In the past two years, extraordinary new research in the microbiome and metagenome fields have shown a wide range of functions, plasticity, and novel applications. From sequencing DNA on the International Space Station in the Biomolecular Sequencer (BSeq) Mission, to sequencing thousands of subway samples in the Metagenomics of Subways and Urban Biomes (MetaSUB) project, to discovering completely novel genera that drive the diseases of diabetes in The Environmental Determinants of Diabetes in the Young (TEDDY) project, many new breakthroughs are constantly being made. These breakthroughs include new metrics and risk factors for diabetes from early childhood onward, new risk stratification criteria for adult diabetes patients, and new deployment of NGS methods in microbiome research for clinicians.

Notably, the ZymoBIOMICS® microbial reference materials (see pages 150-153) have been used for more and more studies as critical positive controls. Several groups have now established both the genetic and epigenetic landscapes of these microbial standards. These landscapes reflect work from the Loman and Mason Labs, which are freely and publicly available for use by other groups. Based on Oxford Nanopore Technologies, PacBio, and Illumina sequencing, these genome assembly metrics and specific sites of base modifications can ensure robust data interpretation for limits of detection. In addition, titrated abundance can be estimated from the release of the new, log-titrated ZymoBIOMICS® Standards.

These data can help in many areas, including rapid iteration for technology development in Next-Gen Sequencing for genomics and epigenomics, process controls for large-scale data projects, and variant-calling and assembly algorithm development.

Notably, some genomes in the ZymoBIOMICS® standards have scant or undetectable levels of modifications like methyl-6-adenine (m6A), whereas others have high or wide-ranging levels of m6A and 5-methylcytosine (5mC). Since new strains can show distinct and different levels of these epigenetic marks, the ZymoBIOMICS® standards are all the more important as reference materials. This work is similar to the “master stick of the genome” efforts of the Genome in a Bottle Consortium and the Global Alliance for Genomics and Health (GA4GH), who are helping to adjudicate the metrics and parameters needed for accurate genetic variant calls in human genome sequencing. Going forward, these “metagenomes in a bottle” represent well-curated and validated metagenome standards that set the stage for in-depth and accurate studies of the microbiome, help improve genome assembly tools, and ensure greater reproducibility and interpretability for scientists and clinicians alike.

About Christopher E. Mason, Ph.D.

Dr. Christopher Mason is currently an Associate Professor at Weill Cornell Medicine, with appointments at the Tri-Institutional Program in Computational Biology and Medicine between Cornell, Memorial Sloan-Kettering Cancer Center and Rockefeller University, the Sandra and Edward Meyer Cancer Center, and the Feil Family Brain and Mind Research Institute. The Mason laboratory is working on a ten-phase, 500-year plan for the survival of the human species on Earth, in space, and on other planets.

Artistic Rendition by Jay Chen and Casey Cruz

About the Cover

by Christopher E. Mason, Ph.D.

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, 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.
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We warrant to you, our direct customer, that our goods shall conform substantially to the description of such goods as provided in our catalog and literature accompanying the goods until their respective expiration dates or, if no expiration date is provided, for one year from the date of your receipt of such goods. THIS WARRANTY IS EXCLUSIVE, AND WE MAKE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. Our warranty shall not be effective if we determine, in our sole discretion, that you have altered or mixed the goods or have failed to store or store them in accordance with instructions furnished by us. Our sole and exclusive liability and your exclusive remedy with respect to goods proved to our satisfaction (applied to analytical methods reasonably selected by us) to be defective or nonconforming shall be the replacement of such goods free of charge, upon the return of such goods in accordance with our instructions, although at our discretion we may provide a credit or refund. IN NO EVENT SHALL WE BE LIABLE UNDER ANY LEGAL THEORY (INCLUDING BUT NOT LIMITED TO CONTRACT, NEGLIGENCE, STRICT LIABILITY IN TORT OR WARRANTY OF ANY KIND) FOR ANY INDIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES (INCLUDING BUT NOT LIMITED TO LOST PROFITS), EVEN IF WE HAD NOTICE OF THE POSSIBILITY OF SUCH DAMAGES. If we manufacture custom goods for you based on instructions, specifications, or other directions you provide to us, we shall not be liable for the lack of sufficient, fitness for purpose or quality of the goods to the extent attributable to such instructions, specifications, or other directions. We shall not be liable for any loss, damage or penalty as a result of any delay in or failure to manufacture, deliver or otherwise perform hereunder due to any cause beyond our reasonable control. Unless specified otherwise, products are for research use only and not intended for diagnostic purposes.

Warranty
This product is warranted to be free from defects in material and workmanship. Returns must be made within thirty (30) days of receipt of goods for full credit. No freight charges will be refunded and return shipping charges will be paid by Zymo Research. Zymo Research reserves the right to inspect any returned goods. Final inspection will determine if credit is due. Credit is issued for unopened product in original containers, with all original accessories and inserts intact and undamaged. We will not issue credit for damaged, altered, or opened product, or for product that has been put to use prior to being returned. Our 100% Satisfaction Guaranteed policy cannot be combined with any other promotional offer.

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2. Enter quantity followed by clicking “add to cart”.
3. If you have a promo code or coupon, please enter the optional promo code prior to checking out.
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So, what is epigenetics?

The Greek prefix “epi” means “on top of” or “over”, so the term “Epigenetics” literally describes regulation at a level above, or in addition to, those of genetic mechanisms. The field of epigenetics was given its name and a vague definition only 30 years ago, but is now a dynamic and rapidly expanding discipline. Through epigenetics, the classic works of Charles Darwin, Gregor Mendel, Jean-Baptiste Lamarck, and others are now seen in a different light. Today, scientists are using epigenetics to investigate the roles of DNA, RNA, proteins, and environment in inheritance.

Epigenetic modifications can result in changes to the structure of chromatin, which is a complex of DNA and proteins, such as histones, that compact and organize DNA in cells. These changes can be as stable and inheritable as classical genetic mechanisms, and their regulation is very complicated and essential for many biological processes, including regulation of gene expression, development, and cellular differentiation. Epigenetic regulation can be mediated by DNA methylation and hydroxymethylation, and small and large non-coding RNAs.

DNA methylation is one of the most studied epigenetic modifications, both in terms of basic biology and biomarker discovery. Zymo Research is the industry leader in providing DNA methylation research products, including bisulfite conversion kits, which are considered the industry “gold standard” for the study of DNA methylation. Zymo Research’s suite of EZ DNA Methylation™ products are the highest quality, most trusted, and most cited technologies. Furthermore, these innovative products feature the fastest methods available for complete bisulfite conversion of DNA. Zymo Research has also pioneered the use of bisulfite-free methods and locus-specific analysis procedures for the study of DNA methylation.

Zymo Research also offers the most comprehensive products and services to investigate other areas of epigenetics, including DNA hydroxymethylation, chromatin immunoprecipitation, and chromatin remodeling, as well as small and large non-coding RNAs. We now offer genome-wide and whole-genome epigenetic services for DNA methylation and hydroxymethylation, targeted methylation analysis, ChIP-Seq, and RNA-Seq – simply send in your samples, and you will receive publication-ready data! Zymo Research is committed to enhancing the study of epigenetics by providing researchers of every discipline with the tools and knowledge needed to help unravel the complexities of genetic regulation, cellular differentiation, embryology, aging, cancer, and other diseases.
A Roadmap for Navigating the Epigenetic Landscape

Epigenetic analyses do not have to be complicated. The scientists at Zymo Research have created this navigation tool to help new and experienced researchers alike tackle epigenetic analysis with ease. Below you will find an overview of some of the most common techniques used for studying DNA methylation with product and service references from Zymo Research to help you along the way.

Bisulfite Treatment:
Bisulfite treatment is considered the "gold standard" for the analysis of DNA methylation. Bisulfite treatment converts unmethylated cytosine to uracil while methylated cytosines are protected from this conversion. Quantitative analyses include methyl-specific PCR (MSP), Bisulfite PCR and Sequencing (BSP), hybridization, pyrosequencing and Next Generation sequencing.

Bisulfite-Free Methods for Locus Specific Analysis:
Simple bisulfite-free methods for investigation of 5-mC and 5-hmC levels can also be used for rapid screening of DNA methylation. Through the use of Methylation-Sensitive-Restriction Enzymes (MSREs), differentially modified loci can be quickly and easily distinguished. These methods interrogate a gene’s methylation.

Enrichment-Based Methods:
Specific enrichment of methylated DNA and hydroxymethylated DNA is critical for the accuracy of enrichment-based sequencing analysis. This is facilitated by the use of sensitive and specific antibodies or primers engineered to target DNA with these modifications.

Global Quantification:
For understanding complicated changes in the genome, the simplest place to start is to determine global changes in DNA methylation. ELISA’s are a great way to determine overall levels of 5-mC and 5-hmC in DNA samples. Enzymatic methods breaking down DNA to individual nucleotides are also available for analysis of DNA methylation using mass spectrometry or HPLC.

Chromatin Analysis:
Chromatin Immunoprecipitation (ChIP) is the prevailing method to investigate protein-DNA interactions on gene expression, such as histone modifications and transcription factors.

Enrichment of Methylated DNA

Genome-Wide Analysis:
Assessment of changes in methylation across the genome offers new ways to identify DNA methylation interactions in mechanisms of development, environmental responses, aging, stress, addiction, cancer and various other diseases. Next Generation sequencing technologies allow high-throughput data analysis and insight into these variations.
Technology Overview: EZ DNA Methylation™

- Conversion efficiency > 99%.
- On-column desulphonation and recovery of bisulfite-treated DNA.
- Conversion workflows in as little as 1 hour.
- Products available for many sample types, including purified DNA, tissue, cells, FFPE, blood, etc.
- Recommended as part of illumina’s workflow.

The gold standard for the analysis of DNA methylation, bisulfite treatment converts unmodified cytosine to uracil while methylated cytosines are protected from this conversion. Sequence analysis post-treatment provides site-specific information on DNA across the genome. This can be accomplished by PCR, hybridization, MSP, and Next-Generation sequencing.

Bisulfite Technology from Zymo Research
The EZ DNA Methylation™ family of kits from Zymo Research remain the most trusted as well as the most cited technologies available for bisulfite conversion and DNA methylation analysis. 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 to only 1.5 hours. The EZ DNA Methylation™ kits have been specifically engineered for complete conversion of as little as 50 pg of DNA. Kits are available in single column, 96-well plate and magnetic bead formats.

- Conversion efficiency > 99%.
- On-column desulphonation and recovery of bisulfite-treated DNA.
- Conversion workflows in as little as 1 hour.
- Products available for many sample types, including purified DNA, tissue, cells, FFPE, blood, etc.
- Recommended as part of illumina’s workflow.

Choosing the right kit is the first step to a successful bisulfite conversion. Zymo Research offers a suite of EZ DNA Methylation™ Kits for a wide variety of sample types and research needs. Check out this quick guide to choose the best kit for your research:

- **Input Type**
  - Purified DNA
  - Cell, Tissue, Blood, etc.

- **New Users**
  - EZ DNA Methylation-Startup™ Kit
  - Page 12

- **Speed & Convenience**
  - EZ DNA Methylation-Lightning® Kit
  - Page 13

- **Low Input**
  - EZ DNA Methylation-Direct™ Kit
  - Page 14

Most-cited Technologies for DNA Methylation Analysis & Detection

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Citations</th>
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</thead>
<tbody>
<tr>
<td>2006</td>
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<tr>
<td>2007</td>
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<td>2008</td>
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<td>2009</td>
<td>2000 – 1000 –</td>
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<tr>
<td>2010</td>
<td>0 –</td>
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</table>

DNA sequencing results after bisulfite treatment. DNA with methylated CpG at nucleotide position 5 was processed using the EZ DNA Methylation-Gold® Kit. The recovered DNA was amplified by PCR and then sequenced directly. The methylated cytosine at position 5 remained intact while the unmethylated cytosines (i.e., positions 7, 9, 11, 14, and 15) were completely converted into uracil following bisulfite treatment and detected as thymine following PCR.

of researchers were satisfied with the overall performance of their EZ DNA Methylation™ Kit

of researchers would recommend our bisulfite conversion technologies to a colleague
**EZ DNA Methylation-Startup™ Kit**

- The complete solution for bisulfite conversion. This all-in-one kit contains: reagents for bisulfite conversion, DNA purification, methylated human DNA with control primers, and a robust hot-start PCR polymerase that is specifically formulated for bisulfite converted DNA.
- 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 products 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. 14). A fully methylated Universal Methylated Human DNA Standard (p. 24) is provided together with a special primer set of blood, cells, and fresh or FFPE tissues without the prerequisite for upstream DNA purification (see EZ DNA Methylation-Direct™ Kit).

**Workflow of the EZ DNA Methylation-Startup™ Kit**

1. **Sample Input**
2. **Bisulfite Conversion**
3. **Desulphonation & Elution of Converted DNA**
4. **PCR Assay with User Designed and Control Primers**
5. **PCR Analysis**
6. **Validate Results**

**Specifications**

- **Product:** EZ DNA Methylation-Startup™ Kit
- **Cat. No.:** D5024
- **Size:** 50 rxns
- **Elution of Converted DNA:** ≥ 10 µl
- **Conversion Efficiency:** > 99.5%
- **Input:** DNA, Cells, Blood, Tissue, FFPE, etc.

**Uses**

- Ready for PCR or other sensitive downstream applications
- For first time user
- Rapid bisulfite treatment
- Rapid column/plate desulphonation
- Novel on-column desulphonation
- Wash
- Elute

**EZ DNA Methylation-Lightning® Kits**

- **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**

Bisulfite conversion is considered the gold standard in DNA methylation analysis. The only downside is that the bisulfite conversion process is relatively harsh and will inherently damage the DNA, leading to DNA fragmentation and low recovery. The EZ DNA Methylation – Lightning® Kit features the fastest bisulfite conversion method resulting in fully converted DNA with reduced fragmentation and more efficient PCR amplification. The bisulfite converted DNA is ideal for downstream DNA methylation analyses such as PCR, MSP, array, bisulfite and Next-Generation sequencing.

**Specifications**

- **Input:** 100 pg to 2 µg of purified DNA
- **Conversion Efficiency:** > 99.5%
- **DNA Recovery:** > 80%
- **Elution Volume:** ≥ 10 µl
- **Bisulfite Conversion Time:** 1.5 hours

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>EZ DNA Methylation-Lightning® Kit</td>
<td>D5030T</td>
<td>10 rxns</td>
<td>Input: 100 pg to 2 µg of purified DNA; Conversion Efficiency: &gt; 99.5%; DNA Recovery: &gt; 80%; Bisulfite Conversion Time: 1.5 hours.</td>
<td>Ready for PCR or other sensitive downstream applications</td>
</tr>
<tr>
<td>EZ DNA Methylation-Lightning® Kit (shallow-well)</td>
<td>D5032</td>
<td>2 x 96 wells</td>
<td>Input: 100 pg to 2 µg of purified DNA; Conversion Efficiency: &gt; 99.5%; DNA Recovery: &gt; 80%; Bisulfite Conversion Time: 1.5 hours.</td>
<td>Rapid bisulfite treatment; Rapid column/plate desulphonation</td>
</tr>
<tr>
<td>EZ DNA Methylation-Lightning® Kit (deep-well)</td>
<td>D5033</td>
<td>2 x 96 wells</td>
<td>Input: 100 pg to 2 µg of purified DNA; Conversion Efficiency: &gt; 99.5%; DNA Recovery: &gt; 70%; Bisulfite Conversion Time: 1.5 hours.</td>
<td></td>
</tr>
</tbody>
</table>
**EZ DNA Methylation-Direct™ Kits**

- **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, Next-Gen Sequencing, and MSP.

**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. Recovered bisulfite-converted DNA is ideal for PCR amplification for downstream analyses including bisulfite treatment, sequencing, microarrays, etc.

**EZ DNA Methylation-Direct™ Kits**

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
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</thead>
<tbody>
<tr>
<td>EZ DNA Methylation-Direct™ Kit</td>
<td>D5020</td>
<td>50 rxns</td>
<td>200 rxns</td>
<td>Input: DNA, Cells, Blood, Tissue, FFPE (as few as 10 cells or 50 pg) Conversion Efficiency: &gt; 99% DNA Recovery: &gt; 80% Bisulfite Conversion Time: 4 hours</td>
</tr>
<tr>
<td>EZ DNA Methylation-Direct™ Kit (shallow-well)</td>
<td>D5022</td>
<td>2 x 96 rxns</td>
<td>Input: DNA, Cells, Blood, Tissue, FFPE (as few as 10 cells or 50 pg) Conversion Efficiency: &gt; 99.5% DNA Recovery: &gt; 75% Bisulfite Conversion Time: 3 hours DNA digestion; Bisulfite treatment; Rapid column/plate/bead desulphonation</td>
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</tr>
<tr>
<td>EZ DNA Methylation-Direct™ MagPrep Kit</td>
<td>D5044</td>
<td>4 x 96 rxns</td>
<td>8 x 96 rxns</td>
<td>Input: DNA, Cells, Blood, Tissue, FFPE (as few as 10 cells or 50 pg) Conversion Efficiency: &gt; 99% DNA Recovery: &gt; 75% Bisulfite Conversion Time: 4 hours</td>
</tr>
</tbody>
</table>

**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 bisulfite treatment, sequencing, microarrays, etc.

**EZ DNA Methylation-Gold® Kits**

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
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</thead>
<tbody>
<tr>
<td>EZ DNA Methylation-Gold® Kit</td>
<td>D5005</td>
<td>50 rxns</td>
<td>200 rxns</td>
<td>Input: DNA, Cells, Blood, Tissue, FFPE (as few as 10 cells or 50 pg) Conversion Efficiency: &gt; 99% DNA Recovery: &gt; 75% Bisulfite Conversion Time: 3 hours</td>
</tr>
<tr>
<td>EZ DNA Methylation-Gold® Kit (shallow-well)</td>
<td>D5007</td>
<td>2 x 96 rxns</td>
<td>Input: DNA, Cells, Blood, Tissue, FFPE (as few as 10 cells or 50 pg) Conversion Efficiency: &gt; 99% DNA Recovery: &gt; 75% Bisulfite Conversion Time: 3 hours DNA digestion; Bisulfite treatment; Rapid column/plate/bead desulphonation</td>
<td></td>
</tr>
<tr>
<td>EZ DNA Methylation-Gold® MagPrep Kit</td>
<td>D5042</td>
<td>4 x 96 rxns</td>
<td>8 x 96 rxns</td>
<td>Input: DNA, Cells, Blood, Tissue, FFPE (as few as 10 cells or 50 pg) Conversion Efficiency: &gt; 99% DNA Recovery: &gt; 75% Bisulfite Conversion Time: 3 hours</td>
</tr>
</tbody>
</table>

**Notes**

- Bisulfite treatment; Rapid column/plate/bead desulphonation
- EZ DNA Methylation-Gold® and Infinium® are registered trademarks of Illumina, Inc.
EZ RNA Methylation® Kit

- Fast and reliable bisulfite conversion of RNA for methylation analysis.
- Specifically optimized for complete conversion of non-methylated cytosine in RNA.
- Ideal for all RNA inputs.
- Complete conversion of RNA in as little as 1 hour.

Description

The EZ RNA Methylation® Kit features rapid and reliable bisulfite treatment and conversion of cytosines in RNA for methylation analysis. The kit streamlines the three-step process for complete conversion of cytosine into uracil, and includes ready-to-use conversion reagent. RNA denaturation and bisulfite conversion processes are combined into a single step. No buffer preparation is necessary. Innovative in-column desulphonation technology eliminates messy precipitation steps to ensure consistent results. The product has been designed to minimize template degradation, loss of RNA during treatment and clean-up, and to provide complete conversion of cytosine for accurate methylation analysis. Recovered RNA is ideal for RT-PCR, sequencing, library preparation and Next-Generation sequencing.

Tips for Bisulfite-treated DNA

**Visualizing Bisulfite-Treated DNA**

Bisulfite-treated DNA can be visualized in agarose/EtBr gels following electrophoresis using a standard UV-light source. Now that the bisulfite-converted DNA is single-stranded and has limited base-pairing at room temperature, it is necessary to cool the gel on ice for 5-10 minutes prior to visualization. This will drive some base-pairing between the single-stranded molecules and allow recovered material to be visible.

**Quantifying Bisulfite-Treated DNA**

Following bisulfite-treatment of genomic DNA, non-methylated cytosine residues are converted into uracil. The recovered DNA is typically A, U, and T-rich. The recovered DNA is now single-stranded and the original base-pairing no longer exists. The absorption coefficient at 260 nm will resemble that of RNA, thus a value of 40 µg/ml for A260 = 1.0 should be used when determining the concentration.

**PCR of Bisulfite Converted DNA**

Generally, primers of 26 to 32 bases are required for amplification of bisulfite-converted DNA. In general, all Cs should be treated as Ts for primer design purposes, unless they are in a CpG context. See example below.

### Template:

5’ - GACCGTTCCAGGTCCAGCAGTGCGCT - 3’

### Bisulfite Converted:

5’ - GACCGTTCCAGGTCCAGCAGTGCGCT - 3’

### Primers

- **Reverse:**
  5’ - ATCATCACRCAA - 3’

Only the reverse primer binds to the converted DNA, the forward primer will bind to the strand generated by the reverse primer. If the primer contains CpG dinucleotides with uncertain methylation status, then mixed bases with C and T can be used (see above). Usually, there should be no more than one mixed position per primer and it should be located toward the 5’ end of the primer. It is not recommended to have mixed bases located at the 3’ end of the primer. Zymo Research’s Bisulfite Primer Seeker (http://www.zymoresearch.com/bisulfite-primer-seeker) is a useful resource when designing primers for bisulfite PCR.

Usually, 35 to 40 cycles are required for successful PCR amplification of bisulfite-converted DNA. Optimal amplicon size is between 150-300 bp, however larger amplicons (up to 1 kb) can be generated with optimized PCR conditions. Annealing temperatures between 55 - 60°C typically work well. As most non-methylated cytosine residues are converted to uracil, the bisulfite-treated DNA is usually AT-rich and has low GC composition. Non-specific PCR amplification is relatively common with bisulfite-treated DNA due to its AT-rich nature. PCR using hot start polymerases (e.g., Zymo Taq™ DNA Polymerase, p. 38) is strongly recommended for the amplification of bisulfite-treated DNA.

### Table: Specifications and Uses

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
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<tr>
<td>EZ RNA Methylation® Kit</td>
<td>R5001</td>
<td>50 preps</td>
<td>Input: 32 µg - 3 µg of DNA-free RNA</td>
<td>Rapid bisulfite treatment; rapid column/plate/flow desulphonation</td>
</tr>
<tr>
<td></td>
<td>R5002</td>
<td>200 preps</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

www.zymoresearch.com  | info@zymoresearch.com  | tel: (949) 679-1190  | toll-free: (888) 882-9652  | fax: (949) 266-9452

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Primer Design for Bisulfite and Methylation Specific PCR

Bisulfite-converted DNA can be analyzed by a variety of methods: Bisulfite Sequencing PCR, Methylation Specific PCR, Pyrosequencing, Next-Generation sequencing platforms and many others. The two most common techniques for locus-specific determination of methylation are Bisulfite Sequencing PCR and Methylation Specific PCR. Below is a guide to help you choose the best workflow for your needs:

Bisulfite Sequencing PCR (BSP)
Quantitative single-base resolution of methylated cytosines within your region of interest.

Design Bisulfite PCR Primers
- Bisulfite PCR primers need to be long, usually between 26-30 bases.
- Amplicon size 150-300 bp.
- Primer can contain a mixed base at the cytosine position.
- 35 to 40 cycles are required for successful amplification.
- Primer can contain a mixed base at the cytosine position.

Annealing temperature gradient should be run with every new primer set to ensure optimal amplification of the specific target.

Amplicon length should be a max of 300 bp.
- Place 2 to 4 CpG sites in each primer set with the CpG sites located as close as possible to the 3' end of each of the primers.
- An optimal primer will have at least 4 non CpG cytosines to distinguish between converted and non-converted templates.
- An ideal melting temperature is 55 - 62°C for both primer sets. Melt temperatures between each primer set must not be bigger than a 1 - 2°C difference. It is okay if the non-methylated primer set is longer to help increase the melting temperature so it is similar to the methylated set.
- Amplicon length should be a max of 300 bp.
- Check your primers for hairpins and dimers. Also be sure to BLAST your primers.

Methylation Specific PCR (MSP)
Qualitative identification of a few methylated cytosines within your primer binding regions.

Design Methylation Specific Primer Sets
- Need to design methylated and non-methylated primer sets.
- Place 2 to 4 CpG sites in each primer set with the CpG sites located as close as possible to the 3' end of each of the primers.
- An optimal primer will have at least 4 non CpG cytosines to distinguish between converted and non-converted templates.
- An ideal melting temperature is 55 - 62°C for both primer sets. Melt temperatures between each primer set must not be bigger than a 1 - 2°C difference. It is okay if the non-methylated primer set is longer to help increase the melting temperature so it is similar to the methylated set.

Frequently Asked Questions

Should the input DNA be dissolved in TE, water, or some other buffer prior to treatment with Zymo Research’s bisulfite kits?
Water, TE, or modified TE buffers can be used to dissolve DNA and do not interfere with the conversion process.

Why am I not getting complete conversion of DNA using the EZ DNA Methylation-Direct™ Kit?
1. If sampling solid tissue, then it is most likely that too much sample was processed, resulting in incomplete DNA conversion.
2. If sampling FFPE tissue, then it is probable that the DNA was extensively damaged and/or cross-linked resulting in incomplete DNA conversion.
3. If debris is not removed by centrifugation following the Proteinase K digestion, it may interfere with the bisulfite conversion process resulting in incomplete conversion of the DNA.

Which Taq polymerase(s) do you recommend for PCR amplification of bisulfite-converted DNA?
We recommend a “hot-start” DNA polymerase (e.g., Zymo Taq™ DNA Polymerase, p.38).

Why are there two different catalog numbers for the EZ-96 DNA Methylation™ product lines?
The two different catalog numbers are used to differentiate between the binding plates that are included in the kits. Deep and shallow-well binding plates are available to accommodate most rotors and microplate carriers. The table below shows a comparison of the two binding plates. It is recommended to use the deep-well binding plates if possible.

Are your bisulfite kits compatible with technologies from Illumina®?
Yes. The EZ DNA Methylation™ Kit technologies from Zymo Research are recommended by Illumina® for GoldenGate® and Infinium® Assays.

What downstream analytical procedures can be used for DNA bisulfite-converted with the EZ DNA Methylation™ Kits?
DNA converted using any of our EZ DNA Methylation™ kits is ideal for subsequent analysis by canonical sequencing methods, MS-SNIPe, COBRA, Bisulfite-PCR, MSF, Bisulfite-sequencing, mass spectroscopy (e.g., Epityper® from Sequenom), as well as other methods for analysis.

Epityper® is a registered trademark of Sequenom, Inc. GoldenGate® and Infinium® are registered trademarks of Illumina, Inc.
Choose Your Epigenetic Standards

- **5-mC & 5-hmC DNA Standard Set**
  - **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.

