 ml	Online
R2101	Direct-zol™ 96 MagBead RNA Kit + TRI Reagent®	2 x 96 preps	110
R2102	Direct-zol™ 96 MagBead RNA Kit	4 x 96 preps	110
R2103	Direct-zol™ 96 MagBead RNA Kit + TRI Reagent®	4 x 96 preps	110
R2130	*Quick*™-DNA/RNA Magbead Kit	1 x 96 preps	130
R2131	*Quick*™-DNA/RNA Magbead Kit	4 x 96 preps	130
R2132	*Quick*™-RNA Magbead Kit	96 preps	114
R2133	*Quick*™-RNA Magbead Kit	4 x 96 preps	114

Cat No.	Product	Size	Page
R2135	ZymoBIOMICS® MagBead DNA/ RNA Kit	1 x 96 preps	131
R2136	ZymoBIOMICS® 96 MagBead DNA/ RNA Kit	4 x 96 preps	131
R2137	ZymoBIOMICS® MagBead RNA Kit	96 preps	172
R2138	ZymoBIOMICS® MagBead RNA Kit	4 x 96 preps	172
R2140	*Quick*-DNA/RNA™ Viral Magbead Kit	250 preps	115
R2140-E	*Quick*-DNA/RNA™ Viral Magbead Kit	250 preps	115
R2141	*Quick*-DNA/RNA™ Viral Magbead Kit	1000 preps	115
R2141-E	*Quick*-DNA/RNA™ Viral Magbead Kit	1000 preps	115
R2143	Load N' Go DNA/RNA Viral Kit	96 preps	138
R2145	*Quick*-DNA/RNA™ Pathogen Magbead Kit	96 preps	139
R2146	*Quick*-DNA/RNA™ Pathogen Kit	4 x 96 preps	139
R2150-1-100	DNA/RNA Buffer HT	100 mL	Online
R2150	*Quick*-DNA/RNA HT	250 preps	133
R2150-E	*Quick*-DNA/RNA HT – Dx	250 preps	133
R2151	*Quick*-DNA/RNA HT	1,000 preps	133
R2151-E	*Quick*-DNA/RNA HT - Dx	1,000 preps	133
R2152	Load N' Go *Quick*-DNA/RNA HT Kit	96 preps	133
R3000	Zymo-Seq RiboFree Total RNA Library Kit	12 preps	221
R3001	Zymo-Seq RiboFree Universal cDNA Kit	12 preps	Online
R3003	Zymo-Seq RiboFree Total RNA Library Kit	96 preps	221
R3004-1-6	Zymo-Seq Wash Buffer	6 mL	Online
R3008	Zymo-Seq SwitchFree 3' mRNA Library Kit	12 preps	224
R3009	Zymo-Seq SwitchFree 3' mRNA Library Kit	96 preps	224
R3011	*Quick*-SARS-CoV-2 rRT-PCR	100 rxns	Online
R3011-1K	*Quick*-SARS-CoV-2 rRT-PCR	1,000 rxns	Online
R3011-10K	*Quick*-SARS-CoV-2 rRT-PCR	10,000 rxns	Online
R3012	ZymoScript RT PreMix Kit	100 rxns	Online
R3014	ZymoScript One-Step RT-qPCR Kit	100 rxns	Online
R5001	EZ RNA Methylation™ Kit	50 preps	Online
R5001-1-1	RNA Conversion Reagent	1.5 ml	Online
R5001-3-10	RNA Desulphonation Buffer	10 ml	Online
R5001-3-40	RNA Desulphonation Buffer	40 ml	Online
R5002	EZ RNA Methylation™ Kit	200 preps	Online
S1001	Rattler™ Plating Beads, 230 g	1 bottle	304
S1001-5	Rattler™ Plating Beads, 230 g	5 bottles	304
S1001-B	Rattler™ Plating Beads - bulk format (non-sterile)	25 kg bag	304
S5001	Vortex-Genie® 2 (120V)	1 unit	307
S5001-1	Microtube Foam Inserts	2 units	307
S5001-2	Microplate Foam Inserts	2 units	307
S5001-3	29-37 mm Tube Foam Inserts	2 units	307