- **Matched DNA Sets**
  - **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**
  - **Uses**: Control DNA for 5-methylcytosine (5-mC) and 5-hydroxymethylcytosine (5-hmC) quantitation applications (i.e. - mass spectrometry, HPLC, TLC, etc.).
  - **Features**: High Quality, Accurate, Versatile.

**Product Details**

<table>
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<tr>
<th>Product Description</th>
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<th>Uses</th>
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<td>Human Matched DNA Set</td>
<td>D5018</td>
<td>1 set</td>
<td>Source: Human Male DNA; Concentration: 250 ng/µl</td>
<td>Control for bisulfite conversion; DNA methylation quantitation</td>
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<tr>
<td>Mouse 5-hmC &amp; 5-mC DNA Set</td>
<td>D5019</td>
<td>1 set</td>
<td>Source: Swiss Webster Mouse DNA; Concentration: 250 ng/µl</td>
<td>Control for bisulfite conversion; DNA methylation quantitation</td>
</tr>
<tr>
<td>5-mC &amp; 5-hmC DNA Standard Set</td>
<td>D5405</td>
<td>1 set</td>
<td>DNA Amount: 2 µg each DNA; Concentration: 30 ng/µl each</td>
<td>Cytosine modification studies (i.e 5-mC &amp; 5-hmC); HPLC; Mass spec; TLC</td>
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</tbody>
</table>
Human Methylated & Non-Methylated DNA Set

- **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 quantification 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), with a set of specifically designed primers that can be used in conjunction with the EZ DNA Methylation™ family of products (p. 12-15). 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 D5014-2 Human Methylated DNA, Meth (-) DNA Control D5014-1 Human Non-methylated DNA. 2% Agarose Gel, 130V for 35 mins. M = Methylated specific primers, U = Non-Methylated specific primers.
**Universal Methylated DNA Standards**

- **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 in combination with the EZ DNA Methylation™ family of products (p. 12-15). 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.

**Additional Bisulfite Conversion Controls**

**Description**

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. The non-methylated pUC19 DNA is pUC19 isolated from tissue that is enzymatically methylated at all CpG sites for use as a positive control. E. coli non-methylated genomic DNA is from a Dam– and Dcm– strain (ER2925). It works perfectly as a negative control for DNA methylation analyses requiring DNA with absolutely no methylation.

**5-mC DNA ELISA Kit**

- **Accurate Quantification:** Sensitive and specific quantification of 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 workflows can be completed in 4 hours or less.

**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 (p. 26) 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 the kit.

**Specifications**

- **Assay Time:** 3 - 4 hours
- **Detection:** ≥ 0.5% 5-mC per 100 ng
- **DNA Input:** 10 - 200 ng
- **Global 5-mC detection and quantitation**

**Uses**

- **96-well format is ideal for processing just a few samples to a large number of samples.**
- **Sensitive and specific quantification of 5-methylcytosine (5-mC) DNA from a variety of samples.**
- **Simple:** The streamlined workflows can be completed in 4 hours or less.
**Epigenetics**

Methylated-DNA IP Kit

- **Robust:** Enrichment & immunoprecipitation 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.

**Product Table**

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<thead>
<tr>
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<tr>
<td>Anti-5-Methylcytosine Monoclonal Antibody (Clone 7D21)</td>
<td>A3002-15</td>
<td>15</td>
<td>IgG1, Concentration: 5 µg/µl</td>
<td>Immunoprecipitation of methylated DNA, ELISA, Immunoblotting, Immunofluorescence</td>
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<td>A3002-30</td>
<td>30</td>
<td>Buffer: PBS pH 7.4 1X, Sodium Azide</td>
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<tr>
<td>A3002-50</td>
<td>50</td>
<td>Short Term Storage: −20°C</td>
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<tr>
<td>A3002-300</td>
<td>300</td>
<td>Long Term Storage: −80°C</td>
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**Methylated-DNA IP Kit**

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<td>D5101</td>
<td>10 rxns</td>
<td>Magnetic Beads</td>
<td>Enrichment Factor: &gt; 100 fold</td>
<td>Immunoprecipitation of methylated DNA; PCR, Sequencing</td>
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<td>Format: Magnetic Beads</td>
<td>Optimal DNA Input: 50 - 500 ng</td>
<td>Elution Volume: 10 µl</td>
<td>Processing Time: 4 hours</td>
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<td>Buffer: PBS pH 7.4 1X, Sodium Azide</td>
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<tr>
<td>A3002-50</td>
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<td>A3002-300</td>
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<tr>
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<td>Elution Volume: 10 µl</td>
<td>Processing Time: 4 hours</td>
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</table>

**Efficient enrichment of methylated DNA using Methylated-DNA IP Kit.** DNA comprised of a mixture of methylated/non-methylated DNA (1:4 ratio) and immunoprecipitated following the Cat. No. D5101 protocol. DIGESTION OF AMPLIFIED WITH NcoI PRODUCED TWO 175 bp FRAGMENTS FOR METHYLATED DNA 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 ME-DIP) COMPARED TO NON-PRECIPITATED (BEFORE ME-DIP) SAMPLES. THE PRODUCTS WERE VISUALIZED USING D1000 Tape on Tapestation 2200 (Agilent, Santa Clara, CA).

**Before MeDIP**

<table>
<thead>
<tr>
<th>Ladder</th>
<th>+</th>
<th>–</th>
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</thead>
</table>

**After MeDIP**

| Non-Methylated DNA | – | |
| Methylated DNA | + | + |

**Non-methylated DNA**

| – | – | + |

**Methylated DNA**

| – | + | + |

**Methylated DNA is efficiently enriched using the 5-Methylcytosine antibody.** Control DNA comprised of a mixture of methylated/non-methylated was immunoprecipitated using mouse Anti-5-Methylcytosine antibody from Zymo or Supplier X. The methylated DNA contains point 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.
**OneStep qMethyl™ Kits**

- 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 qMethyl™ Kit provides a simple, bisulfite-free procedure for rapid, locus-specific DNA methylation assessment via the selective amplification of a methylated region of DNA.

This is accomplished by splitting any DNA to be tested into two parts: a “Test Reaction” and a “Reference Reaction” (see figure below). DNA in the Test Reaction is digested with Methylation Sensitive Restriction Enzymes (MSREs) while DNA in the Reference Reaction is not. The DNA from both samples is then amplified using real-time PCR in the presence of SYTO® fluorescent dye and then quantitated. The “Lite” version allows real-time PCR to be performed with other fluorescent dyes or molecular probes of the researcher’s choosing.

- **Includes reagents and controls for quantitative detection and reliable performance.**
- **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.
- **Simpler:** Ligation- and gel-free workflow can be completed in a few hours.

**Pico Methyl-Seq™ Library Prep Kit**

- **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.
- **Simpler:** 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. Brittle, 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.

**Specifications**

- **DNA Input:** 10 pg – 100 ng
- **DNA Samples:** Genomic DNA, FFPE DNA
- **Sequencing Platform Compatibility:** Illumina TruSeq chemistries for Hi-Seq platforms
- **Uses:** DNA methylation library preparation for WGBS

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**Product**

<table>
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<td>OneStep qMethyl™ Kit</td>
<td>D5310</td>
<td>1 x 96 well</td>
<td>Bisulfite-free DNA methylation analysis; Rapid screening of multiple loci or single loci across multiple samples</td>
<td>SYTO® is a registered trademark of Molecular Probes, Inc.</td>
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<tr>
<td>OneStep qMethyl™ Lite</td>
<td>D5311</td>
<td>1 x 96 well</td>
<td>Bisulfite-free DNA methylation analysis; Rapid screening of multiple loci or single loci across multiple samples</td>
<td>SYTO® is a registered trademark of Molecular Probes, Inc.</td>
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<td>D5455</td>
<td>10 preps</td>
<td>DNA Input: 10 pg – 100 ng</td>
<td>DNA methylation library preparation for WGBS</td>
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<td>D5456</td>
<td>25 preps</td>
<td>DNA Samples: Genomic DNA, FFPE DNA</td>
<td>DNA methylation library preparation for WGBS</td>
</tr>
</tbody>
</table>

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**Images**

- Rapid bisulfite-free methylation analysis is efficiently performed using the OneStep qMethyl™ Kit. Schematics A and B (above) illustrate the sample workflow of Non-methylated DNA and Methylated DNA. Test Reaction samples are MSRE digested while the Reference Reaction samples are not (mock digested). Following digestion, DNA from both samples is used for real-time PCR. The white lollipops in the image represent unmethylated cytosines and black lollipops methylated cytosines in CpG dinucleotide context. Following real-time PCR, amplification plots (C and D) demonstrate non-methylated DNA exhibits large differences in the Ct values for Test and Reference Reactions (C) while highly methylated DNA samples exhibit little difference (D).

- **Pico Methyl-Seq™ libraries ready for sequencing.**

---

**Images**

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

The Double Helix Epigenetic Switch™: 5-methylcytosine and 5-hydroxymethylcytosine Exert Opposite Forces on Base Pairing of DNA Double Helix

Ron Leavitt, James Yen, Xi-Yu Jia
Zymo Research Corporation

Abstract
DNA base pairing governs the fundamental function of DNA in life. Importantly, annealing and unwinding of base-paired double helical DNA strands are essential for DNA replication and transcription processes. Moreover, epigenetic DNA base modifications are thought to be involved in regulation of DNA at all levels in higher organisms. Our recent research into DNA base modifications has shown that 5-methylcytosine (5-mC) and 5-hydroxymethylcytosine (5-hmC) modifications dramatically change the properties of C-G base pairing. In contrast to the 5-mC:G pairing, which increases the base pairing stability relative to normal C-G pairing, we find that 5-hmC:G base pairing greatly decreases stability relative to both C-G and 5-mC:G base pairing. It is evident that cytosine epigenetic modifications provide another layer of hidden codes, which serve as a "lock," neutral and "unlock" mechanism on DNA beyond the canonical genetic codes. We call this the Double Helix Epigenetic Switch™.

Introduction
DNA is the blueprint for life, coding all of the genes needed in each cell within each tissue in all organisms on Earth. It has been over half a century since the discovery of the DNA double helix and uncovering of genetic codes. In the last decade, the development of epigenetic understanding has further elucidated some fundamental mechanisms of how genes are organized, regulated and inherited through elucidated epigenetic regulation mechanisms. In addition, the century old debate on nature versus nurture has finally begun to converge into a more complete picture of biology, where genetics and epigenetics are both considered. It is now clear that both nature and nurture are important.

Cytosine modifications in both 5-mC and 5-hmC are two important epigenetic markers and their involvement in gene regulation has been extensively studied in the last decade. Although fundamental A-T and C-G base pairings are well known for the DNA double helix structure, the direct biochemical effects of epigenetically modified bases of 5-mC and 5-hmC on DNA has not been thoroughly investigated. Here we report the 5-mC and 5-hmC base modification effects on C-G base pairing and the overall effects on dsDNA stability.

Results and Discussion
5-mC and 5-hmC exert opposite forces on DNA stability. High resolution melting (HRM) analysis was used to measure the ΔDSDNA stability. This analysis directly measures DNA as either dsDNA (base-paired) or single stranded (denatured) status. This was used as a measurement of DNA stability for different cytosine modifications in a 897bp DNA fragment (5-methylcytosine & 5-hydroxymethylcytosine DNA Standard Set, DS405, Zymo Research) with relative evenly distributed G, A, T and C. The C was either 100% native C, or 100% 5-mC or 5-hmC.

Figure 1. 5-Hydroxymethylcytosine decreases thermodynamic stability of DNA. (A) Melting curves of DNA standards containing 100% of their cytosine as either unmodified cytosine (C), 5-methylcytosine (5-mC), or 5-hydroxymethylcytosine (5-hmC) were analyzed by high resolution melting (HRM). Samples were done in triplicate and averages were plotted. (B) Tm's were calculated by finding the 50% relative fluorescence levels.

The 5-mC containing DNA showed a dramatic increase in DNA melting temperature, on the other hand, the 5-hmC showed a dramatic decrease in DNA melting temperature (Fig 1A). When the 50% DNA melting point was used for measurement, 5-mC could increase the effective DNA denaturation temperature by 6°C while 5-hmC decreased the effective DNA denaturation temperature by over 2°C in relation to native C. When measuring 5-hmC vs 5-mC, the melting temperature difference was shown to be over 8°C for the same DNA (Figure 1B).

The above observed results were demonstrated using a relatively large DNA fragment (897bp) and represented the collective effect of the whole fragment.

Next, we measured the single cytosine base modification effect on dsDNA stability. To do this, a synthetic 52bp template was designed with a modified C in the middle (Figure 2A). In this set up, the DNA melting temperature changes will result from the effect of the single modified base. As shown in Figure 2B, the effect of the DNA melting temperature could be observed reproducibly, even on a single base modification. This demonstrates that the modifications are affecting the strength of the C-G base pairing. Clearly the 5-hmC:G bond is noticeably weaker than the 5-mC:G bond and the normal C-G bond strength is somewhere in between. This and several other experiments (data not shown here) showed similar results, all of which concluded that the 5-mC increases the ΔDSDNA stability.

Conclusions
Taken together, these results present a unique view of the dynamics of epigenetic modifications. The cytosine modifications not only cause structural changes on the DNA backbone, which may affect the protein binding directly due to the changed chemical structure, but these modifications can also affect the stability of the double helix directly. It is well known that DNA unwinding is an essential step in transcription initiation and DNA replication. It is conceivable that the cytosine mC and hmc modifications also serve as a DNA intrinsic “molecular switch.” We call this the Double Helix Epigenetic Switch™ for its potential to be in a locked, neutral and unlocked status. Thus, cytosine epigenetic modifications give dsDNA another coding dimension beyond the primary code. Together, genetic and epigenetic information render dsDNA into life’s blueprint.
**Quest 5-hmC™ DNA ELISA Kit**

- **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 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.

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.

**Product Cat. No.**

**Size**

**Specifications**

**Uses**

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
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</thead>
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<tr>
<td>Quest 5-hmC™ DNA ELISA Kit</td>
<td>D5425</td>
<td>1 x 96 tests</td>
<td>DNA Input: 25 - 200 ng; Assay Time: 3 - 4 hours</td>
<td>Global 5-mC detection and quantitation</td>
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<tr>
<td></td>
<td>D5426</td>
<td>2 x 96 tests</td>
<td>DNA Input: 25 - 200 ng; Assay Time: 3 - 4 hours</td>
<td>Global 5-mC detection and quantitation</td>
</tr>
</tbody>
</table>

**Anti-5-hmC Polyclonal Antibody**

- **High sensitivity to low levels of 5-hydroxymethylcytosine DNA.**
- **No detectable cross reactivity with cytosine and 5-methylcytosine.**

**Description**

The rabbit Anti-5-hmC 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 immuno precipitation-based enrichment assays, and is suitable for use in other applications including immunohistochemical labeling and chromatographic blotting.

**Product Cat. No.**

**Size**

**Specifications**

**Uses**

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
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<tr>
<td>Anti-5-Hydroxymethylcytosine Polyclonal Antibody</td>
<td>A4001-25</td>
<td>25 µg/25 µl; 50 µg/50 µl; 200 µg/200 µl</td>
<td>Source: Rabbit; Isotype: IgG1; Buffer: PBS at pH 7.5; Storage: -20°C</td>
<td>Immuno precipitation for 5-hmC DNA; ELISA; Immunoblotting; Immunofluorescence</td>
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<tr>
<td></td>
<td>A4001-50</td>
<td>50 µg, 100 µg, 200 µg</td>
<td>Concentration: 1 mg/ml</td>
<td>DNA input 100 ng - 1 µg</td>
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<tr>
<td></td>
<td>A4001-200</td>
<td>200 µg</td>
<td>Buffer: PBS at pH 7.5; Storage: -20°C</td>
<td>S-hmC DNA detection</td>
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</tbody>
</table>

**Quest 5-hmC™ Detection Kit**

- **Method to distinguish 5-hydroxymethylcytosine (5-hmC) within a specific locus.**
- **Convenient and reliable single tube reaction format.**
- **Compatible with various downstream applications (e.g. end-point PCR, qPCR, Next-Generation sequencing, etc.) for complete analysis and quantification of 5-hmC.**

**Description**

The Quest 5-hmC™ Detection Kit allows for locus-specific detection of 5-hydroxymethylcytosine (5-hmC) using a simple and efficient reaction setup. This kit features a robust and highly specific 5-hmC glucosyltransferase enzyme to specifically tag 5-hmC sites, yielding the modified base, glucosyl-5-hydroxymethylcytosine (g-5-hmC).

After glucosylation of 5-hmC, digestion of DNA with g-5-hmC sensitive restriction endonucleases (GSREs) allow 5-hmC to be differentiated from 5-mC. GSREs can efficiently digest DNA when a cytosine, 5-mC, or 5-hmC is present in their recognition site, but it is sensitive to the presence of g-5-hmC. By exploiting this sensitivity, the 5-hmC level of a specific locus can be interrogated by utilizing various downstream applications (e.g. end-point PCR, qPCR, Next-Generation sequencing, etc.).

**Mass Spec.**

<table>
<thead>
<tr>
<th>% 5-hmC</th>
<th>Brain</th>
<th>Kidney</th>
<th>Liver</th>
<th>Thymus</th>
<th>Neg. Cont.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.7</td>
<td>0.2</td>
<td>0.3</td>
<td>0.4</td>
<td>0.1</td>
<td>0.6</td>
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</table>

**Brain**

**Kidney**

**Liver**

**Thymus**

**Neg. Cont.**

**Mammalian DNA**
**Chromatin Overview**

The field of epigenetics has grown tremendously over the past several decades. Chromatin analysis has been a staple in the field for studying protein-DNA interactions and continue to be at the forefront of understanding cellular processes and disease.

Chromatin analyses use a wide-range of techniques to study nucleosome positions, histone modifications, transcription factors, DNA regulatory proteins, and chromatin structure. These tools are essential for studying everything from development, neurological disorders, and even cancer. While chromatin immunoprecipitation (ChiP) remains the prevailing method used for studying protein-DNA interactions and the dynamics of epigenetic modifications, other techniques such as nucleosomal mapping and chromosome conformation capture are proving to be extremely useful.

**RRHP™ 5-hmC Library Prep Kit**

- Innovative library preparation for strand-specific mapping of 5-hmC in DNA.
- Streamlined workflow accommodates low (≥100ng) DNA inputs.
- Libraries are ready for Next-Generation sequencing (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 Next-Generation Sequencing. 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 100 ng, lower sequencing depth, and straight-forward bioinformatics processing.

**Product**

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>RRHP™ 5-hmC Library Prep Kit</td>
<td>D5450</td>
<td>12 preps</td>
<td>DNA Input: 100 ng - 1 μg</td>
<td>5-hmC DNA detection</td>
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<tr>
<td></td>
<td>D5451</td>
<td>20 preps</td>
<td>Sequencing Platform Compatibility:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RunSeq™, TruSeq® Chemistries, HiSeq®</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>and MiSeq® platforms</td>
<td></td>
</tr>
</tbody>
</table>

**Chromatin History**

- 1871: Discovery of Nucleic Acids
- 1942: The term Epigenetics was coined
- 1964: The completion of the Human Genome Project
- 2001: Chromatin Immunoprecipitation (ChiP) technique described
- 2007: The development of ChiP-Seq method was first described

**Chromatin Analysis**

- DNA hydroxymethylation - Genome-wide 5-hmC analysis
- Next-Generation sequencing
- Genomic DNA
- MspI digestion
- Glucosylation
- Selective enrichment and amplification of 5-hmC fragments
- Next-Generation sequencing

**Epigenetics**

- Development of ChIP-Seq technique
- Association between histone modifications and chromatin transcription demonstrated
- Proposed that epigenetic information resides in histone tail modifications
ChIP DNA Clean & Concentrator® Kit

- **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.

**Product Cat. No.**
- Zymo-Spin ™ ChIP Kit (uncapped columns) D5209 10 preps
- D5210 25 preps
- ZR-96 ChIP DNA Clean & Concentrator ® (uncapped columns) D5206
  - D5207 2 x 96 preps
- EZ Nucleosomal DNA Prep Kit (included in the Zymo-Spin ™ ChIP Kit) D5220

**Specifications**
- Sample Source: Mammalian Cells
- 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

**Uses**
- Chromatin Immunoprecipitation (ChIP)

**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.

**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) Atlantic 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.

**EZ Nucleosomal DNA Prep Kit**

- **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/procedures for: cell nuclei isolation, intact nuclei enzymatic digestion, and nucleosomal DNA purification. This kit includes two different enzymes for nucleosomal DNA preparation: Atlantic 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.
ZymoTaq™ DNA Polymerase

- **Reliable:** Hot-start DNA polymerase robustly amplifies DNA, including bisulfite-converted samples.
- **Specific:** Reduces non-specific PCR product formation from difficult templates.
- **Versatile:** Compatible with real-time, quantitative PCR and suitable for TA-cloning.

**Description**

ZymoTaq™ 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, ZymoTaq™ 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, ZymoTaq™ 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.

---

**Table:**

<table>
<thead>
<tr>
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<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
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<td>ZymoTaq™ DNA Polymerase</td>
<td>E2001</td>
<td>50 rxns</td>
<td>Provided as a Premix or as part of a set</td>
<td>Amplification of bisulfite-converted &amp;</td>
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<tr>
<td></td>
<td>E2002</td>
<td>200 rxns</td>
<td></td>
<td>Cpg-d rich DNA, Amplification of DNA,</td>
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<tr>
<td>ZymoTaq™ Premix</td>
<td>E2003</td>
<td>50 rxns</td>
<td>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</td>
<td>TA cloning</td>
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<tr>
<td></td>
<td>E2004</td>
<td>200 rxns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZymoTaq™ qPCR Premix</td>
<td>E2005</td>
<td>50 rxns</td>
<td></td>
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<tr>
<td></td>
<td>E2006</td>
<td>200 rxns</td>
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**QuestTaq™ PreMix**

- **Convenient Setup:** Premixed reagent containing all necessary components.
- **Robust Amplification:** Ideal for amplification of 5mC, 5hmC, and glucosyl-5-hydroxymethylcytosine (g-5-hmC) modified DNA.
- **Versatile:** Can be used for end-point analyses or with a range of fluorescent dyes in real-time PCR.

**Description**

QuestTaq™ PreMix is supplied as a convenient 2X concentrated “master mix” containing all the reagents (i.e., dNTPs, MgCl2, and enhancers) necessary for robust PCR with little or no by-product formation. The QuestTaq™ PreMix has been optimized for the non-biased amplification of cytosine, 5-mC, 5-hmC, and glucosyl-5-hydroxymethylcytosine (g-5-hmC) containing DNA, ensuring high yield amplification across a wide range of templates. The QuestTaq™ PreMix differs from QuestTaq™ qPCR PreMix, in that it excludes SYTO® dye from the PreMix solution. It is compatible with real-time and quantitative PCR using fluorescent dyes of the researcher’s choosing.

Efficient PCR amplification of bisulfite treated DNA for methylation detection.

---

**Table:**

<table>
<thead>
<tr>
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<td>QuestTaq™ PreMix</td>
<td>E2550</td>
<td>50 rxns</td>
<td>Provided as a Premix or as part of a set</td>
<td>Non-biased amplification of 5mC, 5hmC, and g-5-hmC modified DNA</td>
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<tr>
<td></td>
<td>E2551</td>
<td>200 rxns</td>
<td></td>
<td></td>
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<tr>
<td>QuestTaq™ qPCR PreMix</td>
<td>E2552</td>
<td>50 rxns</td>
<td>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</td>
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<tr>
<td></td>
<td>E2553</td>
<td>200 rxns</td>
<td></td>
<td></td>
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</tbody>
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**Figure:**

2X QuestTaq Premix unbiasedly amplifies modified DNA. Cytosine (C), methylcytosine (M), hydroxymethylcytosine (H), and glucosylated hydroxymethylated (G) modified DNA templates (900 bp) were amplified with either QuestTaq™ PreMix or premixes from Suppliers X and Y. In each case, PCR products were visualized using the Agilent 2200 TapeStation.™
**DNA Degradase™ & DNA Degradase Plus™**

- **Fast:** One hour, single enzyme digestion vs. conventional 6–16 hour multi-enzyme digestion protocols.
- **Streamlined Workflow:** Quick, simple procedure for completely degrading DNA into individual nucleotides (DNA Degradase™) or nuclease components (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 components. 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.). Digested DNA products are immediately ready for downstream analysis by global quantitative methods including HPLC, TLC, and LC-MS.

**Product**

<table>
<thead>
<tr>
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<th>Size</th>
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<td>DNA Degradase™</td>
<td>E2016</td>
<td>500 U</td>
<td>Enzyme Concentration: 10 U/µl; Storage: -20°C; Inactivation: 70°C for 20 minutes</td>
<td>Standard Reaction Time: 1 hour, Complete digestion of DNA into individual nucleotide/nucleoside components</td>
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<tr>
<td></td>
<td>E2017</td>
<td>2,000 U</td>
<td>Enzyme Concentration: 5 U/µl; Storage: -20°C; Inactivation: 70°C for 20 minutes</td>
<td>Standard Reaction Time: 1 hour, Complete digestion of DNA into individual nucleotide/nucleoside components</td>
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<tr>
<td>DNA Degradase Plus™</td>
<td>E2020</td>
<td>250 U</td>
<td>Enzyme Concentration: 5 U/µl; Storage: -20°C; Inactivation: 30°C for 20 minutes</td>
<td>Standard Reaction Time: 1 hour, Complete digestion of DNA into individual nucleotide/nucleoside components</td>
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<td>E2021</td>
<td>1,000 U</td>
<td>Enzyme Concentration: 5 U/µl; Storage: -20°C; Inactivation: 30°C for 20 minutes</td>
<td>Standard Reaction Time: 1 hour, Complete digestion of DNA into individual nucleotide/nucleoside components</td>
</tr>
</tbody>
</table>

**CpG Methylase (M.Sssl)**

- 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 completely methylates all cytosines (C5) 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 produces 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 methyltransfer analysis. This product is supplied with 10X Reaction Buffer and S-adenosylmethionine cofactor.

**GpC Methylase (M.CviPl)**

- For complete, in vitro methylation of DNA for methylation analysis.
- Methylation of chromatin DNA for DNA accessibility studies.
- Inhibition of endonucleases with overlapping GpC sequence recognition.
- [3H]-labeling of DNA.

**Description**

Our GpC Methylase completely methylates all cytosines within a 5’…GpC…3’ context in double-stranded DNA. The enzyme is specific for both non-methylated and hemimethylated DNA. The recombinant GpC Methylase is isolated from an E. coli strain that expresses the methyltransferase gene from Chlorella virus. The reaction conditions are optimized to maximize the processivity of the enzyme to ensure rapid, complete, and reproducible methylation of DNA for accurate DNA methyltransfer analysis. This product is supplied with 10X Reaction Buffer and S-adenosylmethionine cofactor.

**Product**

<table>
<thead>
<tr>
<th>Product</th>
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<th>Size</th>
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<td>CpG Methylase (M.Sssl)</td>
<td>E2010</td>
<td>200 U</td>
<td>Enzyme Concentration: 4 U/µl; Storage: -20°C; Inactivation: 65°C for 20 minutes</td>
<td>Standard Reaction Time: 2 hours, Complete digestion of DNA in a total reaction volume of 20 µl for 1 hour at 37°C</td>
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<tr>
<td></td>
<td>E2011</td>
<td>400 U</td>
<td>Enzyme Concentration: 4 U/µl; Storage: -20°C; Inactivation: 65°C for 20 minutes</td>
<td>Standard Reaction Time: 2 hours, Complete digestion of DNA in a total reaction volume of 20 µl for 1 hour at 37°C</td>
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**CpG Methylase (M.CviPl)**

<table>
<thead>
<tr>
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<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
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<tr>
<td>GpC Methylase (M.CviPl)</td>
<td>E2014</td>
<td>200 U</td>
<td>Enzyme Concentration: 4 U/µl; Storage: -20°C; Inactivation: 65°C for 5 minutes</td>
<td>Standard Reaction Time: 2 hours, Complete digestion of DNA in a total reaction volume of 20 µl for 1 hour at 37°C</td>
</tr>
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<td></td>
<td>E2015</td>
<td>1,000 U</td>
<td>Enzyme Concentration: 4 U/µl; Storage: -20°C; Inactivation: 65°C for 5 minutes</td>
<td>Standard Reaction Time: 2 hours, Complete digestion of DNA in a total reaction volume of 20 µl for 1 hour at 37°C</td>
</tr>
</tbody>
</table>
dsDNA Shearase™ Plus

- 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, Next-Gen Sequencing, and DNA immunoprecipitation (i.e. MZiDP, MeDIP-Seq).

Description

Dissolved 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 ≥ 3 µl with recommended DNA Clean & Concentrator® technology (p. 86) making it ideal for use in end modification (linker & adapter) procedures and other applications.

5-hmC Glucosyltransferase

- 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 specifically tags 5-hydroxymethylcytosine in DNA with a glucose moiety. One unit (U) is defined as the amount of enzyme needed to convert 250 ng of 5-hmC DNA into DNA fragments in the range of 100-500 bp in 20 minutes 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.

Methylated & Hydroxymethylated Nucleotides

- Ready to use 5-Hydroxymethylcytosine dNTP mix (dATP, dTTP, dGTP, d5hmCTP) and 5-Methylcytosine dNTP mix (dATP, dTTP, dGTP, d5mCTP) of ultra-high purity; > 99% triphosphate by HPLC.
- Ready incorporated into PCR amplions with ZymoTaq™, QuestTaq™ or other DNA polymerases.
- Free of endo-, exo-deoxyribonuclease, ribonuclease, phosphatase and nicking activities.

Description

Methylated & hydroxymethylated nucleotides are of ultra-high purity and can be used to generate DNA by PCR using ZymoTaq™ or other DNA polymerases.

<table>
<thead>
<tr>
<th>dNTPs</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>dNTP Mix (10 mM)</td>
<td>D1000</td>
</tr>
<tr>
<td>dATP (100 mM)</td>
<td>D1005</td>
</tr>
<tr>
<td>dTTP (100 mM)</td>
<td>D1010</td>
</tr>
<tr>
<td>dGTP (100 mM)</td>
<td>D1015</td>
</tr>
<tr>
<td>d5CTP (100 mM)</td>
<td>D1020</td>
</tr>
<tr>
<td>5-Methylcytosine dNTP Mix (10 mM)</td>
<td>D1030</td>
</tr>
<tr>
<td>5-Methyl dCTP (10 mM)</td>
<td>D1035</td>
</tr>
<tr>
<td>5-Hydroxymethylcytosine dNTP Mix (10 mM)</td>
<td>D1040</td>
</tr>
<tr>
<td>5-Hydroxymethyl dCTP (100 mM)</td>
<td>D1045</td>
</tr>
</tbody>
</table>

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

@ZymoResearch
Following the publication of the sequence of the human genome in 2001, and more recently the ENCODE Project in 2012, it has become clear that genes and chromatin are far more complicated than previously anticipated. DNA once believed to be "junk" has been found to code for specific non-coding transcripts and to contain important regulatory elements. It is now apparent that investigating one or a few genes is no longer sufficient to answer the questions currently posed by researchers in the fields of molecular biology, genetics, and systems biology. Genome-wide genetic and epigenetic analyses need to be considered for complete assessment of the regulation of cellular processes. Zymo Research makes these analyses available to every researcher with a repertoire of genome-wide services. All Next-Gen Epigenetic Services feature state-of-the-art sample prep technologies, Illumina® certified sequencing, cutting-edge bioinformatics, and competitive pricing. All services can be combined for the most comprehensive analysis possible. Zymo Research’s Epigenetic Services can be applied to a broad range of sample sources including human, mouse, plant, platypus, and more! Let Zymo Research do the work for you and receive customizable, publication-ready data.

The scientists at Zymo Research have been developing industry leading epigenetic technologies and workflows for more than a decade. Zymo Research remains committed to pioneering new research tools and services to meet the future challenges of the rapidly growing field of epigenetics. Explore epigenomics with Zymo Research today!

Explore Epigenomics with the Most Comprehensive Services for Epigenetic Analysis!

All services are customizable and can be combined to suit your needs! Please contact us at services@zymoresearch.com to inquire today.
Epigenetic Biomarker Discovery Program

From Collection to Conclusion
Zymo Research offers a new Epigenetic Biomarker Discovery Program for the development of epigenetic lab diagnostic tests. Whether you are interested in developing epigenetic tests for cancer, developmental disorders, autoimmune diseases, obesity and other anomalies, Zymo Research provides a solution for sample collection through to commercial development. The experts at Zymo Research can help you at any step in the development pipeline by offering a portfolio of products and services for sample collection and purification, biomarker discovery, biomarker validation, platform selection, and commercial development.

Sample Collection & Purification
Zymo Research offers specialized collection devices and purification kits for tissues, feces, urine, blood and other biological specimens. Sample collection begins with DNA/RNA Shield™ which is an innovative stabilization reagent that allows samples to be stored and transported at ambient temperatures. DNA/RNA Shield™ does not require the need for refrigeration or specialized equipment and makes shipping your precious specimens to Zymo Research easy.

Biomarker Discovery: Epigenetic NGS Services
With the latest Next-Generation sequencing technologies for DNA methylation analysis, Zymo Research provides comprehensive services and bioinformatics analysis to help discover epigenetic biomarkers in your specific sample set. Zymo Research’s Illumina® analysis, Zymo Research provides comprehensive services and bioinformatics.

Platform Selection
Once you have your specific biomarkers narrowed down and validated, Zymo Research will help you select the most sensitive and cost-effective platform for your lab diagnostic test. A wide range of citation-leading bisulfite and bisulfite-free methods are available to implement your test.

Commercial Development
Zymo Research’s associates, Pangea™ CLIA-certified lab, will help you to bring your lab diagnostic test to the market.

DNA Methylation
Zymo Research offers four platforms for genome-wide DNA methylation analysis at single-nucleotide resolution, each designed to suit your specific coverage needs. The main difference between the platforms is the percentage of the total genome actually being sequenced. All platforms accommodate a wide range of sample types, including any species with a reference genome, low-input (>10 ng), and FFPE samples.

Classic RRBS (Reduced Representation Bisulfite Sequencing) combines restriction enzyme digestion with bisulfite sequencing to enrich for a CpG-dense fraction of the genome. The Classic RRBS platform allows for a maximum amount of methylation data using a minimal amount of sequencing at a significantly reduced cost. This combination makes Classic RRBS the perfect platform for pilot studies. Classic RRBS covers ≥70% of all CpG islands, >75% of all gene promoters, and detects 1.5-2 million unique CpG sites at 5-10x average minimum coverage.

Methyl-MiniSeq® is an expanded version of Classic RRBS. The system is extremely robust and the read depth is impressive, making it ideal for biomarker discovery using identification and analysis of differentially methylated regions. The low cost of this platform relative to the sequence data it produces also makes Methyl-MiniSeq® a good platform for pilot studies. Methyl-MiniSeq® covers ≥85% of all CpG islands, >80% of all gene promoters, and captures approximately 4 million unique CpG sites at 5-10x average minimum coverage.

Methyl-MidiSeq® extends coverage to include a large majority of genetic regulatory elements (enhancers), gene bodies, and repeat DNA sequences that Classic RRBS and Methyl-MiniSeq® do not capture due to low CpG density in those regions. Methyl-MidiSeq® allows for the detection of 8-9 million unique CpG sites at 5-10x coverage.

Methyl-MaxiSeq® is a whole-genome bisulfite sequencing (WGBS) option that provides DNA methylation information at single nucleotide resolution. The Basic Service package for each platform includes sample standardization, library construction, sequencing, and raw data alignment. The Full Service package offers additional downstream bioinformatics processing and statistical analysis.

Notes
*Coverage estimates based on the human genome.
**Service options vary.

<table>
<thead>
<tr>
<th>Service Option</th>
<th>Classic RRBS</th>
<th>Methyl-MiniSeq®</th>
<th>Methyl-MidiSeq®</th>
<th>Methyl-MaxiSeq®</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capable with low DNA input?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Single-base Resolution?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Methylome Coverage*</td>
<td>1.5 - 2 million sites</td>
<td>3 - 4 million sites</td>
<td>8 - 9 million sites</td>
<td>Entire methylome</td>
</tr>
<tr>
<td>Quantitative Analysis</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Genomic Regions covered</td>
<td>Nearly all CpG islands and gene promoters</td>
<td>Twice as many unique CpG sites compared to Classic RRBS</td>
<td>Also includes gene bodies and regulatory regions (50% of enhancers)</td>
<td>Entire methylome</td>
</tr>
<tr>
<td>Notes</td>
<td>Efficient genome-wide analysis</td>
<td>Robust biomarker discovery</td>
<td>Expanded methylation analysis</td>
<td>Complete methylation analysis</td>
</tr>
</tbody>
</table>

*Coverage estimates based on the human genome.
**Service options vary.
MethylCheck™ Bisulfite Sequencing

Zymo Research makes epigenetic biomarker validation simple with our MethylCheck™ platform. Whether you have methylation array (27K/450K/850K) data that you would like to validate in a large sample cohort or have 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 through data analysis, sending you back publication-quality graphs and figures.

The Targeted Bisulfite Sequencing Service Includes:

- Primer Design and Validation
- Targeted Amplification
- Adapterization and Barcoding
- Sequencing with Illumina® Technology
- Sequence Alignment to Reference Genome
- DNA Methylation Analysis

DNA Hydroxymethylation

Zymo Research’s platform for the analysis of DNA hydroxymethylation has unparalleled sensitivity and coverage of 5-hydroxymethylcytosine (5-hmC). With traditional bisulfite-conversion methods, 5-hmCs cannot be distinguished from 5-mCs. Therefore, Zymo Research has developed Reduced Representation Hydroxymethylcytosine Profiling (RRHP™), compatible with Next-Generation sequencing to ensure high coverage and sensitivity for the detection of 5-hmC at single-base resolution. RRHP™ allows genome-wide profiling for 5-hmC with reduced sequencing requirements.

RRHP™

This service is for genome-wide profiling of 5-hydroxymethylcytosine in DNA at single-nucleotide resolution. RRHP™ also allows strand-specific determination of the location of the 5-hmC modification as well as quantification of 5-hmC levels. Data from RRHP™ can be combined with DNA methylation data from Methyl-MiniSeq®, allowing for direct comparison of DNA methylation and hydroxymethylation in the same sample. RRHP™ is compatible with low DNA inputs and has the added advantage of providing read data for simultaneous SNP detection.

Replicate sample 5-hmC levels show very strong correlation when assessed using the RRHP™ platform.

(Peterson A, Chung TH, Tan D, Sun X, Jia XY. Genome Biol. 2014 Sep 24;15(9):456.)
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 interaction 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.

Simply send us your samples and we will handle the rest!

---

**RNA-Sequencing Services**

Zymo Research’s RNA-Seq service makes transcriptome analysis available to every researcher, without the need for expensive equipment or bioinformatics expertise. Now you can achieve transcriptome-wide coverage of total RNA, or small RNA with the latest Next-Gen Sequencing technology.

**Let Zymo Research do the work for you!**

- **Simple and customizable:** All RNA purification, sample prep, sequencing, and bioinformatics analysis is included. Each project is customizable and delivers publication-ready figures.
- **Maximize Coverage:** Proprietary depletion method minimizes bias during rRNA removal, allowing for cost-effective sequencing to increase coverage of relevant transcripts, no matter the sample type.
- **Stringent QC:** Each library is assessed using standards to ensure that quality data is generated.
- **Available Services:** Total RNA-Seq and miRNA-Seq.

---

**Maximize Coverage**

![Maximize Coverage Diagram](image)

**Unbiased Depletion**

- **Example of Zymo Research’s ChIP-Seq Data Output:**
  - A. Browser tracks for visualization of peak regions.
  - B. Venn diagram showing sample comparison data.
  - C. Density profile to analyze peak locations relative to transcriptional start sites.
  - D. Motif analysis to analyze bound genomic regions.

**Stringent QC Using Standards**

- **Empirical quality control ensures reliable data generation and interpretation:** RNA-Seq pipelines are optimized using spike-in standards to deliver datasets of the highest quality and rigor, with the lowest bias. Scatterplot comparing measured (Y-axis) vs theoretical (X-axis) RPKM for spike-in standards.
A growing number of studies have highlighted the strong correlation of DNA methylation changes with aging. Additionally, accelerated biological aging, as determined by DNA methylation profiling, 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 you to effectively gauge the biological age of any human tissue sample. With this easy to use service, the only thing you have to do is provide us with the sample. Starting with DNA purification all the way through bioinformatics analysis, Zymo scientists will do the work for you and provide you with an accurate biological age estimate along with a comprehensive report. Enhance any aging study or satisfy your intellectual curiosity with this multi-tissue age predictor.

- Reliably determine the true biological age of any human sample.
- Quantify changes in biological age following lifestyle interventions or drug treatments.
- Identify disease-associated aging alterations.

Explore Epigenomics with Zymo Research and inquire today at www.zymoresearch.com/services.
2 DNA Purification

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.

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-negative). Extraction methods must also protect DNA from degradation, especially when storing/transporting precious samples. Inadequate preservation can lead to suboptimal analysis. Undesired contaminants necessitate 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.

It is clear that many molecular-based applications including PCR, DNA sequencing, microarray, Southern blotting, etc., require high-quality DNA. 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.
Plasmid DNA Purification

**From E. coli**
- **Miniprep Scale**
  - ZymoPURE™ Plasmid Miniprep Kit
    - s ≤ 100 μg transfection-grade plasmid DNA.
    - Page 64
  - Zymopure™ II Plasmid Prep Kits
    - Vaccine/transfection grade plasmid DNA in ≤ 20 minutes.
    - Page 62-63
- **Midiprep, Maxiprep, and Gigaprep**
  - BAC, YAC, PAC Plasmid DNA ~200 kb
- **High-Throughput**
  - ZymoPURE™ Plasmid Miniprep Kit
    - s ≤ 100 μg transfection-grade plasmid DNA.
    - Page 64
  - Zymopure™ II Plasmid Prep Kits
    - Vaccine/transfection grade plasmid DNA in ≤ 20 minutes.
    - Page 62-63
  - ZymoPURE™ Plasmid Magbead Kit
    - Pelt-free procedure for high-quality plasmid DNA (no centrifugation).
    - Page 68
  - Zymoprep™ Yeast Plasmid Miniprep Kits
    - Simple solution for yeast plasmid DNA isolation using Zymolyase.
    - Page 177

**From Yeast**
- **Zyppy® Plasmid Miniprep Kits**
  - Pelt-free, high-quality plasmid DNA in only 8 minutes.
    - Page 66-67
  - Zyppy®-96 Plasmid Midiprep Kit
    - Pelt-free isolation of transformation grade plasmid DNA in only 15 minutes.
    - Page 65
- **Zymopure™ Express® Plasmid Midiprep Kit**
  - Pelt-free isolation of transformation grade plasmid DNA in only 15 minutes.
  - Page 65

**DNA Isolation**

**Biological Fluids, Cells & Tissues**
- **Quick-DNA™ Plus Kits**
  - High-quality DNA from any biological fluids, cells, and tissue.
    - (Proteinase K included)
    - Page 72-73
- **Quick-DNA™ kits**
  - High-quality DNA from cells and whole blood.
    - (No Proteinase K)
    - Page 72-73
- **Quick-DNA™ Urine Kit**
  - For total, cellular, or cell-free DNA from ≤ 30 ml urine.
    - Page 76

**Liquid Biopsy Serum, Plasma, Urine, Cerebrospinal Fluid, Amniotic Fluid, & Saliva**
- **Quick-cfDNA™ Serum & Plasma Kit**
  - Total cell-free DNA from ≤ 10 ml serum, plasma, cerebrospinal fluid, amniotic fluid, and ≤ 5 ml saliva.
    - Page 77
- **Quick-DNA™ FFPE Kit**
  - Rapid, high-quality DNA from FFPE tissue.
    - Page 74

**Fixed Tissues**
- **Pinpoint® Slide DNA Isolation System**
  - Convenient DNA isolation from glass slides.
    - Page 75

*Format:* Spin-Column, 96-Well Plate, Magnetic Beads

Page 56
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. This rapid, streamlined purification results in ultra-pure, transfection-grade plasmid at superior speeds. 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 plasmid DNA to be eluted directly from a microcentrifuge column in minutes.

Imagine recovering plasmid DNA without large-scale centrifugation cell pelleting directly from culture. 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 isolate plasmid DNA with endotoxin levels ≤ 0.025 EU/μg. 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, restriction endonuclease digestion, in vivo studies, bacterial transformation, PCR amplification, DNA sequencing, and other sensitive downstream applications.

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 7-fold, and enables > 1 mg of plasmid DNA to be eluted directly from a microcentrifuge column.

Technology Overview: ZymoPURE™

EndoZero™ Plasmid DNA in 5 Easy Steps

Zymo Research

<table>
<thead>
<tr>
<th>ZymoPURE™ II</th>
<th>Supplier Q, Anion Exchange</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 min.</td>
<td>Alkaline Lysis</td>
</tr>
<tr>
<td>6 min.</td>
<td>Filtration</td>
</tr>
<tr>
<td>2 min.</td>
<td>Bind</td>
</tr>
<tr>
<td>2 min.</td>
<td>Wash</td>
</tr>
<tr>
<td>3 min.</td>
<td>Elute</td>
</tr>
<tr>
<td></td>
<td>8 min.</td>
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<td></td>
<td>45 min.</td>
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<td>5 min.</td>
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<td>7 min.</td>
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<td></td>
<td>35 min.</td>
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<td></td>
<td>35 min.</td>
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<tr>
<td></td>
<td>10 min.</td>
</tr>
<tr>
<td></td>
<td>10 min.</td>
</tr>
<tr>
<td></td>
<td>5 min.</td>
</tr>
</tbody>
</table>

Plasmid DNA in 18 minutes

Plasmid DNA in 160 minutes

Highly Rated

95% of researchers consider ZymoPURE™ easy to use

85% of researchers would recommend ZymoPURE™ to a colleague

Based on feedback from 687 researchers, 88% were satisfied with the overall performance.
**ZymoPURE™ II Plasmid Kits**

- **Fastest:** Simple 20 minute Midi/Maxi preps.
- **Highest Yield:** 6x more plasmid.
- **Ultra-Pure:** EndoZero™, vaccine grade*, and transfection ready.

**Simple 20 minute EndoZero™ Midi/Maxi preps**

- **bind**
  - rapid loading onto a spin-column via vacuum or centrifuge
- **wash**
  - for ultra-pure endotoxin-free plasmid DNA
- **elute**
  - transfection ready from spin-column

---

**Plasmid DNA Purification**

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Processing Time</th>
<th>Culture Volume</th>
<th>Elution Volume</th>
<th>Plasmid Yield</th>
<th>Endotoxins</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZymoPURE™ II Plasmid Midiprep Kit</td>
<td>D4200 D4201</td>
<td>25 preps 50 preps</td>
<td>20 minutes</td>
<td>≥ 50 µl</td>
<td>≥ 100 µg</td>
<td>≤ 400 µg</td>
<td>≤ 0.025 EU/µg</td>
</tr>
<tr>
<td>ZymoPURE™ II Plasmid Maxiprep Kit</td>
<td>D4202 D4203</td>
<td>10 preps 20 preps</td>
<td>20 minutes</td>
<td>≥ 150 µl</td>
<td>≥ 200 µl</td>
<td>≤ 1.2 mg</td>
<td>≤ 0.025 EU/µg</td>
</tr>
<tr>
<td>ZymoPURE™ II Plasmid Gigaprep Kit</td>
<td>D4204</td>
<td>5 preps 50 minutes</td>
<td>≥ 2.5 L</td>
<td>≥ 2 ml</td>
<td>≥ 10 mg</td>
<td>≤ 0.025 EU/µg</td>
<td></td>
</tr>
</tbody>
</table>

---

* Stated endotoxin levels for the ZymoPURE™ II Maxiprep kit compared to two separate kits from Supplier Q.

---

**Endless possibilities, what will you create?**

---

**EndoFree ZymoPURE™ II**

- **Ultra-Pure Vaccine Grade Plasmid DNA**
- **Highest Yield & Lowest Elution Volume**

---

**Ultra-Pure Vaccine Grade Plasmid DNA**

- **Ultra-Pure EndoZero™ Midi/Maxi preps**
  - rapid loading onto a spin-column via vacuum or centrifuge
  - for ultra-pure endotoxin-free plasmid DNA
  - transfection ready from spin-column
ZymoPURE™ Plasmid Miniprep Kit

- **Highest Yield:** Purify up to 100 µg of plasmid DNA in as little as 25 µl directly from a spin-column.
- **Transfection-Grade:** 50,000 times fewer endotoxins than industry leading minipreps.
- **BAC/YAC/PAC Ready:** Purify DNA up to ~200 kb.

**Superior Yields**

Plasmid DNA yield and concentration from the ZymoPure™ Miniprep Kit compared to other major suppliers. Plasmid DNA (pGL3®) was isolated from 5 ml of JM109 E. coli cultures grown overnight following the manufacturer’s suggested protocol (in duplicate). The size marker “M” is a 1 kb ladder.

**Transfection-grade**

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

**BAC/YAC/PAC Ready**

- **Highest Yield:** Purify up to 100 µg of plasmid DNA in as little as 25 µl directly from a spin-column.
- **Transfection-Grade:** 50,000 times fewer endotoxins than industry leading minipreps.
- **BAC/YAC/PAC Ready:** Purify DNA up to ~200 kb.

**ZymoPURE-Express™ Plasmid Midiprep Kit**

- **50,000 times fewer ENDOTOXINS than the industry leading miniprep kit.**
- **50,000 times fewer ENDOTOXINS** than the industry leading miniprep kit.

**Transfection-grade**

15 minutes from Culture to Plasmid DNA

**Fastest Plasmid Midiprep**

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 cultures grown in duplicate overnight following the manufacturer’s suggested protocol. The size marker “M” is a 1 kb ladder.

**Product** | Cat. No. | Size | Processing Time | Culture Volume | Elution Volume | Plasmid Yield | Endotoxins
---|---|---|---|---|---|---|---
ZymoPURE™ Plasmid Miniprep Kit | D4208T | 10 preps | 15 minutes | ≤ 5 ml | ≤ 25 µl | ≤ 100 µg | ≤ 1 EU/µg DNA
D4209 | 50 preps
D4210 | 100 preps
D4211 | 400 preps
D4212 | 800 preps

ZymoPURE-Express™ Plasmid Midiprep Kit | D4213 | 25 preps | 15 minutes | ≤ 5 ml | ≤ 25 µl | ≤ 1.2 mg | ≤ 1 EU/µg DNA

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Zyppy® Plasmid Purification Kits

Imagine... plasmid DNA directly from culture

1. Add lysis buffer directly to bacterial culture
2. Neutralize
3. Bind, Wash, Elute

Pellet-free, high-quality plasmid DNA in 8 minutes

No Pelleting. No Resuspension.

- **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**

- 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).

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Product Cat. No.</th>
<th>Size</th>
<th>Processing Time</th>
<th>Culture Volume</th>
<th>Elution Volume</th>
<th>Plasmid Yield</th>
<th>Endotoxins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier Q</td>
<td>Zyppy® Plasmid Miniprep Kit</td>
<td>D4036</td>
<td>50 preps</td>
<td>8 minutes</td>
<td>600 µl – 3 ml</td>
<td>≥ 30 µl</td>
<td>≤ 25 µg</td>
</tr>
<tr>
<td></td>
<td>D4019</td>
<td>100 preps</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>D4020</td>
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<td></td>
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<td>800 preps</td>
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<tr>
<td>Supplier Q</td>
<td>Zyppy® Plasmid Miniprep Kit</td>
<td>D4041</td>
<td>2 x 96 preps</td>
<td>45 minutes</td>
<td>750 µl</td>
<td>≥ 30 µl</td>
<td>≤ 5 µg</td>
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<td>D4042</td>
<td>4 x 96 preps</td>
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<td></td>
<td>D4043</td>
<td>8 x 96 preps</td>
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</tbody>
</table>

**Transfection Ready**

- Superior yield: high-quality plasmid DNA is ready for transfection without dilution.
- Transfection-ready format allows for efficient transfection with minimal DNA contamination.

**Proven Performance**

- 90% of researchers would recommend this kit to another researcher.
- 89% would recommend this kit to another researcher.
- 7% overall kit efficiency.
- Great: recommended to all researchers.
- Fair: recommended to a few researchers.
- Poor: not recommended.

**90% of researchers would recommend this kit to another researcher.**

**Overall Kit Efficiency**

- Great: recommended to all researchers.
- Fair: recommended to a few researchers.
- Poor: not recommended.

- 90% would recommend this kit to another researcher.
**Automated Zyppy® Plasmid Purification**

- **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.

**Zyppy® Product Cat. No. Size Processing Time**

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Processing Time</th>
<th>Culture Volume</th>
<th>Elution Volume</th>
<th>Plasmid Yield</th>
<th>Endotoxins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zyppy®-96 Plasmid MagBead Miniprep Kit</td>
<td>D4100</td>
<td>2 x 96 preps</td>
<td>2 x 96 preps</td>
<td>60 minutes</td>
<td>150 µl</td>
<td>≥ 30 µg</td>
<td>≤ 5 EU/µg DNA</td>
</tr>
<tr>
<td></td>
<td>D4101</td>
<td>4 x 96 preps</td>
<td>4 x 96 preps</td>
<td>60 minutes</td>
<td>150 µl</td>
<td>≥ 30 µg</td>
<td>≤ 5 EU/µg DNA</td>
</tr>
<tr>
<td></td>
<td>D4102</td>
<td>8 x 96 preps</td>
<td>8 x 96 preps</td>
<td>60 minutes</td>
<td>150 µl</td>
<td>≥ 30 µg</td>
<td>≤ 5 EU/µg DNA</td>
</tr>
</tbody>
</table>

**High-Quality Plasmid DNA**

Plasmid DNA isolated with Zyppy® shows the highest transcription efficiencies. Luciferase activity is 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).

**High Transfection Efficiency**

Plasmid DNA isolated with Zyppy® was purified then digested with HindIII for one hour at 37°C. Both undigested (−) lane and digested (+) lanes samples were separated in a 1% agarose gel. The undigested samples show supercoiled plasmid DNA (pGEM-3Zf(+)) was purified then digested with HindIII for one hour. The undigested samples show supercoiled HindIII plasmid DNA. The digested samples show a ladder of bands.