Cat No.	Product	Size	Page
S5001-4	Pop-off Cup	1 unit	307
S5001-5	Horizontal 50 ml Tube Holder	1 unit	307
S5001-6	Horizontal 15 ml Tube Holder	1 unit	307
S5001-7	Horizontal Microtube Holder	1 unit	307
S5002	Vortex-Genie® 2 (230V, Euro plug)	1 unit	307
S5009	MagStir Genie® (120V)	1 unit	307
S6001-2-120	Disruptor Genie® (120V)	1 unit	305
S6001-2-230	Disruptor Genie® (230V, Euro plug)	1 unit	305
S6002-96-2	ZR-96 BashingBead Lysis Rack	1 rack	304
S6002-96-3	ZR-96 BashingBead Lysis Rack	1 rack	304
S6002-96-4	ZR-96 BashingBead™ Lysis Rack (Single barcoded Tubes)	1 x 96	304
S6002-96-5	ZR-96 BashingBead™ Lysis Rack (Double barcoded Tubes)	1 x 96	304
S6002-96-6	ZymoBIOMICS® BashingBead™ Lysis Rack (0.5 mm & 0.1 mm)	1 rack	Online
S6002-96-7	ZymoBIOMICS® BashingBead™ Lysis Rack (0.5 mm & 0.1 mm) w/ Heat Sealing Foils	1 rack	Online
S6003-50	ZR BashingBead™ Lysis Tubes (2 mm)	50 pack	298
S6005	FastPrep®-24	1 unit	305
S6005-1	HiPrep™ Adapter (48 x 2 ml tubes)	1 unit	305
S6005-2	CoolPrep™ Adapter (24 x 2 ml tubes)	1 unit	305
S6005-3	TeenPrep™ Adapter (12 x 15 ml tubes)	1 unit	305
S6010	ZR BashingBead™ Lysis/Filtration Tubes with 0.5 mm Beads (50 ml)	25 pack	Online
S6011	ZR BashingBead™ Lysis/Filtration Tubes with 2.0 mm Beads (50 ml)	25 pack	Online
S6012-50	BashingBead™ Lysis Tubes (0.5 & 0.1 mm)	50 pack	298
S6014-50	BashingBead™ Lysis Tubes (0.5 & 2.0 mm)	50 tubes	Online
S7000	EZ-Vac™ Vacuum Manifold	1 manifold	306
S7003	EZ-Vac 96 Vacuum Manifold	1 manifold	306
S7004	Elbow Hose Connector	1 connector	Online
T2001	Frozen-EZ Yeast Transformation II™ Kit	120 rxns	265
T2002	Frozen-EZ Solution 1	60 ml	Online
T2003	Frozen-EZ Solution 2	6 ml	Online
T2004	Frozen-EZ Solution 3	60 ml	Online
T3001	*Mix & Go!™ E. coli* Transformation Kit	up to 20 ml	253
T3001-2-10	*Mix & Go!™* 2X Stock Wash Buffer	10 ml	Online
T3001-2-30	*Mix & Go!™* 2X Stock Wash Buffer	30 ml	Online
T3001-3-10	*Mix & Go!™* 2X Stock Competent Buffer	10 ml	Online
T3001-3-30	*Mix & Go!™* 2X Stock Competent Buffer	30 ml	Online
T3001-4-20	*Mix & Go!™* Dilution Buffer	20 ml	Online
T3001-4-60	*Mix & Go!™* Dilution Buffer	60 ml	Online

Cat No.	Product	Size	Page
T3002	*Mix & Go!™ E. coli* Transformation Buffer Set	up to 60 ml	253
T3003	*Mix & Go!™* Competent Cells - JM109	10 x 100 µl	249
T3005	*Mix & Go!™* Competent Cells - JM109	96 x 50 µl	249
T3007	*Mix & Go!™* Competent Cells - DH5 Alpha	10 x 100 µl	249
T3009	*Mix & Go!™* Competent Cells - DH5 Alpha	96 x 50 µl	249
T3010	*Mix & Go!™* Competent Cells - DH5 Alpha w/ 96-well PCR plates and Cover Foils	96 x 50 µl	249
T3011	*Mix & Go!™* Competent Cells - HB101	96 x 50 µl	249
T3013	*Mix & Go!™* Competent Cells - HB101	10 x 100 µl	249
T3017	*Mix & Go!™* Competent Cells - TG1	10 x 100 µl	249
T3019	*Mix & Go!™* Competent Cells - Zymo 10B	10 x 100 µl	249
T3020	*Mix & Go!™* Competent Cells - Zymo 10B	96 x 50 µl	249
X1001-5	X-Gal	5 ml	287
X1001-25	X-Gal	5 x 5 ml	287
Y1001	α-Factor Mating Pheromone	240 µl	271
Y1004-500	a-Factor Mating Pheromone	500 µl	271
Y1002	Yeast Protein Kit™	200 preps	270
Y1003-50	YPD™ Plus	50 ml	266
Y1003-100	YPD™ Plus	100 ml	266

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