**ZR Plasmid Miniprep™ – Classic**

- Purify high-quality, transfection-grade plasmid DNA for restriction endonuclease digestion, DNA sequencing, transformation, cloning, transfection, in vitro transcription reactions, etc.
- Innovative colored P1, P2, and P3 buffers rapidly identify completion of bacterial cell lysis and neutralization steps.
- Unique column design enables zero buffer retention and low (30 µl) elution volume.

**ZR BAC DNA Miniprep Kit**

- For spin-column purification of endotoxin-free BAC/PAC plasmid DNA (up to ~200 kb) for sequencing, PCR, restriction endonuclease digestion, etc.
- Innovative colored buffers for rapid identification of complete bacterial cell lysis and neutralization steps.
- Unique column design enables zero buffer retention and low-volume (≥ 10 µl) elution.

**ZR Plasmid Miniprep™ – Classic**

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 endotoxin-free 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**

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 endotoxin-free plasmid DNA recovery. BAC DNA purified using the ZR BAC DNA Miniprep Kit is ideal for sequencing, PCR, endonuclease digestion, etc.

**Product**

<table>
<thead>
<tr>
<th>Description</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZR BAC DNA Miniprep Kit</td>
<td>D4048</td>
<td>25 preps</td>
<td>Large plasmid recovery from E. coli culture</td>
<td></td>
</tr>
</tbody>
</table>
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.

Technology Overview: Quick-DNA™ Kits

Accommodates a Wide Variety of Samples

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™ 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.

Reliable & Consistent

DNA yields increase linearly with increasing volumes of human whole blood using the Quick-DNA™ Miniprep Plus Kit. Six replicates of 25, 50, 100, and 200 μl of human whole blood were processed.

Purity By Design

With Zymo-Spin™ Technology, there is absolutely no carryover of buffers, salts, or any PCR inhibitors. The eluted DNA is ready for all sensitive downstream applications including qPCR, Next-Generation Sequencing, and methylation analysis.
**Quick-DNA™ and Quick-DNA™ Plus Kits**

- **Quick & Easy:** Simple 20 minute procedure.
- **Highest Yield:** Recover 3x more DNA.
- **Ultra-Pure:** Ready for qPCR, Next-generation 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 (Proteinase K Included)**

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

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>DNA Recovery</th>
<th>Minimum Elution</th>
<th>(Animal) Cells/Tissue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick-DNA™ Microprep Plus Kit</td>
<td>D4074</td>
<td>50 preps</td>
<td>5 µg</td>
<td>10 µl</td>
<td>≤ 10^6 cells</td>
</tr>
<tr>
<td>Quick-DNA™ Microprep Plus Kit</td>
<td>D4095</td>
<td>200 preps</td>
<td>25 µg</td>
<td>50 µl</td>
<td>≤ 5 x 10^6 cells</td>
</tr>
<tr>
<td>Quick-DNA™ Midiprep Plus Kit</td>
<td>D4075</td>
<td>25 preps</td>
<td>125 µg</td>
<td>250 µl</td>
<td>≤ 3 x 10^7 cells</td>
</tr>
<tr>
<td>Quick-DNA™ Midiprep Plus Kit</td>
<td>D4071</td>
<td>100 preps</td>
<td>5 µg</td>
<td>15 µl</td>
<td>≤ 10^7 cells</td>
</tr>
<tr>
<td>Quick-DNA™ Magbead Plus Kit</td>
<td>D4081</td>
<td>1 x 96 preps</td>
<td>10 µg</td>
<td>75 µl</td>
<td>≤ 3 x 10^7 cells</td>
</tr>
<tr>
<td>Quick-DNA™ Magbead Plus Kit</td>
<td>D4082</td>
<td>4 x 96 preps</td>
<td>5 µg</td>
<td>30 µl</td>
<td>≤ 5 x 10^7 cells</td>
</tr>
</tbody>
</table>

**Quick-DNA™ (No Proteinase K)**

Whole Blood, Swabs, Cells

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>DNA Recovery</th>
<th>Minimum Elution</th>
<th>(Animal) Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick-DNA™ Microprep Kit</td>
<td>D3020</td>
<td>50 preps</td>
<td>5 µg</td>
<td>10 µl</td>
<td>≤ 10^6 cells</td>
</tr>
<tr>
<td>Quick-DNA™ Microprep Kit</td>
<td>D3021</td>
<td>200 preps</td>
<td>25 µg</td>
<td>50 µl</td>
<td>≤ 5 x 10^6 cells</td>
</tr>
<tr>
<td>Quick-DNA™ Midiprep Kit</td>
<td>D3010</td>
<td>100 preps</td>
<td>5 µg</td>
<td>15 µl</td>
<td>≤ 10^7 cells</td>
</tr>
<tr>
<td>Quick-DNA™ Midiprep Kit</td>
<td>D3011</td>
<td>4 x 96 preps</td>
<td>10 µg</td>
<td>75 µl</td>
<td>≤ 3 x 10^7 cells</td>
</tr>
</tbody>
</table>

**Quick-DNA™ Plus Workflow**

**Biological Fluid & Cells** Whole blood, semen, buffy coat, saliva, body fluids, milk, E. coli, insect, mammalian cells (e.g. HeLa, buccal, drosophila, etc.)

**Solid Tissues** Tail snips, ear punches, organ biopsies (brain, liver, heart, kidney, muscle, stomach, etc.)

**Lys & Digest Any Sample**

**Bind & Wash on column**

**Eluted NGS-ready DNA**

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**Quick-DNA™ FFPE Kit**

- **Quick & Easy:** Rapid dewaxing procedure (no xylene necessary).
- **Ultra-Pure:** Ready for qPCR, Next-Gen Sequencing, arrays, etc.
- **Highest Yield:** Recover 6x more DNA.

### Simplest Workflow

1. Deparaffinized Tissue
2. Proteinase K Digestion
3. Zymo-Spin™ IC
4. Ultra-pure DNA

### Size Selection Built In

- **1000 bp**
  - DNA >1000 bp
- **1 kb**
  - DNA >1000 bp

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.

### Pinpoint® Slide DNA Isolation System

- Convenient and streamlined method for the isolation of genomic 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.

### 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.

### Product Specifications

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick-DNA™ FFPE Kit</td>
<td>D3067</td>
<td>50 preps</td>
<td>Format: Spin-Column</td>
<td>DNA isolation from FFPE blocks, FFPE tissue sections</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sample Size: up to 25 mg tissue</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Binding Capacity: 25 µg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Elution Volume: ≥ 25 µl</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinpoint® Slide DNA Isolation System</td>
<td>D3001</td>
<td>50 preps</td>
<td>Format: Spin-Column</td>
<td>DNA isolation from targeted areas of tissue sections, FFPE tissue sections, glass slides</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sample Size: up to 25 mg tissue</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Binding Capacity: 5 µg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Elution Volume: ≥ 10 µl</td>
<td></td>
</tr>
</tbody>
</table>
Genomic DNA Purification

DNA Purification

Quick-DNA™ Urine Kit

- 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: Ready for qPCR, Next-generation sequencing, arrays, etc.

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. 3 ml of urine from a healthy female donor were processed and DNA was eluted in 20 μl final volume. Purified DNA was analyzed using the Agilent 2200 TapeStation® system.

Quick-cfDNA™ Serum & Plasma Kit

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

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.

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick-DNA™ Serum &amp; Plasma Kit</td>
<td>D4076</td>
<td>50 preps</td>
<td>Compatible with vacuum and centrifuge Processing Volume: ≤ 10 ml DNA Recovery: ≥ 100% Elution Volume: ≥ 35 μl</td>
<td>DNA isolation from serum, plasma, amniotic fluid, cerebrospinal fluid, saliva, ideal for cell-free DNA</td>
</tr>
<tr>
<td>Quick-DNA™ Serum &amp; Plasma Buffer Set</td>
<td>D4076-A</td>
<td>Refill</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Superior Preservation

Both cellular and cell-free DNA was effectively purified from urine. 3 ml of urine from a healthy female donor were processed and DNA was eluted in 20 μl final volume. Purified DNA was analyzed using the Agilent 2200 TapeStation® system.

Streamlined Workflow

Cell free DNA yield (pg/µL)

<table>
<thead>
<tr>
<th>Plasma Volume (ml)</th>
<th>1</th>
<th>5</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>30yr Plasma</td>
<td>7,000</td>
<td>1,200</td>
<td>1,500</td>
</tr>
<tr>
<td>30yr F plasma</td>
<td>10,000</td>
<td>5,000</td>
<td>6,000</td>
</tr>
</tbody>
</table>

Highest Yields

<table>
<thead>
<tr>
<th>Total DNA yield (ng)</th>
<th>100</th>
<th>200</th>
<th>300</th>
<th>400</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier Q</td>
<td>100</td>
<td>200</td>
<td>300</td>
<td>400</td>
<td>500</td>
</tr>
<tr>
<td>Zymo Research</td>
<td>150</td>
<td>300</td>
<td>450</td>
<td>600</td>
<td>750</td>
</tr>
</tbody>
</table>

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Quick-DNA™ Viral Kits

- Rapid Protocol: Elute DNA in 6 µl within 10 minutes.
- Ultra-Pure: Ready for qPCR, Next-generation sequencing, arrays, etc.
- High Sensitivity: Yields increase linearly with sample input.

Viral DNA in 10 minutes

Phenol / Chloroform | Quick-DNA™ Viral Kit
---|---
M | neg.
10 | 1 | 0.1 | 0.01 | 0.001
10 | 1 | 0.1 | 0.01 | 0.001

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

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

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

Quick-DNA™ Viral 96 Kit | D3017 | 2 x 96 preps | Elution Volume ≥ 10 µl | DNA Size Limits: 100 bp - 50 kb |
| D3018 | 4 x 96 preps |

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 refractory 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.

Quick-DNA™ Fecal/Soil Microbe Kits

- **Boost Detection:** Included BashingBeads™ ensure complete lysis of tough-to-lyse samples.
- **Inhibitor-Free:** Ready for qPCR, Next-Gen Sequencing, arrays, etc.
- **Simple Workflow:** Lysis, 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).

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

**Complete Homogenization**
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 (p<0.05).

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick-DNA™ Fecal/Soil Microbe MidiPrep Kit</td>
<td>D6110</td>
<td>25 preps</td>
<td>Format: Spin-Column Binding Capacity: 125 µg Elution Volume: ≥ 150 µl Processing Time: 25 min.</td>
<td>Total DNA isolation from: Feces; Gram (+) bacteria; Gram (-) bacteria; yeast; filamentous fungi; unicellular algae; filamentous algae; protist; soil, sludge, clay.</td>
</tr>
<tr>
<td>Quick-DNA™ Fecal/Soil Microbe 96 Kit</td>
<td>D6011</td>
<td>2 x 96 preps</td>
<td>Format: 96-Well Binding Capacity: 50 µg Elution Volume: ≥ 50 µl Processing Time: 30 min.</td>
<td></td>
</tr>
<tr>
<td>Quick-DNA™ Fecal/Soil Microbe 96 Magbead Kit (includes ZR BashingBead™ Lysis Rack)</td>
<td>D6011-FM</td>
<td>2 x 96 preps</td>
<td>Format: Magnetic Bead Binding Capacity: 25 µg Elution Volume: ≥ 35 µl Processing Time: 2 hours</td>
<td></td>
</tr>
<tr>
<td>Quick-DNA™ Fecal/Soil Microbe 96 Magbead Kit (Lysis Matrix Not Included)</td>
<td>D6011-FM</td>
<td>2 x 96 preps</td>
<td>Format: Magnetic Bead Binding Capacity: 25 µg Elution Volume: ≥ 35 µl Processing Time: 2 hours</td>
<td></td>
</tr>
<tr>
<td>Quick-DNA™ Fecal/Soil Microbe 96 Magbead Kit (includes ZR BashingBead™ Lysis Tubes)</td>
<td>D6012-FM</td>
<td>2 x 96 preps</td>
<td>Format: Magnetic Bead Binding Capacity: 25 µg Elution Volume: ≥ 35 µl Processing Time: 2 hours</td>
<td></td>
</tr>
</tbody>
</table>
**Quick-DNA™ Fungal/Bacterial Kits**

- **Boost Detection**: Included BashingBeads™ ensure complete lysis of tough-to-lyse samples.
- **Ultra-Pure**: Ready for qPCR, Next-Gen Sequencing, arrays, etc.
- **Simple Workflow**: Fastest workflow (< 20 minutes).

### Highest Yields

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick-DNA™ Fungal/Bacterial Microprep Kit</td>
<td>D6007</td>
<td>50 preps</td>
<td>Format: Spin-Column Binding Capacity: 5 µg Elution Volume: ≥ 10 µl Processing Time: 15 minutes</td>
<td>DNA isolation from: Gram (+) bacteria; Gram (-) bacteria; Yeast; Filamentous fungi; Unicellular algae; Filamentous algae; Protist; Either fungi or bacteria grown in media</td>
</tr>
<tr>
<td>Quick-DNA™ Fungal/Bacterial Miniprep Kit</td>
<td>D6005</td>
<td>50 preps</td>
<td>Format: Spin-Column Binding Capacity: 25 µg Elution Volume: ≥ 35 µl Processing Time: 15 minutes</td>
<td>DNA isolation from: Insects/arthropods; tough-to-lyse tissues; tough-to-lyse organisms; soft &amp; solid tissues (food)</td>
</tr>
<tr>
<td>Quick-DNA™ Fungal/Bacterial Midiprep Kit</td>
<td>D6105</td>
<td>25 preps</td>
<td>Format: Spin-Column Binding Capacity: 125 µg Elution Volume: ≥ 150 µl Processing Time: 20 minutes</td>
<td>DNA isolation from: Gram (+) bacteria; Gram (-) bacteria; Yeast; Filamentous fungi; Unicellular algae; Filamentous algae; Protist; Either fungi or bacteria grown in media</td>
</tr>
<tr>
<td>Quick-DNA™ Fungal/Bacterial 96 Kit</td>
<td>D6006</td>
<td>2 x 96 preps</td>
<td>Format: 96-Well Binding Capacity: 5 µg Elution Volume: ≥ 25 µl Processing Time: 40 minutes</td>
<td>DNA isolation from: Insects/arthropods; tough-to-lyse tissues; tough-to-lyse organisms; soft &amp; solid tissues (food)</td>
</tr>
</tbody>
</table>

### Simple Workflow

- **Homogenize sample with ZR BashingBead™ Lysis Tube**
- **Bind, Wash, Elute DNA with Zymo-Spin™ IC or IIC**
- **PCR Ready, Ultra-Pure DNA**

**Quick-DNA™ Tissue/Insect Kits**

- **Simple Workflow**: Lyse, purify on column, and filter to remove PCR inhibitors.
- **Highest Yield**: Included BashingBeads™ ensure complete lysis of tough-to-lyse samples.
- **Ultra-Pure**: 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**
- **Bind, Wash, Elute DNA with Zymo-Spin™ IC or IIC**
- **PCR Ready, Ultra-Pure DNA**

**Summary**

- Quick-DNA™ Fungal/Bacterial Kits offer high yields and ultra-pure DNA suitable for qPCR, Next-Gen Sequencing, and arrays.
- Quick-DNA™ Tissue/Insect Kits provide high recovery of DNA from tissues and insects, ideal for PCR and sequencing applications.

DNA isolated from Saccharomyces cerevisiae (spores) and E. coli using the Quick-DNA™ Fungal/Bacterial 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.
Quick-DNA™ Plant/Seed Kits

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

![Comparison of DNA yields from various plant and seed samples using the Quick-DNA™ Plant/Seed Kit.](image)

DNA Clean-Up from any Enzymatic Reaction

High-quality, inhibitor-free DNA is crucial for successful PCR, DNA ligation/cloning, sequencing, arrays, etc. Our scientists have developed the most comprehensive technologies for DNA clean-up and concentration from any preparation. Core to these products is the total removal of salts/alcohol from samples with uniquely designed spin-columns and plates that ensure complete elution with no binding/wash buffer carryover. Coupled with uniquely formulated buffers, these technologies assure the purification of high-quality DNA without the inclusion of inhibitors.

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. 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-Generation Sequencing cleanups.

Which DNA Clean & Concentrator® Kit should I use?

- **DNA Clean & Concentrator® Kits**
  - Ultra pure DNA in 2 minutes (50 bp to 23 kb) from PCR, impure preps and enzymatic digestions
  - Format: Spin-Column
  - Binding Capacity: 5 µg
  - Elution Volume: ≥ 50 µl
  - Processing Time: 30 minutes
  - Page 86-87

- **Genomic DNA Clean & Concentrator® Kits**
  - High molecular weight DNA clean-up (1 kb to > 200 kb)
  - Format: Spin-Column
  - Binding Capacity: 500 µg
  - Elution Volume: ≥ 1 ml
  - Processing Time: 5 minutes
  - Page 90

- **Oligo Clean & Concentrator™ Kits**
  - DNA & RNA oligos and probes (16 to 200 nt)
  - Format: Spin-Column
  - Binding Capacity: 50 µg
  - Elution Volume: ≥ 50 µl
  - Processing Time: 5 minutes
  - Page 88

- **Select-a-Size DNA Clean & Concentrator®**
  - High-quality, size selected DNA in 7 minutes (library preparation and NGS applications)
  - Format: Spin-Column
  - Binding Capacity: 50 µg
  - Elution Volume: ≥ 50 µl
  - Processing Time: 5 minutes
  - Page 89

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0 DNA Clean-Up

Concentrator to your sample and transfer to the supplied Zymo-Spin purification of up to 25 µg DNA from enzymatic reactions (e.g., PCR), endonuclease digestion, 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™ Column technology, which yields high-quality, purified DNA in just minutes and is compatible with cDNA and ssDNA. Eluted DNA is ideal for use in PCR, DNA sequencing, DNA ligation, endonuclease digestion, RNA transcription, radiolabeling, 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 samples 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 PCR, arrays, ligations, sequencing, etc.

DNA Clean & Concentrator®-5 Kits

- Quick (2 minute) desalting and recovery of ultra-pure DNA from enzymatic reactions (e.g., PCR and endonuclease digestions), cell-free lysates, etc.
- Column design allows DNA to be eluted at high concentrations into minimal volumes.
- Eluted DNA is optimal for any downstream molecular biology application.

DNA Clean & Concentrator®-25 Kits

- Quick (2 minute) desalting and recovery of ultra-pure DNA from enzymatic reactions (e.g., PCR and endonuclease digestions), cell-free lysates, etc.
- Column design allows DNA to be eluted at high concentrations into minimal volumes.
- Eluted DNA is suitable for PCR, arrays, ligation, sequencing, etc.

DNA Clean & Concentrator®-100 & 500 Kits

- Simple, rapid recovery of ultra-pure DNA from PCR, endonuclease digestions, cell-free lysates, etc.
- Unique column construction allows sample loading and washing to be performed using a centrifuge, microcentrifuge, vacuum, or syringe.

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™

- Quick (20 minute), recovery of ultra-pure DNA from PCR, endonuclease digestions, cell-free lysates, etc.
- Eluted DNA is well suited for use in PCR, DNA sequencing, DNA ligation, endonuclease digestion, RNA transcription, radiolabeling, etc.

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.

Specifications

- Binding Capacity: 500 µg
- Processing Time: ≤ 20 minutes
- Elution Volume: ≥ 30 µl
- Format: 96-Well, Shallow Well

- Binding Capacity: 100 µg
- Processing Time: ≤ 20 minutes
- Elution Volume: ≥ 2 ml
- Format: Spin-Column

- Binding Capacity: 5 µg
- Processing Time: 2 minutes
- Elution Volume: ≥ 6 µl
- Format: Spin-Column

- Binding Capacity: 5 µg
- Processing Time: 2 minutes
- Elution Volume: ≥ 6 µl
- Format: Spin-Column

- Binding Capacity: 5 µg
- Processing Time: < 20 minutes
- Elution Volume: ≥ 6 µl
- Format: Spin-Column

- Binding Capacity: 50 µg
- Processing Time: ≤ 15 minutes
- Elution Volume: ≥ 6 µl
- Format: Spin-Column

- Binding Capacity: 50 µg
- Processing Time: ≤ 15 minutes
- Elution Volume: ≥ 6 µl
- Format: Spin-Column

Table 1: Product Specifications

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNA Clean &amp; Concentrator®-5 (uncapped column)</td>
<td>D4003</td>
<td>50 preps</td>
<td>Format: Spin-Column</td>
<td>Elution Volume: ≥ 6 µl</td>
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<td>D4003T</td>
<td>10 preps</td>
<td>Binding Capacity: 5 µg</td>
<td>DNA Size Limits: 50 bp - 23 kb</td>
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<tr>
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<td>D4004</td>
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<td>DNA Size Limits: 50 bp - 23 kb</td>
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<td>DNA Clean &amp; Concentrator®-5 (padded column)</td>
<td>D4013</td>
<td>50 preps</td>
<td>Format: Spin-Column</td>
<td>Elution Volume: ≥ 6 µl</td>
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<td>D4014</td>
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<td>DNA Size Limits: 50 bp - 23 kb</td>
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<tr>
<td>25/96 DNA Clean &amp; Concentrator®-5</td>
<td>D4021</td>
<td>2 x 96 preps</td>
<td>Format: 16-Well, Deep Well</td>
<td>Elution Volume: ≥ 10 µl</td>
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<tr>
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<td>D4024</td>
<td>4 x 96 preps</td>
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<td>Binding Capacity: 5 µg</td>
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<td>DNA Size Limits: 50 bp - 23 kb</td>
<td>DNA Size Limits: 50 bp - 23 kb</td>
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<td>DNA Clean &amp; Concentrator®-25 (uncapped column)</td>
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<td>D4006</td>
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<td>DNA Size Limits: 50 bp - 23 kb</td>
</tr>
<tr>
<td>DNA Clean &amp; Concentrator®-25 (padded column)</td>
<td>D4003</td>
<td>50 preps</td>
<td>Format: Spin-Column</td>
<td>Elution Volume: ≥ 6 µl</td>
</tr>
<tr>
<td></td>
<td>D4004</td>
<td>200 preps</td>
<td>Binding Capacity: 5 µg</td>
<td>DNA Size Limits: 50 bp - 23 kb</td>
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Table 2: Product Specifications

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<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
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<tr>
<td>DNA Clean &amp; Concentrator®-100</td>
<td>D4069</td>
<td>25 preps</td>
<td>Format: Spin-Column</td>
<td>Elution Volume: ≥ 150 µl</td>
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<td>D4073</td>
<td>50 preps</td>
<td>Processing Time: ≤ 20 minutes</td>
<td>Binding Capacity: 150 µg</td>
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<tr>
<td>DNA Clean &amp; Concentrator®-500</td>
<td>D4031</td>
<td>10 preps</td>
<td>Format: Spin-Column</td>
<td>Elution Volume: ≥ 2 ml</td>
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<td>D4035</td>
<td>20 preps</td>
<td>Processing Time: ≤ 20 minutes</td>
<td>Binding Capacity: 500 µg</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DNA Size Limits: 50 bp - 23 kb</td>
<td>DNA Size Limits: 50 bp - 23 kb</td>
</tr>
<tr>
<td>ZR-96 DNA Clean-up Kit™</td>
<td>D4077</td>
<td>2 x 96 preps</td>
<td>Format: 16-Well, Deep Well</td>
<td>Elution Volume: ≥ 10 µl</td>
</tr>
<tr>
<td></td>
<td>D4078</td>
<td>4 x 96 preps</td>
<td>Processing Time: ≥ 20 minutes</td>
<td>Binding Capacity: 5 µg</td>
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<td></td>
<td></td>
<td></td>
<td>DNA Size Limits: 50 bp - 23 kb</td>
<td>DNA Size Limits: 50 bp - 23 kb</td>
</tr>
</tbody>
</table>

Table 3: Product Specifications
Oligo Clean & Concentrator™ Kits

- Quick (2 minute) recovery of ultra-pure DNA and RNA oligonucleotides.
- Complete removal of dyes, salts, enzymes, and short oligos.
- Eluted DNA/RNA is well suited for use in hybridization, sequencing, PCR, ligation, etc.

**Description**

The Oligo Clean & Concentrator™ provides a streamlined method for efficient recovery and clean-up of DNA fragments, and oligonucleotides 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.

**Specifications**

- **Size Limit:** ≥ 16 nt
- **Binding Capacity:** 10 µg ssDNA/RNA or 5 µg dsDNA
- **Processing Time:** 2 minutes
- **Elution Volume:** ≥ 10 µl

**Uses**

- DNA Size Selection
- DNA Clean-Up
- Oligonucleotide Recovery
- Probe purification; Enzyme removal; Nucleotide/Dye removal
- cDNA/ssDNA purification; PCR clean-up; ligation, endonuclease digestion, RT-PCR, etc.
- Next Generation sequencing; library prep; PCR clean-up, ligation

---

Select-a-Size DNA Clean & Concentrator™ Kit

- Quick (7 minute) protocol to select for ≥300 bp, ≥200 bp, ≥150 bp, ≥100 bp, ≥50 bp DNA fragments or perform a double size selection.
- Clean and concentrate DNA from enzymatic reactions in as little as 10 µl of DNA/RNA free water.
- Eluted DNA is well suited for use in Next-Generation sequencing, PCR, DNA ligation, endonuclease digestion, RT-PCR, etc.

**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. Our Zymo-Spin™ Column technology yields high-quality DNA, in as little as seven minutes, that is ideal for Next-Generation sequencing, PCR, and other downstream applications.

**Specifications**

- **Size Limit:** ≥ 16 nt
- **Binding Capacity:** 10 µg ssDNA/RNA or 5 µg dsDNA
- **Processing Time:** 7 minutes
- **Elution Volume:** ≥ 10 µl

**Uses**

- DNA Size Selection, DNA Clean up, PCR clean-up, ligation, Next Generation sequencing; library prep; PCR clean-up, ligation
- DNA Size Selection, DNA Clean-up, Automation

---

**Product**

**Cat. No.**

- **Size**
  - D4060: 50 preps
  - D4061: 200 preps

**Specifications**

- Format: Spin-Column
- Elution Volume: ≥ 6 µl
- Processing Time: 2 minutes

**Oligonucleotide Recovery**

- Binding Capacity: 10 µg ssDNA/RNA or 5 µg dsDNA
- Size Limit: ≤ 16 nt

**Uses**

- DNA Size Selection
- DNA Clean-Up
- Oligonucleotide Recovery
- Probe purification; Enzyme removal; Nucleotide/Dye removal
- cDNA/ssDNA purification; PCR clean-up; ligation, endonuclease digestion, RT-PCR, etc.
- Next Generation sequencing; library prep; PCR clean-up, ligation

---

**Product**

**Cat. No.**

- **Size**
  - D4080: 25 preps

**Specifications**

- 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 Double Size Selection

**Uses**

- Next Generation sequencing; library prep; PCR clean-up, ligation

---

**Product**

**Cat. No.**

- **Size**
  - D4084: 25 preps
  - D4085: 10 ml

**Specifications**

- Format: Magnetic Bead
- Elution Volume: ≥ 10 µl
- Processing Time: 10 minutes
- Binding Capacity: 3 µg
  - DNA Size Limits: 50 bp - 23 kb
  - Cutoffs: Left: 100 bp – 400 bp
  - Right: 200 bp - 1000 bp
  - Double Size Selection

**Uses**

- DNA Size Selection, DNA Clean-up, Automation

---

**Product**

**Cat. No.**

- **Size**
  - D4062: 2 x 96 preps
  - D4063: 4 x 96 preps

**Specifications**

- Format: Spin-Column
- Elution Volume: ≥ 6 µl
- Processing Time: 2 minutes
- Binding Capacity: 10 µg ssDNA/RNA or 5 µg dsDNA
- Size Limit: ≤ 16 nt

**Oligonucleotide clean-up; DNA extract purification; Probe purification; Enzyme removal; Nucleotide/Dye removal**

**Uses**

- DNA Size Selection
- DNA Clean-Up
- Oligonucleotide Recovery
- Probe purification; Enzyme removal; Nucleotide/Dye removal
- cDNA/ssDNA purification; PCR clean-up; ligation, endonuclease digestion, RT-PCR, etc.
- Next Generation sequencing; library prep; PCR clean-up, ligation

---

**Product**

**Cat. No.**

- **Size**
  - D4081: 25 preps

**Specifications**

- 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 Double Size Selection

**Uses**

- Next Generation sequencing; library prep; PCR clean-up, ligation

---

**Product**

**Cat. No.**

- **Size**
  - D4084: 25 preps

**Specifications**

- Format: Magnetic Bead
- Elution Volume: ≥ 10 µl
- Processing Time: 10 minutes
- Binding Capacity: 3 µg
  - DNA Size Limits: 50 bp - 23 kb
  - Cutoffs: Left: 100 bp – 400 bp
  - Right: 200 bp - 1000 bp
  - Double Size Selection

**Uses**

- DNA Size Selection, DNA Clean-up, Automation
Genomic DNA Clean & Concentrator® Kits

- Quick (5 minute) spin-column recovery of 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). No messy precipitations!
- Unique spin-column for low volume (±10 µl) elution of ultra-pure, high-yield DNA.
- Eluted DNA is ideal for PCR, restriction endonuclease digestion, Sanger and Next-Generation sequencing, 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, (wga) DNA, 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.

ZR-96 Genomic DNA Clean & Concentrator®-5

- 96-well plate recovery of large-sized DNA from any enzymatic reaction or impure preparation. No messy precipitations!
- Unique plate for low volume (±15 µl) elution of ultra-pure, highly concentrated DNA.
- Eluted DNA is ideal for PCR, restriction endonuclease digestion, Sanger and Next-Generation Sequencing, 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 precipitators: simply add the specially formulated ChIP DNA Binding Buffer to a sample and then transfer the mixture to the supplied Zymo-Spin™-196-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.

Product

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<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
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<td>Processing Time: 3 minutes</td>
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<td>D4011</td>
<td>100 preps</td>
<td>Elution Volume: ≥ 50 µl</td>
<td>DNA Size Limit: 50 bp to 200 kb</td>
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<tr>
<td>Genomic DNA Clean &amp; Concentrator®-25</td>
<td>D4054</td>
<td>25 preps</td>
<td>Format: Spin-Column</td>
<td>Processing Time: 5 minutes</td>
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<td>D4055</td>
<td>100 preps</td>
<td>Elution Volume: ≥ 50 µl</td>
<td>DNA Size Limit: 25 bp to 200 kb</td>
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Product

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<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
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<td>D4066</td>
<td>2 x 16 preps</td>
<td>Format: 96-Well</td>
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<td>D4067</td>
<td>4 x 16 preps</td>
<td>Elution Volume: ≥ 15 µl</td>
<td>DNA Size Limit: 50 bp to 200 kb</td>
</tr>
</tbody>
</table>

Downloadable Product

www.zymoresearch.com | info@zymoresearch.com | tel: (949) 679-1190 | toll-free: (888) 882-9652 | fax: (949) 266-9452
**ZR DNA Sequencing Clean-Up Kits™**

- Complete elimination of “dye blobs” for high-quality Phred scores and long read lengths.
- Flexible 6 - 20 µl elution volumes allow for direct loading of samples with no precipitation or drying steps.
- Reusable columns!

**Description**

The ZR DNA Sequencing Clean-Up Kits™ provide simple and rapid methods 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.

**Product Cat. No.**

<table>
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<tr>
<th>DNA Sequencing Clean-Up Kits™</th>
<th>D4050</th>
<th>50 preps</th>
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<tbody>
<tr>
<td>Elution Volume: ≥ 6 µl</td>
<td>Processing Time: 2 minutes</td>
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</tr>
</tbody>
</table>

**Uses**

Sequencing DNA clean-up; enzyme removal; dye terminator removal; nucleotide/dye removal

**OneStep™ PCR Inhibitor Removal Kits**

- Removes PCR inhibitors such as polyphenolics, humic/fulvic acids, tannins, melanin, etc. from nucleic acid solutions to yield high-quality DNA or RNA.
- Fast, one-step procedure for cleaning impure samples prior to PCR, sequencing, reverse transcription (RT), etc.

**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.

**Product Cat. No.**

<table>
<thead>
<tr>
<th>OneStep™ PCR Inhibitor Removal Kit</th>
<th>D6030</th>
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<tbody>
<tr>
<td>Elution Volume: 50 - 200 µl</td>
<td>Processing Time: 4 minutes</td>
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</table>

**Uses**

DNA recovery: 50 – 90% Polyphenolic PCR inhibitor removal from DNA & RNA (e.g. humic/fulvic acids, tannins, melanin).

**PCR amplification of an eukaryotic transcript (post-RT):**

- Total RNA isolated from sludge with or without inclusion of the Zymo-Spin™ IV-HRC Spin Filter. M is a 1 kb DNA Marker (Zymo Research).
- PCR 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).
Zymoclean™ Gel DNA Recovery Kits

- Quick (15 minute) recovery of ultra-pure DNA from agarose gels.
- Column design permits DNA elution at high concentrations into minimal volumes ≥ 6 µl.
- Eluted DNA is well suited for use in DNA ligation, sequencing, labeling, PCR, 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 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.

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zymoclean™ Gel DNA Recovery Kit (uncapped columns)</td>
<td>D4001</td>
<td>50 preps</td>
<td>Format: Spin-Column Elution Volume: ≥ 6 µl Processing Time: 15 minutes Binding Capacity: 5 µg DNA Size Limits: 50 bp – 23 kb</td>
<td>Recover DNA from TAE/TBE agarose gel slices</td>
</tr>
<tr>
<td>Zymoclean™ Gel DNA Recovery Kit (capped columns)</td>
<td>D4007</td>
<td>50 preps</td>
<td>Format: Spin-Column Elution Volume: ≥ 6 µl Processing Time: 15 minutes Binding Capacity: 5 µg DNA Size Limits: 50 bp – 23 kb</td>
<td>Recover DNA from TAE/TBE agarose gel slices</td>
</tr>
<tr>
<td>ZR-96 Zymoclean™ Gel DNA Recovery Kit</td>
<td>D4021</td>
<td>2 x 96 preps</td>
<td>Format: Spin-Column Elution Volume: ≥ 15 µl Processing Time: 15 minutes Binding Capacity: 10 µg DNA Size Limits: ≥ 50 bp – 200 kb</td>
<td>Recover high molecular weight DNA from TAE/TBE agarose gel slices</td>
</tr>
</tbody>
</table>

Zymoclean™ Large Fragment DNA Recovery Kit

- Quick (15 minute) recovery of large-sized DNA (e.g., genomic, plasmid [BAC/PAC], viral, phage, etc.) from agarose gels.
- Unique column design for low volume (≥ 10 µl) elution of ultra-pure, high-yield DNA.
- Eluted DNA is well suited for use in endonuclease digestion, sequencing, labeling, PCR, 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 5: intact λ phage DNA; lanes 5, 6: intact λ ~48 kb bands.

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

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 Analysis

Tools for Effective DNA Analysis

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 ensure your DNA samples are of the highest quality for processing, making DNA size approximation easy for both PCR products as well as plasmid DNAs.

Femto™ Quantification Kits

- Quantify as little 20 femtograms of DNA in as little as 1 µl of sample.
- High specificity and sensitivity for DNA in a background of non-target DNA.
- Fast and simple: add samples to the PreMix... and quantify.

Description

The Femto™ Human DNA Quantification Kit can detect and quantify human DNA with high specificity and sensitivity. Human DNA can be reliably quantified in a background of non-human DNA such as bacterial, fungal, animal, plant DNA, etc. 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.

Quantify as little 20 femtograms of DNA in as little as 1 µl of sample.

Next-Gen. sequencing library preparation, and metagenomic analysis. As little as 20 fg from 1 µl of purified biological liquids or other downstream applications that require accurate DNA input amounts including STR analysis, quantifying bacteria DNA template for

Femto™ Human DNA Quantification Kit

- Human DNA detection and quantification
- Detection Dye: SYTO 9®

Femto™ Bacterial DNA Quantification Kit

- Bacterial DNA detection and quantification
- Detection Dye: SYTO 9®

Femto™ Fungal DNA Quantification Kit

- Fungal DNA detection and quantification

ZR DNA Markers™

The ZR DNA Markers™ are defined DNA size fragments that encompass a range of sizes from 50 bp up to 1 kb. This makes DNA size approximation easy for both PCR products as well as plasmid DNAs. 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 DNAs, 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.

Description

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

Available Products

- Human DNA Quantification Kit
- Bacterial DNA Quantification Kit
- Fungal DNA Quantification Kit
- ZR 50 bp DNA Marker™
- ZR 100 bp DNA Marker™
- ZR 1 kb DNA Marker™

Specifications

- SYTO® is a registered trademark of Molecular Probes, Inc.
- SYTO 9®
- DNA Inpt: 20 fg - 20 ng
- Detection Dye: SYTO 9®

Available Ranges

- 500 ng of the ZR 50 bp DNA Marker™
- 500 ng of the ZR 100 bp DNA Marker™
- 500 ng of the ZR 1 kb DNA Marker™

Electrophoresis

- ZR 50 bp DNA Marker™ was separated in a 1.5% w/v agarose/EtBr/TAE gel.
- ZR 100 bp DNA Marker™ was separated in a 1.8% w/v agarose/EtBr/TAE gel.
- ZR 1 kb DNA Marker™ was separated in a 0.8% w/v agarose/EtBr/TAE gel.

Uses

- DNA size standard for gel electrophoresis
- DNA size for standard for gel electrophoresis
- DNA size for standard for gel electrophoresis,

Product

- ZR 50 bp DNA Marker™
- ZR 100 bp DNA Marker™
- ZR 1 kb DNA Marker™

Cat. No.

- M3001-50
- M3002-50
- M3003-50

Size

- 50 µg / 100 µl
- 50 µg / 100 µl
- 50 µg / 100 µl

Specifications

- Ranges Available: 50 - 1200 bp
- Ranges Available: 100 - 1500 bp
- Ranges Available: 0.5 - 10 kb

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

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RNA Purification

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 Isolation

**RNA Purification**

**Cells**
- **Quick-RNA™ Miniprep Kit**
  - 100 µg total RNA (≥17 nt)
  - DNase I included
  - Page 110
- **Quick-RNA™ Viral Kits**
  - Serum, plasma, culture supernatant, urine, saliva, blood, CSF
  - Page 112
- **Quick-RNA™ Whole Blood Kit**
  - Mammalian whole blood, plasma, serum, pelleted blood cells, nucleated blood.
  - Page 113

**Biological Fluids & Tissues**
- **Direct-zol™ RNA Miniprep Plus Kit**
  - 100 µg total RNA (≥17 nt)
  - DNase I included
  - Page 104-107
- **Quick-RNA™ Miniprep Plus Kit**
  - 100 µg total RNA (≥17 nt) from cells, all tissue types, & blood.
  - DNase I, Protease K, DNA/RNA Shield included
  - Page 111

**Quick-RNA™ Fungal/Bacterial Kits**
- 50 µg total RNA (≥17 nt)
- *BashingBeads™ included
  - Page 117

**Pinpoint™ Slide RNA Isolation System I & II**
- Total RNA from fresh (I) and FFPE (II) tissue
  - Page 114

**Quick-RNA™ FFPE Kit**
- Zymo-Spin™ column isolation of high-quality RNA
  - Page 115

**Fixed Tissues**
- **Pinpoint™ Slide RNA Isolation System I & II**
  - Total RNA from fresh (I) and FFPE (II) tissue
  - Page 114

**Microbial**
- **Quick-RNA™ Fecal/Soil Microbe Microprep Kit**
  - 50 µg total RNA (≥17 nt)
  - *OneStep PCR Inhibitor Removal, BashingBeads™ included
  - Page 117

**Culture**
- **YeaStar™ RNA Kit**
  - 25 µg total RNA
  - *Zymolyase included
  - Page 183

**Environmental (Fecal, soil, water filtrate and other)**
- **Quick-RNA™ Plant Miniprep Kit**
  - 50 µg total RNA (≥17 nt) from leaves, stems, seeds, etc.
  - *OneStep PCR Inhibitor Removal, BashingBeads™ included
  - Page 118

**Plant**
- **Quick-RNA™ Plant Miniprep Kit**
  - 50 µg total RNA (≥17 nt) from leaves, stems, seeds, etc.
  - *OneStep PCR Inhibitor Removal, BashingBeads™ included
  - Page 118

**Pinpoint™ Slide RNA Isolation System I & II**
- Total RNA from fresh (I) and FFPE (II) tissue
  - Page 114

**Quick-RNA™ FFPE Kit**
- Zymo-Spin™ column isolation of high-quality RNA
  - Page 115

**Quick-RNA™ Fungal/Bacterial Kits**
- 50 µg total RNA (≥17 nt)
- *BashingBeads™ included
  - Page 117

**YeaStar™ RNA Kit**
- 25 µg total RNA
- *Zymolyase included
  - Page 183

**Quick-RNA™ Fecal/Soil Microbe Microprep Kit**
- 50 µg total RNA (≥17 nt)
- *OneStep PCR Inhibitor Removal, BashingBeads™ included
  - Page 117
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 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 (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.
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, directly on column. The innovative Direct-zol™ procedure bypasses phase separation and precipitation steps with a spin-column format, 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.

**Non-Biased miRNA Recovery**

**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.

### RNA Purification

**RNA Purified from TRIzol® using Direct-zol™ RNA compared to an unbiased method (mirVana™, Ambion).** Data is highly correlated (2837 overlapped miRNA: $r^2 = 0.9706$). Analysis was performed using miRNA-Seq (MiSeq™, Illumina).
RNA Purification

**Direct-zol™ 96 Magbead RNA Kit**

- 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.

**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).**

<table>
<thead>
<tr>
<th>Concentration [ng/μl]</th>
<th>Volume [μl]</th>
<th>Yield [ng/50μl]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual</td>
<td>Automated</td>
<td>Manual</td>
</tr>
<tr>
<td>60</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>30</td>
<td>20</td>
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<td>10</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

**Product**

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct-zol™ 96 Magbead RNA Kit</td>
<td>R2100, R2101*</td>
<td>2 x 96 preps</td>
<td>Format: Magnetic Beads, Elution Volume: 50μl, Binding Capacity: 10μg/gm, Size Limits: 17 - 200 nt, Processing Time: 45 minutes</td>
<td>HTP &amp; automated RNA isolation from samples stored in TRI Reagent® (Molecular Research Center, Inc.), RNAzol®, QIAzol®, TriPure®, TriSure® and all other acid-guanidinium-phenol reagents including cells from culture; solid tissue; plasma; serum; whole blood, in vitro processed RNA.</td>
</tr>
<tr>
<td></td>
<td>R2102, R2103*</td>
<td>4 x 96 preps</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R2104, R2105*</td>
<td>8 x 96 preps</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Supplied with TRI Reagent®

**Direct-zol™ DNA/RNA Miniprep Kit**

- One Input, One Column: Purify DNA & RNA directly from TRIzol® with just one spin-column.
- Easy Handling: No phase-separation or precipitation steps.
- High-Quality: DNA & RNA (including small & micro RNA) ready for Next-Gen Sequencing, qPCR and RT-qPCR, hybridization, etc.

**Description**

The Direct-zol™ DNA/RNA kits provide an innovative method for the purification of DNA and total RNA from a variety of samples freshly lysed in TRIzol® or similar, including animal cells, tissue, bacteria, yeast, plant, biological liquids and etc. Upon lysis of the sample with TRIzol® or similar, RNA and DNA is bound directly to the Zymo-Spin™ Column. Then simply spin, wash, and elute high-quality RNA and DNA into separate fractions. No phase separation, precipitation, or post-purification steps are necessary. The eluted nucleic acids are suitable for all subsequent molecular manipulations and analyses including Next-Gen sequencing, RT-qPCR, hybridization, etc.

**NGS-Ready DNA and RNA**

High quality DNA and RNA purified in duplicate from the same input of mammalian (HeLa) and bacterial (E. coli) cells using the Direct-zol™ DNA/RNA Miniprep Kit. Samples were visualized using the Agilent 2200 TapeStation® system.

**Product**

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Binding Capacity</th>
<th>Minimum Elution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct-zol™ DNA/RNA Miniprep Kit</td>
<td>R2080T, R2080</td>
<td>10 preps</td>
<td>25 μg DNA and 50 μg RNA</td>
<td>25 μl</td>
</tr>
<tr>
<td></td>
<td>R2081*</td>
<td>50 preps</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Supplied with TRI Reagent®
**Adjust to your surroundings.**

**RNA from any Sample.**

**Quick-RNA™ Kits**
- **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.

**Technology Overview: Quick-RNA™**

**High Quality DNA-free RNA from Diverse Sample Sources**

Speed, precision, and phenol-free purification of total RNA (including miRNAs) from diverse sample sources. The Quick-RNA™ 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!

**Value**

<table>
<thead>
<tr>
<th>Value</th>
<th>Quick-RNA™</th>
<th>Supplier Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small RNA (≥17 nt) recovery</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>DNase I included</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>gDNA removal column included</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Proteinase K</td>
<td>Yes*</td>
<td>No</td>
</tr>
<tr>
<td>DNA/RNA Shield™ (for sample storage)</td>
<td>Yes*</td>
<td>No</td>
</tr>
</tbody>
</table>

*Quick-RNA™ Miniprep Plus Kit*

**Versatility**

<table>
<thead>
<tr>
<th>Versatility</th>
<th>Supplier Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver</td>
<td>Yes*</td>
</tr>
<tr>
<td>Lung</td>
<td>Yes*</td>
</tr>
<tr>
<td>Spleen</td>
<td>Yes*</td>
</tr>
<tr>
<td>Brain</td>
<td>Yes*</td>
</tr>
<tr>
<td>Muscle</td>
<td>Yes*</td>
</tr>
<tr>
<td>Heart</td>
<td>Yes*</td>
</tr>
</tbody>
</table>

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).

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

- **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 a 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™ column. 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.

**RNA Purification**

**Total RNA Purification**

**Quick-RNA™ Miniprep Plus Kit**

- **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 Protease 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.

**High-Quality RNA**

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).

**Ultra-Pure**

RNA purification from: Cultured cells; Fetal/foetal soft tissue, Buccal cells/ swabs; Buffy coat; Biological fluids

**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 2100 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.
Quick-RNA™ Viral Kits

- **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 RT-qPCR.

**Product Cat. No.**

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick-RNA™ Viral Kit</td>
<td>R1034</td>
<td>50 preps</td>
<td>Format: Spin-Column</td>
<td>Viral RNA recovery from cultured cells; Plasma; Serum; Culture supernatant; Urine; Virus</td>
</tr>
<tr>
<td></td>
<td>R1035</td>
<td>200 preps</td>
<td>Elution Volume: ≥ 6 µl</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Binding Capacity: 10 µg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Processing Time: 3 minutes</td>
<td></td>
</tr>
<tr>
<td>Quick-RNA™ Viral 96 Kit</td>
<td>R1040</td>
<td>2 x 96 preps</td>
<td>Format: 96-Well</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R1041</td>
<td>4 x 96 preps</td>
<td>Elution Volume: ≥ 10 µl</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Binding Capacity: 10 µg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Processing Time: 15 minutes</td>
<td></td>
</tr>
</tbody>
</table>

Also available in MagBead format for DNA/RNA co-purification. See page 136.

---

Quick-RNA™ Whole Blood Kit

- **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-qPCR, 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.
**ZR Urine RNA Isolation Kit™**

- 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.

**Pinpoint™ Slide RNA Isolation Systems**

- Allows for the isolation of total RNA from fresh and/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.

**Quick-RNA™ FFPE Kit**

- Easy Processing: Includes Decaparaffinization Solution for simple paraffin removal. No xylene necessary.
- Improved Recovery: Optimized Protease 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.

**Quick-cfRNA™ Serum & Plasma Kit**

- 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.

---

**Specifications**

**Zymo Research**

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

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**Product** | **Cat. No.** | **Size** | **Specifications** | **Uses**

| ZR Urine RNA Isolation Kit™ | R1238 | 20 preps | Format: Spin-Column. Elution Volume: ≥6 µl. RNA Size Limits: ≥17 nt. Processing Time: 10 minutes. | RNA isolation from urine; Cells; Biological sediment; Microvesicles; Exosomes.

| Pinpoint™ Slide RNA Isolation System I Kit | R1693 | 50 preps | Format: Spin-Column. Elution Volume: ≥6 µl. RNA Size Limits: ≥17 nt. | Tissue sections (Systems I & II); FFPE tissue sections (System I).

| Pinpoint™ Slide RNA Isolation System II Kit | R1697 | 50 preps | Format: Spin-Column. Elution Volume: ≥6 µl. RNA Size Limits: ≥17 nt. | Tissue sections (Systems I & II); FFPE tissue sections (System I).

---

**Product** | **Cat. No.** | **Size** | **Specifications** | **Uses**


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-PCR and more.

Technology Overview: BashingBeads™ Lysis & 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 0.5 - 1 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, fungal, and microorganisms in soil, 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, hybridization, etc.

Quick-RNA™ Fecal/Soil Microbe Microprep Kit

- 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, hybridization, etc.

Quick-RNA™ Fungal/Bacterial Kits

- 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, which is ideal for subsequent procedures including RT-qPCR.

Product | Cat. No. | Size | Specifications | Uses |
---|---|---|---|---|
Quick-RNA™ Fecal/Soil Microbe Microprep Kit | R2040 | 50 preps | Format: Spin-Columns Elution Volume: ≥ 14 µl Binding Capacity: 10 µg Processing Time: 15 minutes | RNA isolation from: Soil; Sediment; Feces |
Quick-RNA™ Fungal/Bacterial Microprep Kit | R2100 | 50 preps | Format: Spin-Columns Elution Volume: ≥ 6 µl Binding Capacity: 1 µg Processing Time: 15 minutes | RNA isolation from: Gram (+) and (-) bacteria; Yeast; Filamentous fungi; Protists; Soft tissue (limited); Food |
Quick-RNA™ Fungal/Bacterial Miniprep Kit | R2014 | 50 preps | Format: Spin-Columns Elution Volume: ≥ 25 µl Binding Capacity: 50 µg Processing Time: 15 minutes | RNA isolation from: Gram (+) and (-) bacteria; Yeast; Filamentous fungi; Protists; Soft tissue (limited); Food |

PCR amplification of a eukaryotic transcript post-RT:

Total RNA isolated from sludge with or without inclusion of the ZymoSpin IV-HRC spin filter during the Quick-RNA™ Fecal/Soil Microbe Microprep Kit protocol. M is a ZR 1 kb DNA Marker (Zymo Research).

Our state-of-the-art BashingBeads™ are constructed of the highest quality, dense ceramic material available today. They are used when through sample homogenization/lysis is required by the researcher. RNA shearing by physical and chemical methods are minimized since the beads are 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.

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

pGEM® is a registered trademark of Promega Corporation.
**Quick-RNA™ Tissue/Insect Microprep Kit**

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

**Quick-RNA™ Plant Miniprep Kit**

- Quick, 10 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.

**Analysis of Quick-RNA™ Tissue/Insect Microprep Kit**

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.

**Quick-RNA™ Plant Miniprep Kit**

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 duplicate (lanes 1 and 2). Samples were processed (2 x 30 sec at 6 m/s) using a FastPrep®-24 instrument (MP Biomedicals) and washed alongside (lane M) RNA Millenium™ Markers (Ambion) in a 1% (w/v) nondenaturing agarose gel.

**Product**

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick-RNA™ Tissue/Insect Microprep Kit</td>
<td>R1020</td>
<td>50 preps</td>
<td>Format: Spin-Columns</td>
<td>RNA isolation from: Tissue; Solid tissue; Tough-to-lyse tissues; Tough-to-lyse organs; Insects;arthropods; Fodoral</td>
</tr>
<tr>
<td>Quick-RNA™ Plant Miniprep Kit</td>
<td>R1024</td>
<td>50 preps</td>
<td>Format: Spin-Columns</td>
<td>RNA isolation from: Plant material; Seeds; Fruit</td>
</tr>
</tbody>
</table>

**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-qPCR.

**RNA Clean & Concentrator™ Kits**

- **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-qPCR, hybridization, etc.

**Specifications**

- **Product**
- **Cat. No.**
- **Size**
- **Specifications**
- **Uses**

**Product**

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
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<td>RNA Clean &amp; Concentrator™-5</td>
<td>R1015</td>
<td>50 preps</td>
<td>Format: Spin-Columns</td>
<td>RNA clean-up; RNA-free RNA; Enzyme removal; Nucleotide/dye removal; Small-RNA/probe purification</td>
</tr>
<tr>
<td>RNA Clean &amp; Concentrator™-5 w/ Offload</td>
<td>R1013</td>
<td>50 preps</td>
<td>Binding Capacity: 50 µg</td>
<td>RNA Size Limits: ≥ 17 nt Processing Time: 20 minutes</td>
</tr>
<tr>
<td>ZR-96 RNA Clean &amp; Concentrator™-5</td>
<td>R1080</td>
<td>2 x 96 preps</td>
<td>Binding Capacity: 25 µg</td>
<td>RNA Size Limits: ≥ 17 nt Processing Time: 10 minutes</td>
</tr>
<tr>
<td>RNA Clean &amp; Concentrator™-25</td>
<td>R1017</td>
<td>50 preps</td>
<td>Binding Capacity: 50 µg</td>
<td>RNA Size Limits: ≥ 17 nt Processing Time: 5 minutes</td>
</tr>
<tr>
<td>RNA Clean &amp; Concentrator™-100</td>
<td>R1019</td>
<td>25 preps</td>
<td>Binding Capacity: 250 µg</td>
<td>RNA Size Limits: ≥ 17 nt Processing Time: 10 minutes</td>
</tr>
<tr>
<td>RNA Clean &amp; Concentrator™ MagBead Kit</td>
<td>R1081</td>
<td>10 ml</td>
<td>Binding Capacity: 10 µg</td>
<td>RNA Clean-up, Automation</td>
</tr>
</tbody>
</table>
**Zymoclean™ Gel RNA Recovery Kit**

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

**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%).

![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).](image)

- ZR small-RNA™ Ladder
  - **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](image)

<table>
<thead>
<tr>
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<th>Size</th>
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<th>Uses</th>
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<tr>
<td>Zymoclean™ Gel RNA Recovery Kit</td>
<td>R1011</td>
<td>30 preps</td>
<td>Format: Spin-Columns Elution Volume: ≥ 6 µl</td>
<td>RNA from agarose gel slices</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Binding Capacity: 10 µg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RNA Size Limits: ≥ 200 nt</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Processing Time: 30 minutes</td>
<td></td>
</tr>
<tr>
<td>ZR small-RNA™ Ladder</td>
<td>R1090</td>
<td>10 µg</td>
<td>Ladder for four microRNAs (17, 21, 25, 29 nt)</td>
<td>RNA from agarose gel slices</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Concentration: 20 ng/µl</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Amount: 10 µg</td>
<td></td>
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<td></td>
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<td></td>
<td>Storage: -20 °C</td>
<td></td>
</tr>
</tbody>
</table>

**ZR small-RNA™ PAGE Recovery Kit**

- For concentrated recovery of small RNA (8 DNA) fragments from polyacrylamide gels.
- Compatible with up to 25% (w/v) polyacrylamide.

**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.

![Recovery and ligation of single-stranded RNA oligonucleotides](image)

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZR small-RNA™ PAGE Recovery Kit</td>
<td>R1100</td>
<td>20 preps</td>
<td>Format: Spin-Columns Elution Volume: ≥ 6 µl</td>
<td>RNA (&amp;DNA) from polyacrylamide gel slices</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Binding Capacity: 10 µg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RNA Size Limits: ≥ 200 nt</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Processing Time: 45 minutes</td>
<td></td>
</tr>
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</table>
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) or co-purification (DNA and RNA together) products provide high-quality DNA and RNA while the procedures are fast and simple to perform. The Quick-DNA/RNA™ Miniprep Kit is designed for parallel purification of DNA and RNA from the same sample. Without sacrificing DNA yield, this kit also allows for recovery of a broad range of RNA including small RNA molecules. Cells or tissues can be processed with the Quick-DNA/RNA™ Viral Miniprep Kit to purify DNA and RNA from the same sample into separate elutions. The ssDNA/RNA Clean & Concentrator™ facilitates the rapid recovery of both 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. Finally, our revolutionary ZymoBIOMICS® DNA/RNA kits are designed to handle a wide variety of sample inputs. These kits are designed to 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 samples while extracting high-quality, inhibitor-free nucleic acids that are ready for downstream applications.
Purify DNA & RNA from the Same Sample
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) or co-purification (DNA and RNA together) products provide high-quality DNA and RNA while the procedures are fast and simple to perform. The Quick-DNA/RNA™ Miniprep Kit is designed for parallel purification of DNA and RNA from the same sample. Without sacrificing DNA yield, this kit also allows for recovery of a broad range of nucleic acid including small RNA molecules. Cells or tissues can be processed with the Quick-DNA/RNA™ Viral Miniprep Kit to purify DNA and RNA from the same sample into separate elutions. The ssDNA/RNA Clean & Concentrator™ facilitates the rapid recovery of both 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. Finally, our revolutionary ZymoBIOMICS® DNA/RNA kits are designed to handle a wide variety of sample inputs. These kits are designed to eliminate bias during extraction by lysing all microbes including gram negative, gram positive, fungus, protozoans and algae. Together, the Zymo Research DNA/RNA purification kits quickly and easily handle a wide variety of samples while extracting high-quality, inhibitor-free nucleic acids that are ready for downstream applications.

**DNA & RNA Clean-Up and Size Selection**

**DNA and RNA Clean & Concentrator™ Kits**

- **Tunable**: Size selection can be tuned from 100 bp to 1000 bp with left, right, or double size selection.
- **Ultra-Pure**: 10 μl elutions are ready for Next-Gen Sequencing, etc.
- **Automation Ready**: Scripts and automation support readily available.

**Easy Size Selection**

- **Select-a-Size DNA Clean & Concentrator® MagBead** shows efficient recovery at different concentrations. DNA recovery (≥80%) is consistent from low to high amounts of genomic DNA input (n=3).
- **Small RNA (<200 nt) is separated from large RNA (>200 nt) using the RNA Clean & Concentrator™ MagBead. Size was analyzed using the Agilent 2200 TapeStation® system.**

**High DNA Yield**

- **Select-a-Size DNA Clean & Concentrator® MagBead** shows efficient recovery at different concentrations. DNA recovery (≥80%) is consistent from low to high amounts of genomic DNA input (n=3).

**Product**  | **Cat. No.** | **Size** | **Specifications** | **Uses**
--- | --- | --- | --- | ---
Select-a-Size DNA Clean & Concentrator® MagBead Kit | D4084 | 10 ml | Elution Volume: ≥ 15 μl  
Cutoff Left: 100 bp – 400 bp  
Right: 200 bp – 1000 bp  
Double Size Selection | DNA Size Selection, DNA Clean up, Automation
Select-a-Size DNA Clean & Concentrator® MagBead Kit | D4085 | 50 ml | Elution Volume: ≥ 15 μl  
Cutoff Left: 100 bp – 400 bp  
Right: 200 bp – 1000 bp  
Double Size Selection | DNA Size Selection, DNA Clean up, Automation
RNA Clean & Concentrator™ MagBead Kit | R1081 | 10 ml | Elution Volume: ≥ 10 μl  
Cutoff Left: 17 nt or 200 nt | RNA Clean up, Automation
Quick-DNA/RNA™ Kit

- **Quick & Easy**: Extract DNA and RNA from the any sample in <15 minutes.
- **Sensitive**: Single cell-level recovery of DNA and RNA.
- **Ultra-Pure**: Ready for Next-generation sequencing, RT-qPCR, arrays, etc.

### Universal Sample Compatibility

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

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Binding Capacity</th>
<th>Minimum Elution</th>
<th>Sample Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick-DNA/RNA™ Miniprep Plus Kit</td>
<td>D7001</td>
<td>50 preps</td>
<td>10 µg</td>
<td>6 µl</td>
<td>Cells, Soft Tissue</td>
</tr>
<tr>
<td>Quick-DNA/RNA™ Miniprep Kit</td>
<td>D7003T</td>
<td>10 preps</td>
<td>50 µg</td>
<td>25 µl</td>
<td>Any Tissue</td>
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<tr>
<td>Quick-DNA/RNA™ Miniprep Plus Kit</td>
<td>D7003T</td>
<td>10 preps</td>
<td>100 µg</td>
<td>50 µl</td>
<td>Whole Blood</td>
</tr>
<tr>
<td>Quick-DNA/RNA™ Magbead Kit</td>
<td>R2130</td>
<td>4 x 96 preps</td>
<td>20 µl</td>
<td>60 µl</td>
<td>Whole Blood</td>
</tr>
<tr>
<td>Quick-DNA/RNA™ Magbead Kit</td>
<td>R2131</td>
<td>4 x 96 preps</td>
<td>20 µl</td>
<td>100 µl</td>
<td>Whole Blood</td>
</tr>
</tbody>
</table>

### Highest Yields

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

### Single-Cell Detection

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

ZymoBIOMICS® DNA/RNA Miniprep Kit

- **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) and 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

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

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZymoBIOMICS® DNA/RNA Miniprep Kit</td>
<td>K2002</td>
<td>50 preps</td>
<td>Formazin Column ≥ 4.0</td>
<td>Accurate DNA/RNA isolation of microbial communities from any sample type (fleas, soil, water, biofilms, sewage, body fluid, etc.)</td>
</tr>
</tbody>
</table>
**DNA/RNA Co-Purification**

**Quick-DNA/RNA™ Blood Tube Kit**

- **Quick & Easy:** Sample protection in DNA/RNA Shield™ coupled to high quality extraction.
- **Highest Yields:** Purify up to 30 µg DNA and/or 30 µg RNA in 50 µl elution volumes.
- **Ultra-Pure:** Ready for Next-generation sequencing, RT-qPCR, Microarray, etc.

**High Quality DNA/RNA Without Reagent Removal**

DNA 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**

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
<th>Sample Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1151</td>
<td>50 preps</td>
<td>Up to 3 ml Whole Blood</td>
</tr>
</tbody>
</table>

**DNA/RNA Co-Purification**

**Quick-DNA/RNA™ Serum & Plasma Kit**

- **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-generation sequencing, RT-qPCR, nCounter®, etc.

**Highest Recovery of Cell-Free miRNA**

Cell-free RNA recovery scales proportionally with sample input using the Quick-DNA/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**

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
<th>Sample Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1072</td>
<td>50 preps</td>
<td>Serum, Plasma, CSF or amniotic fluid</td>
</tr>
</tbody>
</table>

**DNA/RNA Co-Purification**

**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.
DNA/RNA Co-Purification

Quick-DNA/RNA™ Viral Kit

- **Quick & Easy:** Co-purify DNA and RNA from samples in <15 minutes.
- **High Sensitivity:** Optimized for recovery of low viral copy.
- **Ultra-Pure:** Ready for Next-generation sequencing, RT-qPCR, arrays, etc.

**Quick-DNA/RNA™ Pathogen Kit**

- **Quick & Easy:** Pathogen inactivation and DNA/RNA extraction from a variety of with provided DNA/RNA Shield™.
- **High Sensitivity:** Reliable recovery of total nucleic acid.
- **Ultra-Pure:** Ready for Next-generation 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. Ultra-pure, inhibitor-free West Nile Virus nucleic acids (spike-in) were detected by RT-qPCR down to 40 viral copies.

---

**Product** | **Cat. No.** | **Size** | **Binding Capacity** | **Minimum Elution** | **Sample Input**
---|---|---|---|---|---
Quick-DNA/RNA™ Viral Kit | D7020 | 50 preps | 25 µg DNA/50 µg RNA | 35 µl | Plasma, Serum, CSF, Cell culture media, whole blood, urine, saliva, swab, fecal, and any sample in DNA/RNA Shield™
Quick-DNA/RNA™ Viral 96 Kit | D7022 | 2 x 96-well plate | 10 µg | 10 µl | 4 x 96-well plate
Quick-DNA/RNA™ Viral MagBead Kit | R2140 | 96 preps | 10 µg per 20 µl magnetic beads | 50 µl | Vectors, Tissue, Biological liquids

---

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

---

**Semi-quantitative RT-qPCR 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).**

**Sensitive Detection**

The Quick-DNA™ 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-qPCR 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).
**Quick-DNA/RNA™ FFPE Kit**

- **Easy Processing:** Included Deparaffinization Solution for simple paraffin removal. No xylene necessary.
- **Improved Recovery:** Optimized Protease 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.

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

**SSDNA/RNA Clean & Concentrator™**

- **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**

**Improved Recovery**

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

**High-Quality FFPE DNA**

DNA isolated with the Quick-DNA™ FFPE Kit is higher quality (left) compared to a Supplier Q kit (right). Quality assessed using the Agilent 2200 TapeStation® system.

**High-Quality FFPE RNA**

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.
Sample collection and preservation stand as the origin of all workflows that use nucleic acids. The methods and technologies used to collect and store samples can profoundly impact analyses and downstream applications of nucleic acids. Compositional changes and bias can occur because of nucleic acid degradation, cellular growth or decay, and the logistics of collection. Current collection and transportation methods require the use of costly cold-chain logistics to prevent or slow down these processes. Without proper storage conditions, the aforementioned changes and biases can lead to misrepresentation of an analyte’s abundance, systematic bias, reduced sensitivity, complete signal loss, poor reproducibility, and an inability to compare results between labs. RNA is especially vulnerable to degradation due to the ubiquity of RNases and the inherent instability of the RNA phosphoester bond. Even DNA is prone to rapid degradation and complete signal loss. For instance, when detecting *H. Pylori* in a stool sample, by real-time PCR, it is necessary to store the samples in a preservative or the DNA rapidly degrades.

There are a plethora of other factors within collection and storage that can affect downstream use of nucleic acids. Microbial growth and decay can significantly alter the composition of a sample if the organisms are not inactivated. Compositional changes associated with other collection methodologies, especially if phase separation (e.g. precipitation) is utilized, can also significantly bias downstream analyses. Small nucleic acids (e.g. miRNA) are particularly vulnerable to such biases and/or complete signal loss because of their aberrant behavior when compared to larger nucleic acids. The ease of processing a sample post storage in a preservation solution is critical to cost and throughput. Additionally, methodologies that require phase separation and/or reagent removal impose significant and costly challenges for high throughput applications and automation. Another major consideration when choosing a sample stabilization reagent is the logistics and cost of transporting samples potentially containing pathogens.

Zymo Research has overcome these challenges with a range of DNA/RNA Shield™ sample collection devices, which can reliably provide a genetic snapshot at the time of collection by stabilizing nucleic acids at ambient temperature for up to 30 days, inactivating pathogens, and rendering the sample noninfectious for safe transport. Samples collected in DNA/RNA Shield™ devices are prepared for hassle-free transport and are ready for any downstream purification. Also, unlike any preservative on the market, there is no need for removal of the DNA/RNA Shield™ reagent for purification of nucleic acid.

At Zymo Research, we have made it our goal to standardize sample collection in the clinical/research setting.
Sample Collection & Stabilization

**DNA/RNA Shield™**

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

Protect your precious samples

Sample transportation medium for any biological sample without cold-chain

**Safety At All Levels**

DNA/RNA Shield™ lyses and effectively inactivates pathogens in a sample. This includes tough-to-lyse microbes and viruses without the need for additional steps, such as heat-treatment, homogenization, or alcohol sterilization.

DNA/RNA Shield™ has been rigorously tested to ensure its capability to inactivate even the toughest of viruses. In an independent study, the virucidal activity was shown to inactivate murine parvovirus. DNA/RNA Shield™ abides by the Centers for Disease Control's (CDC) guidelines for pathogen inactivation.

**Use by Scientists around the world for studying:**

<table>
<thead>
<tr>
<th>Bacteria</th>
<th>Viruses</th>
<th>Yeast &amp; Eukaryotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. subtilis</td>
<td>Parovirus</td>
<td>C. albicans</td>
</tr>
<tr>
<td>E. faecalis</td>
<td>Chikungunya Virus</td>
<td>C. neoformans</td>
</tr>
<tr>
<td>E. coli</td>
<td>Dengue Virus</td>
<td>S. cerevisiae</td>
</tr>
<tr>
<td>L. fermentum</td>
<td>Ebola virus</td>
<td>P. malarie</td>
</tr>
<tr>
<td>L. monocytogenes</td>
<td>Herpes Simplex Virus-1</td>
<td></td>
</tr>
<tr>
<td>M. tuberculosis</td>
<td>Herpes Simplex Virus-2</td>
<td></td>
</tr>
<tr>
<td>P. aeruginosa</td>
<td>Influenza A</td>
<td></td>
</tr>
<tr>
<td>S. enterica</td>
<td>Rhinovirus</td>
<td></td>
</tr>
<tr>
<td>S. aureus</td>
<td>MERS-coronavirus</td>
<td></td>
</tr>
<tr>
<td>S. pneumoniae</td>
<td>West Nile Virus</td>
<td></td>
</tr>
<tr>
<td>X. fastidiosa</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.
DNA/RNA Shield™ preserves the genetic integrity of a sample at the point of collection for sensitive down-stream analyses (i.e. Next-gen sequencing, RT-PCR, etc.). Any sample type can be stored in DNA/RNA Shield™ for transport at ambient temperature, even in the most extreme conditions.

Scientists at NASA are utilizing DNA/RNA Shield™ to collect biological specimens from astronauts to assess how the human microbiome is affected by a microgravity environment. DNA/RNA Shield™ serves a vital role in preserving the genetic profiles of their samples in ever-changing and uncontrollable conditions of space.

Today’s most common practice for storing biological specimens, whether it be short or long-term, is the use of freezers. Unfortunately, freezers are not impervious to failing for a number of reasons - most notably due to 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.

**Protect Your Samples During Freeze-Thaw**

Add DNA/RNA Shield™ Reagent to Already Frozen or Fresh Samples & Prevent Degradation

**Nucleic Acid Stabilization at Ambient Temperature**

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

**Microbial genus composition of stool is unchanged after one month at ambient temperature with DNA/RNA Shield™.** The extracted DNA was subjected to microbial composition profiling via 16S rRNA gene targeted sequencing.

**Sample Collection & Stabilization**

- **Stool**: RNA in stool is effectively stabilized in DNA/RNA Shield™ at ambient temperature.
- **Blood**: RNA in blood is effectively stabilized in DNA/RNA Shield™ at ambient temperature.

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

**High-quality DNA from blood stored in DNA/RNA Shield™ that was freeze-thawed from -80°C to room temperature.**

**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.

1. Whole blood samples + DNA/RNA Shield™ were subjected to > 2 freeze-thaw cycles. Total RNA was subsequently purified using the QIAamp™ RNA Blood Mini Kit.
Sample Collection & Stabilization

**DNA/RNA Shield™ - Swab and Collection Tube**

**Description**
A general swab collection system (12 x 80 mm screwcap tube) 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**
- Mouth, nose, and throat sample collection
- Environmental sample collection
- Pathogen inactivation and detection

**DNA/RNA Shield™ Saliva Collection Kit**

**Description**
The DNA/RNA Shield™ Saliva Collection Kit ensures sample stability during storage/transport at ambient temperatures without a need for refrigeration or specialized equipment. DNA/RNA Shield™ reagent effectively inactivates pathogens (e.g., virus, bacteria) in collected samples. Each collection kit comes with a tube pre-filled with 2 ml of DNA/RNA Shield™.

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

**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
- Bloodborne pathogen detection

**DNA/RNA Shield™ - Fecal Collection Tube**

**Description**
Store and inactivate fecal samples with the DNA/RNA Shield™ Fecal Collection Tube, which includes a fecal scoop cup, a scoop attached to its screwcap, and a lysis tube. Samples collected are ready for downstream microbiomic analysis.

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

**Table: DNA/RNA Shield™ Product Specifications**

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNA/RNA Shield™ - Swab &amp; Collection Tube</td>
<td>R1106</td>
<td>10 pack (1 ml fill)</td>
<td>Prefilled with DNA/RNA Shield™ and sterilized</td>
<td>General swab collection of samples</td>
</tr>
<tr>
<td></td>
<td>R1107</td>
<td>50 pack (1 ml fill)</td>
<td></td>
<td>(mouth, nose, throat, surfaces, etc.)</td>
</tr>
<tr>
<td>DNA/RNA Shield™ - Collection Tube w/ Swab</td>
<td>R1108</td>
<td>10 pack (2 ml fill)</td>
<td>©Prefilled with DNA/RNA Shield™ (1 or 2 ml) and sterilized</td>
<td>General swab collection of samples</td>
</tr>
<tr>
<td></td>
<td>R1109</td>
<td>50 pack (2 ml fill)</td>
<td></td>
<td>(mouth, nose, throat)</td>
</tr>
<tr>
<td>DNA/RNA Shield™ Saliva Collection Kit</td>
<td>R1210</td>
<td>1 unit</td>
<td>©Prefilled with DNA/RNA Shield™ (2ml) to be added after saliva collection</td>
<td>Saliva sample collection (2ml of saliva)</td>
</tr>
</tbody>
</table>

*Products not shown at actual size.*

**Table: DNA/RNA Shield™ Product Specifications**

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNA/RNA Shield™ - Blood Collection Tube</td>
<td>R1150</td>
<td>50 pack</td>
<td>©Prefilled with DNA/RNA Shield™ and sterilized</td>
<td>Whole blood collection</td>
</tr>
<tr>
<td>DNA/RNA Shield™ - Fecal Collection Tube</td>
<td>R1101</td>
<td>10 pack</td>
<td>©Prefilled with DNA/RNA Shield™ and sterilized</td>
<td>Fecal sample collection (up to 1 g/ml)</td>
</tr>
</tbody>
</table>

*Products not shown at actual size.*
DNA/RNA Shield™ - Lysis Tube (Microbe)

Description
Collect and inactivate samples in lysis tubes prefilled with DNA/RNA Shield™. Each tube is filled with ultra-high density BashingBeads™ specifically designed for optimal microbial lysis. Samples collected are ready for any sensitive downstream analysis. Each lysis tube can be paired with a sterile swab for initial sample handling.

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

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNA/RNA Shield™ - Lysis Tube (Microbe)</td>
<td>R1103</td>
<td>50 tubes</td>
<td>A 2 ml tube prefilled with 1 ml of DNA/RNA Shield™ containing 1 ml of DNA/RNA Shield™</td>
<td>Collection of tough-to-lyse microbes from faces, saliva, soil, etc.</td>
</tr>
<tr>
<td>DNA/RNA Shield™ - Lysis Tube (Microbe) with Swab</td>
<td>R1104</td>
<td>50 tubes</td>
<td>A 2 ml tube prefilled with 1 ml of DNA/RNA Shield™ containing 1 ml of DNA/RNA Shield™ and a sterile swab</td>
<td>Collection of tough-to-lyse microbes from faces, saliva, soil, etc. with a sterile swab.</td>
</tr>
<tr>
<td>DNA/RNA Shield™ - Lysis Tube (Tissue)</td>
<td>R1105</td>
<td>50 tubes</td>
<td>A 2 ml tube prefilled with 1 ml of DNA/RNA Shield™ containing 1 ml of DNA/RNA Shield™</td>
<td>Collection of tissue, whole insects, and tough-to-lyse pathogens.</td>
</tr>
<tr>
<td>DNA/RNA Shield™ - Collection Tube (BashingBeads™ not included)</td>
<td>R1102</td>
<td>50 tubes</td>
<td>A 2 ml tube prefilled with 1 ml of DNA/RNA Shield™ containing 1 ml of DNA/RNA Shield™</td>
<td>Collection of solid tissues, and biological liquids.</td>
</tr>
</tbody>
</table>

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.

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

Urine Conditioning Buffer™ (UCB™)

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.

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

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNA/RNA Shield™</td>
<td>R100-50</td>
<td>50 ml</td>
<td>Store and/or transport urine samples with UCB™ for later purification of high-quality DNA/RNA</td>
<td>Sample stabilization at ambient temperature; Ready for transport; Infectious agent inactivation</td>
</tr>
<tr>
<td>DNA/RNA Shield™ (2X concentrate)</td>
<td>R1200-25</td>
<td>25 ml</td>
<td>Store and/or transport urine samples with UCB™ for later purification of high-quality DNA/RNA</td>
<td>Sample stabilization at ambient temperature; Ready for transport; Infectious agent inactivation</td>
</tr>
<tr>
<td>Urine Conditioning Buffer™ (UCB™)</td>
<td>D3051-1-140</td>
<td>140 ml</td>
<td>Urine collection and preservation</td>
<td>Sample stabilization at ambient temperature; Ready for transport; Infectious agent inactivation</td>
</tr>
</tbody>
</table>

DNA/RNA Shield™

Description
DNA/RNA Shield™ ensure 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

Contact us with any custom needs at busdev@zymoresearch.com
In recent years, the advances in DNA sequencing and other genome-enabled technologies have lowered the cost and time requirements needed to sequence any organism. Next-Generation sequencing (NGS) of microbial communities has dramatically increased the amount of research and exploration in both the human and environmental microbial ecosystem. When asked, many of the leading government agencies researching microbiomes expressed a strong interest in microbiome research as a means to solving problems, particularly those related to the production of food, the improvement of human health and ecosystem health, the production of clean, renewable energy, and the manufacture of microbiome-based therapeutics and products.\(^1\)

Advancements in NGS, as well as increased funding, have enabled large-scale, multi-lab research of microbial communities. However, early quality control studies on microbiome research suggest that, while the technology and funding are readily available, there are no standard reference materials or controls. The field is littered with data containing errors and bias. The combination of variation in measurements between labs and lack of standard reference materials has led to growing concern within the scientific community regarding the reproducibility of research.\(^2\)

Despite the significant amounts of bias stalking every step of a microbiomics workflow, there are currently no established methods, references, and standards that could be used to gain quality microbiomics insights. The absence of these metrics removes the fundamental cornerstone of the scientific method: reproducability. From the smallest research lab to large commercial service providers, lack of replicable results is a known problem within the field.

The ZymoBIOMICS product line was developed with the goal of eliminating bias across the entire microbiomic workflow. This new workflow employs the use of a collection reagent and storage devices, specially designed to inactivate all microbes (including viruses) and take a molecular snapshot of a sample at the time of collection, DNA extraction methods to uniformly lyse easy and tough-to-lyse microbes, and two novel sets of microbial standards to assess bias at extraction and analysis at each step of the workflow. The ZymoBIOMICS product line is intended to offer a standardized metric to determine the accuracy of microbiomics/metagenomics workflows and enhance data reproducibility across labs.

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The Challenges and Solutions of Microbiomics Research

Early quality control studies of microbiomics research suggested 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 complete 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- 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 systematically evaluated through entire workflows and eliminated or at least 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 ZymoBIO® product line achieves this through a complete suite of standardization 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. ZymoBIO® 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/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 storage 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 active cold chain), microbes can markedly vary in growth and survival rates which lead to drastically altered community profiles. When freezing samples is an effective solution, access to freezers or cryogenic storage 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®, designed by Zymo Research, 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, for up to one month, allows for cold-free transportation and significantly reduces cold-free associated costs. DNA/RNA Shield® inactivates organisms (bacteria, fungi, virus, etc.), including those that may be present in ambient conditions. Processes that involve chemical or thermal lysis often cause over-representation of easy-to-lyse organisms (e.g. Gram-negative bacteria) due to poor ligation 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 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. ZymoBIO® DNA and RNA Kits (pages 156-158) were developed to achieve uniform cell lysis from a wide range of organisms (e.g. Gram-negative/positive bacteria, fungi, protozoans, and algae). Some combinations of 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 one cell lysis mechanism might only introduce additional types of bias into the process as opposed to reducing the bias overall.

Bioinformatics

As the field of microbiomics continues to develop, another form of bias and error that has appeared is bioburden (nucleic acid contamination) introduced through complex and lengthy sample handling, reagents, and kits required to sequence DNA from a sample (Galler 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 positives microbial identifications. The impact of bioburden becomes magnified as bioinformatics technologies, such as QIIME and mothur (such as QIIME and mothur) mostly rely on clustering sequence data. Species-level resolution is achieved by combining a novel taxonomy assignment method with a well-curated 16S database. ZymoBIO® – Standardizing Microbiomics
Theoretical Impurity Level: < 0.01% foreign microbial DNA

Impurity Level: < 0.01%

Storage Solution: 10mM Tris-HCl and 0.1 mM RNA Shield™ (R1100-50)

DNA has a wide GC range of 15% - 85%. The DNA standard is designed to have the same DNA purity level (<0.01%), and contains genomes of a wide range of GC content (15% - 85%). 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 DNA Standard, so that they can be more powerful when working in tandem.

Assess bias within collection, storage, and extraction protocol

Assess bias in library preparation. 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.

The occurrence of PCR chimeras increases with the number of PCR cycles during 16S sequencing. 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

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 DNA Standard, so that they can be more powerful when working in tandem.

**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.

**Address & Reduce PCR Chimera**

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

**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.

**Product**

- **ZymoBIOMICS® Microbial Community DNA Standard**
  - **Cat. No.:** D6305
  - **Size:** 200 ng
  - **Uses:** Assess bias in library preparation for 16S and shotgun sequencing.
  - **Specifications:** 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.

**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 microbiome workflow. The Microbial Community Standard 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 from the beginning, the Microbial Community Standard can guide construction and optimization of entire workflows and can also be used as a routine quality control.

**Defined Microbial Community**

The ZymoBIOMICS® Microbial Community Standard contains three easy-to-lyse bacteria, five tough-to-lyse bacteria, and two tough-to-lyse yeasts.

**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.

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

**Product**

- **ZymoBIOMICS® Microbial Community DNA Standard**
  - **Cat. No.:** D6305
  - **Size:** 200 ng
  - **Uses:** Assess bias in library preparation for 16S and shotgun sequencing.
  - **Specifications:** 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.
ZymoBIOMICS® Microbial Community Standards 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 table below), which allows the user to easily assess the detection limit of a microbiomics workflow.

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.

Assess Performance of 16S Sequencing

The 16S sequencing results from the ZymoBIOMICS® Microbial Community Standard II (Log Distribution) were analyzed using Qiime 1.9.0 and Dada2 analysis pipelines. DNA was extracted using the ZymoBIOMICS® DNA Miniprep kit. A library of 16S V3-V4 region was prepared with the Quick-16S™ NGS Library Prep kit. Sequencing was performed using an Illumina® MiSeq® generating 93,762 paired-end reads (2 x 300 bp). Dada2 showed no false positives. The Qiime pipeline predicted 9 false positives, while the Dada2 pipeline made no false predictions, but had a lower detection limit identifying the presence of L. fermentum while Dada2 did not.

Assess Performance of Shotgun Metagenomic Sequencing

The shotgun sequencing data of the ZymoBIOMICS® Microbial Community Standard II (Log Distribution) were analyzed using three different bioinformatics pipelines, MetaPhlan2, mOTU, and a commercial program. The library prepared with an internal method was sequenced using an Illumina® MiSeq®. The three analysis pipelines had similar detection limits down to a relative genome copy number abundance of ~0.01% (L. fermentum abundance). MetaPhlan2 and the commercial program led to false positives; while the mOTU pipeline made no false predictions, it was unable to detect yeast.

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
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<tr>
<td>ZymoBIOMICS® Microbial Community Standard II (Log Distribution)</td>
<td>D6310</td>
<td>10 prep</td>
<td>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: &lt; 0.01% foreign microbial DNA. Relative-abundance deviation in average: &lt;30%</td>
<td>Assessing accuracy of taxonomy identification Assessing bias in composition measurement</td>
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<tr>
<td>ZymoBIOMICS® Microbial Community DNA Standard II (Log Distribution)</td>
<td>D6311</td>
<td>220 ng/20µL</td>
<td>Source: genomic DNA of eight bacteria and two yeasts. Impurity level: &lt; 0.01% foreign microbial DNA. Relative-abundance deviation in average: &lt;30%</td>
<td>Assessing accuracy of taxonomy identification Assessing bias in composition measurement</td>
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<td>Human HCT116 DKO Non-Methylated DNA</td>
<td>D3504-1</td>
<td>5 µg</td>
<td>Source: DNA purified from HCT116 DKO cells. Concentration: 250 ng/µL in buffer</td>
<td>Used in conjunction with D3611, simulation of real samples of human DNA mixed with microbial DNA.</td>
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</tbody>
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Illumina® and MiSeq® are registered trademarks of Illumina, Inc.
Technology Overview: DNA/RNA Shield™

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

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). The (PU) was subsequently determined by plaque assay. Validated by: Inbanka A. – D. Post and Prof. A. Mehta, Department of Medical Microbiology and Immunology, University of Wisconsin; Madison; Eliss (Shield) – J. Arena and Dr. A. Griffiths, Department of Virology and Immunology, Texas Biomedical Research Institute; HSV-1/2 - H. Oh, F. Diaz and Prof. D. Kruse, Virology Program, Harvard Medical School; E. coli, L. fermenston, B. subtilis, S. cerevisiae – Zymo Research Corporation.

Nucleic Acid Stabilization at Ambient Temperature
DNA and RNA in stool is effectively stabilized in DNA/RNA Shield™ at ambient temperature. Graphs show spike-in DNA and RNA controls from stool purified at the indicated time points and analyzed by (RT)qPCR.

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 compatible, automatable)

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 unibased 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.

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 with DNA/RNA Shield™ at ambient temperature and inactivating microbes.

Nucleic Acid Stabilization At Ambient Temperature
DNA and RNA in saliva and stool is effectively stabilized in DNA/RNA Shield™ at ambient temperature. Graphs show: spike-in DNA and RNA controls from saliva and stool purified at the indicated time points and analyzed by (RT)qPCR.

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 analyzed by (RT)qPCR. Controls: HSV-1 and HIV (ArcMedica™, Life Technologies).

For more information about DNA/RNA Shield™ Bulk Reagent, see page 143

www.zymoresearch.com | info@zymoresearch.com | tel: (949) 679-1190 | toll-free: (888) 882-9682 | fax: (949) 266-9452
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 20 Minute Workflow:** No precipitations or lengthy incubations.

**Description**

The ZymoBIOMICS® DNA Kits are designed for purifying DNA from a variety of sample inputs that is 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 BashingBead™. 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 15-20 kb.

**Microbiomics-grade Unbiased DNA Extraction**

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

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.

**Accurate lysis using ZR BashingBead™ Lysis Tubes**

**Superior Yield and Purity**

- **Flowchart:** Streamlined 20 Minute Workflow

**Product Specifications**

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
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<tr>
<td>ZymoBIOMICS® DNA Miniprep Kit</td>
<td>D4300</td>
<td>50 preps</td>
<td>Format: Spin-Column</td>
<td>Accurately isolates DNA of microbial communities from any sample type (bacteria, fungi, protozoa, algae)</td>
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<td>D4301</td>
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<td>Binding Capacity: 5 µg</td>
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**ZymoBIOMICS® Miniprep Kit**

- **DNA Miniprep Kit (Lysis Matrix Not Included)**
  - Format: Spin-Column
  - Binding Capacity: 25 µg
  - Elution Volume: 50 µl
  - Processing Time: 20 minutes
- **DNA Miniprep Kit (Lysis Matrix Not Included)**
  - Format: Spin-Column
  - Binding Capacity: 5 µg
  - Elution Volume: 10 µl
  - Processing Time: 20 minutes

**Accurate lysis using ZR BashingBead™ Lysis Tubes**

- **Flowchart:** Streamlined 20 Minute Workflow

**Product Cat. No. | Size  | Specifications | Uses**
<table>
<thead>
<tr>
<th></th>
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<tr>
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<td>50 preps</td>
<td>Format: Spin-Column</td>
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<td>Binding Capacity: 5 µg</td>
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<td>D4302</td>
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<td>50 preps</td>
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<td>D4311</td>
<td>2 x 96 preps</td>
<td>Processing Time: 45 minutes</td>
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</table>
ZymoBIOMICS® RNA Miniprep Kit

- Rapid, robust, and simple purification of high quality, inhibitor-free total RNA (including small/micro RNAs) from any sample including feces, soil, water, biofilms, swabs, saliva, body fluids, etc.
- ZymoBIOMICS® innovative lysis system enables efficient and unbiased lysis of microbes including Gram-positive/negative bacteria, fungi, protozoans, algae, viruses, etc.
- DNA-free RNA is ready for use in any downstream application. DNase I included.

**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**

- Accurate lysis using DNA/RNA Shield™ Lyon Tube (Microbe)
- Complete PCR inhibitor removal using Zymo-Spin™ III-HRC Filters
- Ultra-pure RNA from Inhibitor-rich Samples

**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.

**ZymoBIOMICS® 96 MagBead DNA Kit**

- 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 eliminates bias associated with unequal lysis efficiencies of different organisms (e.g. Gram-negative/positive bacteria, fungi, protozoans, and algae), making it ideal for microbiomic studies.
- The automation friendly workflow enables nearly any sample to be processed in as little as 90 minutes for 96 preps.

**Description**

The ZymoBIOMICS® 96 MagBead DNA Kit is designed for purifying DNA from a wide array of sample inputs that is 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 microbiomic studies. Unbiased mechanical lysis of tough microbes is achieved by bead beating with ultra-high-density (BeadBlast®). The automation-friendly workflow integrates PCR inhibitor removal technology directly into the purification system, removing complex precipitation steps commonly used in other methodologies. The kit’s unique system allows for a simple bind, wash, elute procedure, which is unmatched in providing ultra-pure DNA, free of PCR inhibitors. Purified DNA is ideal for all downstream applications including PCR, arrays, 16S RNA gene sequencing, and shotgun sequencing.

**No Cross-Contamination**

The ZymoBIOMICS® 96 MagBead DNA Kit provides accurate representation of the organisms extracted from the ZymoBIOMICS® Microbial Community Standard.

**Accurate Profiling**

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

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
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<td>R2001</td>
<td>50 preps</td>
<td>Format: Spin-Column Binding Capacity: 100 µg Elution Volume: ≥ 50 µl RNA Size: ≥ 17 nucleotides</td>
<td>Accurately isolates RNA of microbial communities from any sample type (feces, soil, water, biofilm, saliva, body fluids, etc.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZymoBIOMICS® 96 MagBead DNA Kit [includes ZR BashingBead® Lysis Rack]</td>
<td>D4302</td>
<td>2 x 96 preps</td>
<td>Format: 96-Well Binding Capacity: 10 µg Elution Volume: ≥ 50 µl Processing Time: 90 minutes</td>
<td>Accurate high-throughput DNA isolation of microbial communities from any sample type (feces, soil, water, biofilm, saliva, body fluids, etc.)</td>
</tr>
<tr>
<td>ZymoBIOMICS® 96 MagBead DNA Kit [lysis Matrix Not Included]</td>
<td>D4306</td>
<td>2 x 96 preps</td>
<td>96-Wells</td>
<td>90 min</td>
</tr>
</tbody>
</table>
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.

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 from microbial communities while removing host DNA from applicable sample types

Quick-16S™ NGS Library Prep Kit

- Fast & Simple: Only 1.5 hours of hands-on time. No TapeStation® analyses or AMPure® clean-ups.
- 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 and 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.

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

Minimize PCR Chimera Formation

The Quick-16S™ NGS Library Prep Kit minimizes PCR chimera formation compared to 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).

Best Phylogenetic Coverage

A. The Quick-16S™ Primer Set V1-V2 includes coverage of common human-associated microbes, including Bifidobacterium, Peptostreptococcus, and Clostridium, 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.
ZymoBIOMICS® PCR PreMix

- High Sensitivity PCR: Robust amplification and detection of low copy DNA.
- DNA-Free: Certified low bioburden.
- Simple Setup: Add water, DNA, and primers.

Description

The ZymoBIOMICS® PCR PreMix is supplied as a 2X concentrated "master mix", which contains all the reagents needed to perform PCR and other molecular downstream analysis with the addition of probes or fluorescent dyes. It features a “hot-start” DNA polymerase that has 3-terminal transferase activity. The PreMix is validated low-bioburden in regards to bacterial contamination. The addition of “A” overhangs to amplified DNA makes it ideal for use in TA-cloning. Simple and easy to use: just add water, primers, and template DNA to the ZymoBIOMICS® PCR PreMix, then heat and go!

Femto™ Bacterial DNA Quantification Kit

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

Description

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

Product

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZymoBIOMICS® PCR PreMix</td>
<td>£2566</td>
<td>90 nL</td>
<td>Source: Recombinant Enzyme</td>
<td>For amplification of DNA intended for highly sensitive applications; Low bioburden</td>
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<td></td>
<td>£2567</td>
<td>300 nL</td>
<td>Activity: 5’ - 3’ DNA polymerization; Optimum Reaction Temperature: 72°C</td>
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<tr>
<td>Femto™ Bacterial DNA Quantification Kit</td>
<td>£2006</td>
<td>100 nL</td>
<td>Detection Dye: SYTO®9</td>
<td>Bacterial DNA quantification</td>
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</table>

ZymoBIOMICS® Services

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

Description

Next-Generation sequencing services for discovery, identification, and characterization of microbial communities. All ZymoBIOMICS® Services feature state-of-the-art sample prep technologies, validation using the ZymoBIOMICS® Microbial Community Standards, Illumina® 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.
Despite the remarkable diversity of research interests in labs throughout the world, most labs 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 > 10^8 transformants per μg pUC19 DNA. Zymo Research’s innovative Mix & Go!™ transformation procedure streamlines the process, eliminating long outgrowth times and the need for electroporation. Using premade Mix & Go!™ Competent Cells from Zymo Research, a scientist can transform cells in less than 20 seconds (p. 167). 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™ (p. 171), 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!
Mix & Go™ Competent E. coli

Product Guide: Mix & Go™ Competent Cells

Mix & Go™ Competent Cells

- Mix & Go™ transformation procedure with transformation efficiencies of 10^8 - 10^9 transformants/µg of plasmid DNA.
- Simply add DNA and then spread. DNA transformation in as little as 20 seconds.
- Uses: bacterial transformations, DNA cloning, blue-white screening

Mix & Go™ Competent Cells

- JM109
  - Genotype: F[ traD36 proA-B lacIq ΔlacZM15 proph-gptlacU169 skf(1) p21 mi2 endA1 hsdR17 (rK- mK+) F-hsdRM15 (rK-mK+ McrB-) φ80lacZΔM15 ΔlacX74 recA1 endA1 araD139 Δ(ara leu) 7697 galU galK rpsL nupG λ- F- mcrA Δ(mrr-hsdRMS-mcrBC) F-hsdRM15 ΔlacZYA-argF U169 Δ( lacZYA-argF) U169 ΔlacX74 recA1 endA1 araD139 Δ(ara leu) 7697 galU galK rpsL nupG λ-
  - Cat. No.: T3003
  - Size: 10 x 100 µl aliquots (10 tubes)
  - Cat. No.: T3005
  - Size: 96 x 50 µl aliquots (12 x 8-tube strips)

- DH5 Alpha
  - Genotype: F[ traD36 proA-B lacIq ΔlacZM15 proph-gpt lacU169 proph-gptlacU169 skf(1) p21 mi2 endA1 hsdR17 (rK- mK+) F-hsdRM15 (rK-mK+ McrB-) φ80lacZΔM15 ΔlacX74 recA1 endA1 araD139 Δ(ara leu) 7697 galU galK rpsL nupG λ-
  - Cat. No.: T3007
  - Size: 10 x 100 µl aliquots (10 tubes)
  - Cat. No.: T3009
  - Size: 96 x 50 µl aliquots (12 x 8-tube strips)
  - Cat. No.: T3070
  - Size: 96 x 50 µl aliquots (96-well plate)

- HB101
  - Genotype: F[ traD36 lacIq ΔlacZM15 proph-gpt lacU169 proph-gptlacU169 skf(1) p21 mi2 endA1 hsdR17 (rK- mK+) F-hsdRM15 (rK-mK+ McrB-) φ80lacZΔM15 ΔlacX74 recA1 endA1 araD139 Δ(ara leu) 7697 galU galK rpsL nupG λ-
  - Cat. No.: T3011
  - Size: 10 x 100 µl aliquots (10 tubes)
  - Cat. No.: T3013
  - Size: 96 x 50 µl aliquots (12 x 8-tube strips)

- TG1
  - Genotype: F[ traD36 lacIq ΔlacZM15 proph-gpt lacU169 proph-gptlacU169 skf(1) p21 mi2 endA1 hsdR17 (rK- mK+) F-hsdRM15 (rK-mK+ McrB-) φ80lacZΔM15 ΔlacX74 recA1 endA1 araD139 Δ(ara leu) 7697 galU galK rpsL nupG λ-
  - Cat. No.: T3017
  - Size: 10 x 100 µl aliquots (10 tubes)

- Zymo 10B
  - Genotype: F[ traD36 lacIq ΔlacZM15 proph-gpt lacU169 proph-gptlacU169 skf(1) p21 mi2 endA1 hsdR17 (rK- mK+) F-hsdRM15 (rK-mK+ McrB-) φ80lacZΔM15 ΔlacX74 recA1 endA1 araD139 Δ(ara leu) 7697 galU galK rpsL nupG λ-
  - Cat. No.: T3019
  - Size: 10 x 100 µl aliquots (10 tubes)

Specifications

<table>
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<tr>
<th>Strain Background</th>
<th>JM109</th>
<th>DH5 Alpha</th>
<th>HB101</th>
<th>TG1</th>
<th>Zymo 10B</th>
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<tr>
<td>K-12</td>
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Mix & Go™ transformation procedure with transformation efficiencies of 10^8 - 10^9 transformants/µg of plasmid DNA.
Simply add DNA and then spread. DNA transformation in as little as 20 seconds.
Uses: bacterial transformations, DNA cloning, blue-white screening
**Product Guide: XJ Autolysis™ E. coli Strains**

<table>
<thead>
<tr>
<th>XJa Autolysis™</th>
<th>XJa (DE3) Autolysis™</th>
<th>XJb Autolysis™</th>
<th>XJb (DE3) Autolysis™</th>
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</thead>
<tbody>
<tr>
<td>Genotype</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>F’[F’[ΔaraB::λ]relA1 recA1 ΔaraB::λ R, cat (CmR), lam, lac, lac-DE3] glnV44 (supE44) e14- (McrA-) thi, gyrA96 (NalR), 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.</td>
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</table>

**Specifications**

<table>
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<tr>
<th>Strain Background</th>
<th>Autolysis inducible by Arabinose</th>
<th>Autolysis inducible by Arabinose</th>
<th>Autolysis inducible by Arabinose</th>
<th>Autolysis inducible by Arabinose</th>
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</thead>
<tbody>
<tr>
<td>K-12</td>
<td>√</td>
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**Catalog Number**

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<tr>
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<th>T3021/T5021</th>
<th>T3031/T5031</th>
<th>T3041/T5041</th>
<th>T3051/T5051</th>
</tr>
</thead>
</table>

**XJ Autolysis™ E. coli Strains**

- Straightforward transformation procedure with up to 10⁸ - 10⁹ transformants/µg plasmid.
- Simple, fast, and controlled autolysis of E. coli.
- Available with DE3 lysogen for T7 promoter transcription.

**Description**

XJ Autolysis™ E. coli strains are a new alternative for bacterial transformation and lysis. These strains are efficiently lysed following E. coli, K-strain JM109). XJa lysis efficiency is 10-20% lower than XJa. For optimal lysis, more care needs to be taken when selecting the lysis buffer. However, even very low concentrations of a detergent may improve lysis significantly.

**Cell Growth**

- This strain is EndA- and yields high quality DNA preparations.
- This strain is EndA- and yields high quality DNA preparations.
- This strain is EndA- and yields high quality DNA preparations.
- This strain is EndA- and yields high quality DNA preparations.

**Autolysis**

- A very robust strain, reaching higher OD's than E. coli K-strain.
- A very robust strain, reaching higher OD's than E. coli K-strain.
- A very robust strain, reaching higher OD's than E. coli K-strain.
- A very robust strain, reaching higher OD's than E. coli K-strain.

**Transformations of Large Plasmids (deoR)**

- Plasmid Size Up to 10 kb
- Plasmid Size Up to 10 kb
- Plasmid Size Up to 10 kb
- Plasmid Size Up to 10 kb

**Transformation Efficiency**

- 5-10 transformants/µg plasmid.
- 5-10 transformants/µg plasmid.
- 5-10 transformants/µg plasmid.
- 5-10 transformants/µg plasmid.

**DNA Stability**

- The RecA- mutation in XJa stabilizes DNA stability.
- The RecA- mutation in XJa stabilizes DNA stability.
- The RecA- mutation in XJa stabilizes DNA stability.
- The RecA- mutation in XJa stabilizes DNA stability.

**DNA Extraction**

- The RecA- mutation in XJa stabilizes DNA extraction.
- The RecA- mutation in XJa stabilizes DNA extraction.
- The RecA- mutation in XJa stabilizes DNA extraction.
- The RecA- mutation in XJa stabilizes DNA extraction.

**Product**

- XJa Autolysis™
- XJa (DE3) Autolysis™
- XJb Autolysis™
- XJb (DE3) Autolysis™

**Cat. No.**

- T3021: 1 glycerol stock, 1 ml 500X L-Arabinose
- T3031: 10 x 100 µl Mix & Go™ Competent Cells, 1 ml 500X L-Arabinose
- T3041: 1 glycerol stock, 1 ml 500X L-Arabinose
- T3051: 10 x 100 µl Mix & Go™ Competent Cells, 1 ml 500X L-Arabinose

**Size**

- 500X L-Arabinose
- 500X L-Arabinose
- 500X L-Arabinose
- 500X L-Arabinose
**Mix & Go™ E. coli Transformation Kit & Buffer Set**

- Make your own highly efficient chemically competent cells: $10^7$-10$^8$ transformants/µg of plasmid DNA for most common lab strains.
- No heat shock or related procedures: simply add DNA and spread onto a plate - Mix & Go™

**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 $10^7$-10$^8$ transformants/µg plasmid DNA with most E. coli strains. Uniquely formulated reagents make it easy to generate Mix & Go™ Competent Cells from current 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 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.

**ZymoBroth™**

- Uniquely formulated growth medium for making highly competent E. coli for DNA transformation.
- Choice growth medium for 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 K12 derivatives (such as JM109, HB101, etc.) and B strain derivatives (such as BL21, etc.).

**ZymoBroth™**: 100 ml and 500 ml, chemically competent E. coli preparation.

**Product**

- **Mix & Go™ E. coli Transformation Kit**: Product Cat. No. T3001, Size up to 20 ml, Uses Reagents for Competent Cell Preparation, ZymoBroth™ Growth Medium.
- **Mix & Go™ E. coli Transformation Buffer Set**: Product Cat. No. T3002, Size up to 60 ml, Uses Reagents for Competent Cell Preparation.

**Product**

- **ZymoBroth™**: Product Cat. No. M3015-100, 100 ml; M3015-500, 500 ml, Uses Chemically competent E. coli preparation.

**Transformation kinetics.** Mix & Go™ E. coli prepared with ZymoBroth™ display fast transformation kinetics and high transformation efficiencies.
Rattler™ Plating Beads

- Sterile 4.5 mm glass plating beads that are convenient and easy to use.
- No flaming required.
- Quickly spread cells evenly over the entire growth surface of a plate.
- Ideal when plating yeast for two-hybrid screens.

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 following inversion of the plates and pouring off from the plate lids. Using the Rattler™ Plating Beads is simple, easy, and saves you time. The beads come sterile in polycarbonate bottles and can be reused following cleaning and autoclaving.

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 dilute, we recommend using the DNA Clean & Concentrator® (see p. 86) 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 (K12 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.

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rattler™ Plating Beads - 230 g/bottle</td>
<td>S1001</td>
<td>1 bottle</td>
<td>Material: Solid, glass 4.5mm beads can be washed, autoclaved, and reused</td>
<td>Spreading inocula on solid media (plates)</td>
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<tr>
<td>Rattler™ Plating Beads - bulk format (non-sterile)</td>
<td>S1001-B</td>
<td>25 kg bag</td>
<td>Packaging: Polycarbonate, autoclavable wide mouth bottle. The bulk format is supplied non-sterile as a 25 kg bag</td>
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</tbody>
</table>
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. For transformation of yeast and fungus, a 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/α-Factor Mating Pheromone and 5-Fluoroorotic Acid. The Zymolyase and Yeast Protein Kit remain important reagents for yeast lysis and protein purification, respectively.
Zymolyase - Yeast Lytic Enzyme

- **100T Equivalent:** Prepared from Arthrobacter luteus. Essential enzyme activities are β-1,3-glucanase and β-1,3-glucan laminaripentaose-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. The use of lytic enzymes like Zymolyase 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 laminaripentaose-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.


---

**Product** | **Cat. No.** | **Size** | **Specifications** | **Uses**
--- | --- | --- | --- | ---

Zymolyase - Yeast Lytic Enzyme | E1004 | 1,000 U | Enzyme Concentration: 5 U/μl Total Protein Concentration: 10 - 15 mg/ml Storage: -10°C | Spheroplast/Protoplast formation; Yeast cell fusion; Yeast transformation

R-Zymolyase (with RNase) | E1006 | 1,000 U | |

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Zymoprep™ Yeast Plasmid Miniprep I & II

- **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 and 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 as liquid cultures. The system is ideal for low-copy numbers 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**

1. Spin down cells
2. Add solution 1 with Zymolyase, incubate to digest cell wall
3. Standard alkaline lysis process
4. Transfer the supernatant to new tubes
5. Add 400 μl of isopropanol to precipitate the DNA
6. Centrifuge for 8 minutes
7. Resuspend plasmid pellet in 35 μl of TE
8. Spin down cells
9. Wash
10. Elute in 10 μl TE

---

Zymoprep™ Yeast Plasmid Miniprep I

- **Cat. No.:** D2001
- **Size:** 100 preps
- **Specifications:** Format: Spin Column Elution Volume: ≥ 10 μl Processing Time: 35 - 90 minutes Binding Capacity: 5 µg DNA Size Limits: ≤ 23 kb
- **Uses:** Plasmid recovery from yeast

Zymoprep™ Yeast Plasmid Miniprep II

- **Cat. No.:** D2004
- **Size:** 50 preps
- **Specifications:** Format: Spin Column Elution Volume: ≥ 10 μl Processing Time: 35 - 90 minutes Binding Capacity: 5 µg DNA Size Limits: ≤ 23 kb
- **Uses:** Plasmid recovery from yeast

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YeaStar™ Genomic DNA Kit

- **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.

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
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<tbody>
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<td>40 preps</td>
<td>Format: Spin-Column</td>
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<td></td>
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<td>Binding Capacity: 25 µg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Elution Volume: ≥ 60 µl</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Processing Time: 1.5 hours</td>
<td></td>
</tr>
</tbody>
</table>

**Product Cat. No.**

<table>
<thead>
<tr>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yeast transformation &amp; outgrowth</td>
</tr>
</tbody>
</table>

**YPD Plus™**

- **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 a 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 were performed with outgrowth performed in either standard YPD or YPD Plus™ medium. The relative percentage of transformants is shown in the graph to the left. Each plot represents the relative transformation efficiency averaged from six individual transformations.

**Product**

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y1003-50</td>
<td>50 ml</td>
<td>Yeast transformation &amp; outgrowth</td>
</tr>
<tr>
<td>Y1003-100</td>
<td>100 ml</td>
<td>Yeast transformation &amp; outgrowth</td>
</tr>
</tbody>
</table>
**Frozen-EZ Yeast Transformation II™ Kit**

- **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 with no 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 (i.e., ≤ -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 Specifications and Uses**

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frozen-EZ Yeast Transformation II™ Kit</td>
<td>T2001</td>
<td>120 rxns</td>
<td>Transformation Efficiency: 10⁷ - 10⁸ cfu/µg DNA Input: 0.2 - 1.0 µg</td>
<td>Competent yeast cell preparation; Competent Cell Stability: ≥ 1 year at ≤ -70°C</td>
</tr>
</tbody>
</table>

**α-Factor Mating Pheromone**

- Aqueous solution of yeast α-factor (alpha-factor) mating pheromone.

**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 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 pheromone 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-factor peptide mating pheromone as a ready to use liquid that has been optimized for both activity and stability and is guaranteed to retain biological function through multiple freeze-thaw cycles.

**Product Specifications and Uses**

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>α-Factor Mating Pheromone</td>
<td>Y1001</td>
<td>240 µl</td>
<td>Concentration: 10 mM in 0.1 M sodium acetate, pH 5.2</td>
<td>Yeast mating induction; G1 phase arrest</td>
</tr>
<tr>
<td>α-Factor Mating Pheromone</td>
<td>Y1004-500</td>
<td>500 µl</td>
<td>Concentration: 1 mg/ml in methanol</td>
<td>Yeast mating induction; G1 phase arrest</td>
</tr>
</tbody>
</table>

**a-Factor Mating Pheromone**

- Aqueous solution of yeast a-factor (A-factor) mating phoromone.

**Description**

a-Factor is one of two mating pheromones in baking yeast. It is the “opposite” sex of mating pheromone α-Factor (alpha-factor). When yeast “a” and “α” cells encounter the opposite mating pheromones, they induce genes necessary for mating, arrest the cell cycle in G1, alter cell surface and nuclear determinants, and also cause morphological changes.

**Product Specifications and Uses**

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>α-Factor Mating Pheromone</td>
<td>Y1004-500</td>
<td>500 µl</td>
<td>Concentration: 1 mg/ml in methanol</td>
<td>Yeast mating induction; G1 phase arrest</td>
</tr>
</tbody>
</table>

---

**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, center; 5 μM, left). 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 BAR-1 protease-positive wild strain which require ~20 - 50X more pheromone to arrest the cells.
5-Fluoroorotic Acid (5-FOA)

- 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-flurouracil) in strains expressing the functional URA3 gene coding for orotidine-5′-monophosphate decarboxylase that is involved in the synthesis of uracil. Yeast strains that are phenotypically Ura- become Ura- and 5-FOA 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).

Product

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Specifications</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-FOA (powder)</td>
<td>F9001-1</td>
<td>1 g</td>
<td>Molecular Weight: 174.0</td>
<td>Yeast Counter-selection; Yeast DNA amplification; Yeast cell lysis; Yeast RNA isolation; Yeast cell lysis (i.e. Zyomyces) RNA isolation</td>
</tr>
<tr>
<td></td>
<td>F9001-5</td>
<td>5 g</td>
<td>Method for Determining Identity: TLC, melting point and lot comparison</td>
<td></td>
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<tr>
<td>100X 5-FOA (liquid)</td>
<td>F9003</td>
<td>10 ml</td>
<td>Purify: Estimated &gt;98% by TLC, melting point, and lot comparison</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Solubility: 50 mg in 1 ml (1:1 NH₄OH:H₂O) with gentle heating, or 100 mg/ml DMSO Storage: Store in freezer</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Yeast Counter-selection; Yeast DNA amplification; Yeast cell lysis; Yeast RNA isolation; Yeast cell lysis (i.e. Zyomyces) RNA isolation</td>
<td></td>
</tr>
</tbody>
</table>

Yeast Protein Kit™

- 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.

YeaStar™ RNA Kit

- 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 niger var. aureus, Candida albicans, Pichia pastoris, Saccharomyces cerevisiae, Schizosaccharomyces pombe. The kit is ideal for the purification of high-quality, total RNA from any fungus that can be lysed by yeast lytic enzyme. The kit facilitates the purification of 10-25 µg of total RNA from 1-3.5 ml of cultured cells using innovative Zymo-Spin™ Column technology.

Yeast Research

5-FOA

- 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-flurouracil) in strains expressing the functional URA3 gene coding for orotidine-5′-monophosphate decarboxylase that is involved in the synthesis of uracil. Yeast strains that are phenotypically Ura- become Ura- and 5-FOA 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).

Product

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<tr>
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<td>F9001-1</td>
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<td>Yeast Counter-selection; Yeast DNA amplification; Yeast cell lysis; Yeast RNA isolation; Yeast cell lysis (i.e. Zyomyces) RNA isolation</td>
</tr>
<tr>
<td></td>
<td>F9001-5</td>
<td>5 g</td>
<td>Method for Determining Identity: TLC, melting point and lot comparison</td>
<td></td>
</tr>
<tr>
<td>100X 5-FOA (liquid)</td>
<td>F9003</td>
<td>10 ml</td>
<td>Purify: Estimated &gt;98% by TLC, melting point, and lot comparison</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Solubility: 50 mg in 1 ml (1:1 NH₄OH:H₂O) with gentle heating, or 100 mg/ml DMSO Storage: Store in freezer</td>
<td>Yeast Counter-selection; Yeast DNA amplification; Yeast cell lysis; Yeast RNA isolation; Yeast cell lysis (i.e. Zyomyces) RNA isolation</td>
</tr>
</tbody>
</table>
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. 169) 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.

In addition to epigenetic enzymes presented in the Epigenetics Section (p. 38-43), Zymo Research offers several others, including DNase I (RNase-free), Proteinase K, RNase A, and Zymolyase that are detailed in this chapter.

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- Tag-Spin Technology Overview .......................................................................................... 187
- His-Spin Protein Miniprep™ ............................................................................................... 188
- Strep-Spin™ Protein Miniprep Kit ....................................................................................... 189
- MBP-Spin™ Protein Miniprep Kit ....................................................................................... 190
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- Atlantis dsDNase .................................................................................................................. 191
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- ZymoTaq™ DNA Polymerase ........................................................................................... 195
Dual Media Set™

- 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).

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual Media Set™ (EB + OB)</td>
<td>M3011</td>
<td>100 ml EB - 900 ml OB</td>
<td></td>
</tr>
<tr>
<td>Expansion Broth (EB)</td>
<td>M3012-100</td>
<td>100 ml</td>
<td>Recombinant protein expression</td>
</tr>
<tr>
<td></td>
<td>M3012-500</td>
<td>500 ml</td>
<td></td>
</tr>
<tr>
<td>Overexpression Broth (OB)</td>
<td>M3013-100</td>
<td>100 ml</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M3013-500</td>
<td>500 ml</td>
<td></td>
</tr>
</tbody>
</table>

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. Frequently used affinity tags that facilitate very efficient purification of recombinant proteins include poly(His)-tag, Strep-tag® and maltose binding protein (MBP).

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 protein in only a few minutes for small-scale protein studies.

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. SDS-PAGE of cell proteins after growth using the Dual Media Set™. M – protein markers; 1-5, West Nile virus protein E (54 kDa): 1, repressed expression in EB, 2-5, over-expression in OB for 5, 10, 18, and 24 hours, respectively, after inoculation with uninduced EB culture; 6-10, C-terminal domain of West Nile virus protein E (32 kDa): 6, repressed expression in EB, 7-10, over-expression in OB for 5, 10, 18, and 24 hours, respectively, after inoculation with uninduced EB culture; 11-15, Methyl-binding domain of MeCP2 (18 kDa): 11, repressed expression in EB, 12-15, over-expression in OB for 5, 10, 18, and 24 hours, respectively, after inoculation with uninduced EB culture.

Product Expression & Enzymes

9Protein Expression & Enzymes

9Protein Expression & Enzymes
**His-Spin Protein Miniprep™**

- Fast (5 minute) method for the purification of His-tagged proteins from cell free extracts.
- Screen bacterial colonies directly on the basis of protein expression vs. plasmid DNA.
- No special instrumentation is required other than a benchtop microcentrifuge.

**Strep-Spin™ Protein Miniprep Kit**

- **Fast & Simple:** Purify Strep-tagged proteins from cell-free extracts using a spin-column in as little as 5 minutes.
- **Easy Identification:** Screen recombinant colonies directly for protein products rather than plasmid inserts.
- **High-Quality:** Purified proteins are ready for sensitive assays to study enzyme kinetics, biochemical analyses, SDS-PAGE, etc.

**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 as fast 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: get results in minutes, not hours!

**Specifications**

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>His-Spin Protein Miniprep™</td>
<td>P3001</td>
<td>10 preps</td>
<td>Format Spin-Column</td>
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<tr>
<td></td>
<td>P3002</td>
<td>50 preps</td>
<td>Protein Binding Capacity: 1 mg</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>His-tagged protein purification</td>
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<tr>
<td>His-Affinity Gel</td>
<td>P3003-2</td>
<td>14 ml</td>
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</table>

**Uses**

- Purification of His-tagged proteins.
- Purification of Strep-tagged proteins.

**High-Quality**

- Purified proteins are ready for sensitive assays to study enzyme kinetics, biochemical analyses, SDS-PAGE, etc.

**Fast & Simple**

- Purify Strep-tagged proteins from cell-free extracts using a spin-column in as little as 5 minutes.

**Description**

The Strep-Spin Protein Miniprep Kit™ provides a fast purification technology for Strep-tagged proteins. The procedure is based on a novel Strep-Tactin® XT Superflow® resin which binds efficiently to Twin-Strep-tag™ as well as single Strep-tag.

Up to 600 μg of Strep-tagged protein can be eluted in only 7 minutes. The purified protein is ideal for enzymatic assays, protein biochemical analyses, SDS-PAGE and other applications.

The straightforward spin-wash-elute protocol dramatically simplifies protein purification: get results in minutes, not hours!
**MBP-Spin™ Protein Miniprep Kit**

- **Fast & Simple:** Purify MBP-tagged proteins from cell-free extracts using a spin-column in ≥ 6 minutes.
- **High-Quality:** Prepare pure proteins for small-scale studies.
- **Convenient:** No special instrumentation needed other than a microcentrifuge.

**Description**

The MBP-Spin Protein Miniprep Kit™ provides a fast purification technology for MBP-tagged proteins. The easy-to-follow procedure is based on an affinity matrix composed of amylose resin to specifically bind proteins fused to maltose-binding protein (MBP), and the unique Zymo-Spin™ Technology.

Up to 1 mg of MBP-tagged protein can be eluted into ≥ 200 µl of the provided MBP-Elution Buffer in only 6 minutes. The purified protein is ultra-pure and is ideal for enzymatic assays, biochemical analyses, SDS-PAGE and other sensitive applications. The straightforward spin-wash-elute protocol dramatically simplifies protein purification: get results in minutes, not hours!

**High-Quality**

- **Fast & Simple**

![Diagram](image)

The MBP-Spin™ Protein Miniprep Kit purifies high-quality MBP-tagged proteins directly from a spin-column. N-terminal MBP-tag fusion proteins were expressed in E. coli cells, and the cell extracts as well as the proteins purified using the MBP-Spin™ Protein Miniprep Kit were analyzed by SDS-PAGE on a 4-20% gel and stained with InstantBlue™; (MBP-Calmodulin 55 kDa, MBP-BDV-Phosphoprotein 65 kDa, MBP-GFP 69 kDa).

**Fast & Simple**

- **Cell Lysate**
- **Bind**
- **Wash**
- **Elute**

**Purified Protein**

**Enzymes**

**5-hmC Glucosyltransferase**

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. See p. 42 for details.

**Specifications:**
- **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 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 MgCl2 (Kunitz, 1950).

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
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<tbody>
<tr>
<td>P2016</td>
<td>100 U</td>
</tr>
<tr>
<td>P2007</td>
<td>200 U</td>
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**Atlantis dsDNase**

Atlantis dsDNase is a double-strand DNA specific endonuclease that cleaves phosphodiester bonds in DNA to yield homogeneous populations of core nucleosomes.

**Specifications:**
- **Typical buffer consists of 20 mM Tris-HCl (pH 7.5) and 5 mM MgCl2.**
- **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 MgCl2 (Kunitz, 1950).

<table>
<thead>
<tr>
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<th>Size</th>
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<tr>
<td>E2010</td>
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<tr>
<td>E2011</td>
<td>400 U</td>
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**CpG Methylase (M. SssI)**

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. See p. 41 for details.

**Specifications:**
- **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.
- **Inactivation:** 65°C for 20 min.

**Unit Definition:** One unit (U) is the amount of enzyme required to protect 1 µg of 5-hmC DNA Standard [D5405-3] from Csp6I restriction enzyme digestion via glucosylation in a reaction incubated at 37°C for 1 hour.

<table>
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<td>E2027</td>
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**Product**

<table>
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<th>Size</th>
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</thead>
<tbody>
<tr>
<td>MBP-Spin™ Protein Miniprep Kit</td>
<td>P2006</td>
<td>10 preps</td>
<td>MBP-tagged protein purification</td>
</tr>
<tr>
<td></td>
<td>P2007</td>
<td>50 preps</td>
<td></td>
</tr>
</tbody>
</table>
Enzymes

DNA Degradase™ and DNA Degradase Plus™
DNA Degradase™ and DNA Degradase Plus™ from Zymo Research are nuclease mixtures that quickly and efficiently degrade DNA into individual nucleotides or nucleosides, respectively. DNA Degradase™ is ideal for whole-genome DNA methylation analysis. See p. 41 for details.

Specifications:
- Provided with 10X DNA Degradase™ Reaction Buffer and 2XK SAM (S-adenosylmethionine).
- Specifications:
  - Cat. No.: E2016
  - Size: 500 U
  - Cat. No.: E2017
  - Size: 2,000 U
  - Cat. No.: E2001
  - Size: 250 U
  - Cat. No.: E2021
  - Size: 1,000 U

DNA Degradase™ is ideal for whole-genome DNA methylation analysis. See p. 41 for details.

Unit Definition:
- One unit (U) is defined as the amount of enzyme required to protect 1 µg of DNA against cleavage by HaeII restriction endonuclease in a total reaction volume of 20 µl for 1 hour at 37°C.

Optimum Reaction Temperature:
- 37°C

Heat Inactivation:
- 65°C for 20 min.

Enzyme Inactivation:
- Provided with 10X DNA Degradase™ Reaction Buffer.

Enzyme Concentration:
- 1 U/µl

Micrococcal Nuclease
Micrococcal Nuclease digests 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 CaCl2. CaCl2 is essential for activity.
- Enzyme Commission Number: EC 3.1.31.11
- Enzyme Concentration: 0.1 U/µl
- Optimum Reaction Temperature: 37°C
- Unit Definition: One unit (U) will produce 1.0 µmole of acid soluble polynucleotides from native DNA per min at pH 8.8 at 37°C, based on EM/260 = 10,000 for the mixed nucleotides.

Proteinase K
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.
- Specifications:
  - Cat. No.: D3000-1
  - Size: 10 U/100 µl

Protein Expression & Enzymes

GpC Methylase (M. CoIPI)
The GpC Methylase from Zymo Research completely methylates all cytosine bases at the 5' position in double-stranded, non-methylated and hemi-methylated DNA having the dinucleotide sequence 5'-GpC-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. See p. 41 for details.

Specifications:
- Provided in solution (4 U/µl) with 10X GpC Reaction Buffer and 20X SAM (S-adenosylmethionine).
- Source: Recombinant GpC Methylase is isolated from Escherichia coli expressing the methyltransferase gene from a Chlorella virus.
- Heat Inactivation: 65°C for 20 min.

Unit Definition:
- One unit (U) is defined as the amount of enzyme required to protect 1 µg of a DNA against cleavage by HaeII restriction endonuclease in a total reaction volume of 20 µl for 1 hour at 37°C.

Optimum Reaction Temperature:
- 37°C

Heat Inactivation:
- 65°C for 20 min.

Enzyme Inactivation:
- Provided in solution (4 U/µl) with 10X GpC Reaction Buffer and 20X SAM (S-adenosylmethionine).

Enzyme Concentration:
- 1 U/µl

Protein Expressions & Enzymes

dsDNA Shearase™ Plus
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. See p. 42 for details.

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.

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.

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.

pH and Temperature Range:
- > 30 units/mg protein
- pH 7.5 at 37°C

Enzyme Commission Number:
- 4.2.1.1

Specifications:
- Lyophilized enzyme provided with Proteinase K Storage Buffer.
- Specifications:
  - Cat. No.: D3000-1
  - Size: 10 U/100 µl

Proteinase K
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 RNA preparations from microorganisms, cells, and plants.

Specifications:
- Lyophilized enzyme provided with Proteinase K Storage Buffer.
- Specifications:
  - Cat. No.: D3000-2-1
  - Size: 5 mg
  - Cat. No.: D3000-2-20
  - Size: 20 mg

Protein Expressions & Enzymes

9 Protein Expression & Enzymes
**Enzymes**

**Protein Expression & Enzymes**

---

**QuestTag™ PreMix and QuestTag™ qPCR PreMix**

QuestTag™ PreMix is supplied as a convenient 2X concentrated "master mix for robust PCR with little or no by-product formation. It has been optimized for the non-biased amplification of cDNA, 5'-methylcytosine (5-mC), 5-hydroxymethylcytosine (5-hmC), and glucosyl-5-hydroxymethylcytosine (g5-hmC) containing DNA, ensuring high yield amplification across a wide range of templates. The QuestTag™ PreMix differs from QuestTag™ qPCR PreMix in that it excludes SYTO® 9 dye from the PreMix solution, making it compatible with real-time and quantitative PCR with fluorescent dyes of the researcher’s choosing. QuestTag™ DNA Polymerase has 3′-terminal transferase activity. The addition of “A” overhangs to amplified DNA makes it ideal for use in TA-cloning. See p. 39 for details.

**Specifications:**
- Provided as a 2X PreMix (E2050, E2051) or 2X qPCR PreMix (E2052, E2053) containing SYTO® 9 dye.
- Source: Recombinant Enzyme
- Activity: 5′ – 3′ polymerization
- Enzyme Concentration: Reaction conditions at 1X (20 µl total volume) will contain 2 units of QuestTag™ DNA polymerase
- Optimum Reaction Temperature: 72°C
- Unit Definition: One unit (U) is defined as the amount of enzyme required for the incorporation of 10 nmol dNTPs into an acid-insoluble form in 30 minutes at 72°C.

---

**Yeast (0.8 - 1.0 OD<sub>1,3</sub>)-glucan laminaripentaohydrolase**

**Essential Enzyme:** *Arthrobacter luteus*

**Source:** Zymo Research

**Specifications:**
- Lyophilized enzyme provided with Zymolyase Storage buffer.
- Zymolyase from Zymo Research is prepared from *Arthrobacter luteus*.
- Zymolyase 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. See p. 174 for details.

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zymolyase</td>
<td>E1004</td>
<td>1,000 U</td>
</tr>
<tr>
<td>R-Zymolyase</td>
<td>E1008</td>
<td>1,000 U</td>
</tr>
</tbody>
</table>

---

**Zymolyase**

Digestion of yeast and fungal cell walls is necessary for many experimental procedures including spheroplasting, immunofluorescence, transformation, protein purification, and others. The use of 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. See p. 174 for details.

**Specifications:**
- Lyophilized enzyme provided with Zymolyase Storage buffer.
- Source: *Arthrobacter luteus*

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zymolyase</td>
<td>E1004</td>
<td>1,000 U</td>
</tr>
<tr>
<td>R-Zymolyase</td>
<td>E1008</td>
<td>1,000 U</td>
</tr>
</tbody>
</table>

---

**ZymoTaq™ DNA Polymerase**

ZymoTaq™ 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. ZymoTaq™ 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. See p. 38 for details.

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZymoTaq™ DNA Polymerase</td>
<td>E2001</td>
<td>50 rxns</td>
</tr>
<tr>
<td>R-Zymolyase</td>
<td>E2002</td>
<td>50 rxns</td>
</tr>
</tbody>
</table>

---

**RNase A**

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 suitable 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.
- Source: Bovine Pancreas

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1008-8</td>
<td>8 mg</td>
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</tr>
<tr>
<td>E1008-24</td>
<td>24 mg</td>
<td></td>
</tr>
<tr>
<td>E1008-35</td>
<td>35 mg</td>
<td></td>
</tr>
</tbody>
</table>

---

**SYTO® 9 dye**

SYTO® 9 dye is a registered trademark of Molecular Probes, Inc.

---

**Product Cat. No. Size**

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zymolyase</td>
<td>E1004</td>
<td>1,000 U</td>
</tr>
<tr>
<td>R-Zymolyase</td>
<td>E1008</td>
<td>1,000 U</td>
</tr>
</tbody>
</table>

---

**DYNAActive™ DNA Polymerase**

DYNAActive™ DNA Polymerase has been optimized for the non-biased amplification of cystosine, 5-methylcytosine (5-mC), 5-hydroxymethylcytosine (5-hmC), and glucosyl-5-hydroxymethylcytosine (g5-hmC) containing DNA, ensuring high yield amplification across a wide range of templates. The DYNAActive™ DNA Polymerase has 3′-terminal transferase activity. The addition of “A” overhangs to amplified DNA makes it ideal for use in TA-cloning. See p. 174 for details.

---

**DYNAActive™ PreMix**

DYNAActive™ PreMix is supplied as a convenient 2X concentrated “master mix for robust PCR with little or no by-product formation. It has been optimized for the non-biased amplification of cDNA, 5′-methylcytosine (5-mC), 5-hydroxymethylcytosine (5-hmC), and glucosyl-5-hydroxymethylcytosine (g5-hmC) containing DNA, ensuring high yield amplification across a wide range of templates. The DYNAActive™ PreMix differs from DYNAActive™ qPCR PreMix in that it excludes SYTO® 9 dye from the PreMix solution, making it compatible with real-time and quantitative PCR with fluorescent dyes of the researcher’s choosing. DYNAActive™ DNA Polymerase has 3′-terminal transferase activity. The addition of “A” overhangs to amplified DNA makes it ideal for use in TA-cloning. See p. 39 for details.

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zymolyase</td>
<td>E1004</td>
<td>1,000 U</td>
</tr>
<tr>
<td>R-Zymolyase</td>
<td>E1008</td>
<td>1,000 U</td>
</tr>
</tbody>
</table>

---

**Product**

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zymolyase</td>
<td>E1004</td>
<td>1,000 U</td>
</tr>
<tr>
<td>R-Zymolyase</td>
<td>E1008</td>
<td>1,000 U</td>
</tr>
</tbody>
</table>

---

**DYNAActive™ DNA Polymerase**

DYNAActive™ DNA Polymerase has been optimized for the non-biased amplification of cystosine, 5-methylcytosine (5-mC), 5-hydroxymethylcytosine (5-hmC), and glucosyl-5-hydroxymethylcytosine (g5-hmC) containing DNA, ensuring high yield amplification across a wide range of templates. The DYNAActive™ DNA Polymerase has 3′-terminal transferase activity. The addition of “A” overhangs to amplified DNA makes it ideal for use in TA-cloning. See p. 38 for details.

**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) of lytic activity is defined as the amount of enzyme that catalyzes a 10% decrease in optical density at 800 nm (OD<sub>800</sub>) in 30 minutes at 30°C.
- Assay Condition: Yeast (0.8 - 1.0 OD<sub>1,3</sub>) in 50 mM potassium phosphate, pH 7.5, 10 mM 2-mercaptoethanol.

<table>
<thead>
<tr>
<th>Product</th>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>E2003</td>
<td>50 rxns</td>
<td></td>
</tr>
<tr>
<td>E2004</td>
<td>200 rxns</td>
<td></td>
</tr>
</tbody>
</table>
Zymo Research offers a range of premade, ready to use 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

Antibiotics

Ampicillin Sodium................................................................................................................. 198
Chloramphenicol.................................................................................................... 198
Kanamycin Sulfate................................................................................................................. 198
Tetracycline Hydrochloride................................................................................................... 198

Chemicals

5-FOA.......................................................................................................................... 199
Arabinose.................................................................................................................. 199
His-Affinity Gel....................................................................................................................... 199
IPTG............................................................................................................................. 199
X-GAL........................................................................................................................... 199

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 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.

- **Purity:** ≥ 98%
- **Concentration:** 100 mg/ml
- **Storage:** -20°C

**Chloramphenicol**
Premade chloramphenicol solution. Chloramphenicol inhibits bacterial protein synthesis by binding 50S ribosomal subunit. Commonly used for the amplification of vectors in Gram (-) bacteria. Effective against both Gram (-) and Gram (+) bacteria and some mycobacteria.

- **Purity:** ≥ 97%
- **Concentration:** 10 mg/ml
- **Storage:** -20°C

**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.

- **Purity:** ≥ 98%
- **Concentration:** 35 mg/ml
- **Storage:** -20°C

**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.

- **Purity:** ≥ 98%
- **Concentration:** 10 mg/ml
- **Storage:** -20°C

**Chemicals**

**5-FOA (5-Fluoroorotic Acid)**
Synthetic 5-FOA monohydrate powder or 100X (100 mg/ml) solution in DMSO. See p. 182 for details.

- **Formula:** C$_{5}$H$_{3}$FN$_{2}$O$_{4}$ • H$_{2}$O
- **M. W.:** 174.0 g/mol
- **Purity:** ≥ 98%

**Arabinose**
Concentrated arabinose inducer for XJ Autolysis™ strains.

- **Concentration:** 500X; 1.5 M L-arabinose, 0.5 M MgCl$_{2}$
- **Storage:** -20°C

**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. 185, for details.

**IPTG (Isopropyl-β-D-thiogalactopyranoside)**
Premade IPTG in water.

**X-Gal (5-bromo-4-chloro-3-indolyl β-D-galactopyranoside)**
Sterile, ready to use X-Gal solution.

**Purity:** ≥ 98%
**Concentration:** 0.5 M
**Storage:** -20°C
**Concentration:** 2% w/v in DMF
**Storage:** -20°C

---

**Cat. No.** | **Size**
--- | ---
A1001-3 | 5 ml
A1001-25 | 5 x 5 ml

---

**Cat. No.** | **Size**
--- | ---
P9001-1 | 5-FOA 1g (Powder)
P9001-5 | 5-FOA 5g (Powder)
P9003 | 100X 5-FOA 10 ml (Liquid)

---

**Cat. No.** | **Size**
--- | ---
A0001-1 | 1 ml
A0001-10 | 10 x 1 ml

---

**Cat. No.** | **Size**
--- | ---
P2003-2 | 14 ml

---

**Cat. No.** | **Size**
--- | ---
11001-5 | 5 ml
11001-25 | 5 x 5 ml

---

**Cat. No.** | **Size**
--- | ---
X1001-5 | 5 ml
X1001-25 | 5 x 5 ml
For instance, our innovative Zymo-Spin™ I column has zero matrix, eliminating the likelihood of buffer carryover. Rapid and complete filtration of solutions through the column makes the Zymo-Spin™ series of columns and plates from Zymo Research the ideal choice for purifying DNA and/or RNA. The nucleic acid binding columns are vital components of the purification process. Our Zymo-Spin™ technology ensures high-quality, high-yield DNA or RNA.

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. Our 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. Products featuring BashingBead™ lysis technology were spotlighted in the chapters on environmental DNA and RNA purification. 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 Squash™ 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

<table>
<thead>
<tr>
<th>Name</th>
<th>Format</th>
<th>DNA Binding Capacity / RNA Binding Capacity</th>
<th>Elution</th>
<th>Compatibility</th>
<th>Cat. No. / Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zymo-Spin™ I IC</td>
<td>DNA/RNA binding</td>
<td>5 µg / 10 µg</td>
<td>≥ 6 µl</td>
<td>microcentrifuge, vacuum manifold</td>
<td>C1003-50 – 50 pack, C1003-250 – 250 pack</td>
</tr>
<tr>
<td>Zymo-Spin™ I IC-XL</td>
<td>DNA/RNA binding</td>
<td>10 µg</td>
<td>≥ 6 µl</td>
<td>microcentrifuge, vacuum manifold</td>
<td>C1002-25 – 25 pack, C1002-100 – 100 pack</td>
</tr>
<tr>
<td>Zymo-Spin™ I IC-S</td>
<td>DNA binding</td>
<td>5 µg</td>
<td>≥ 6 µl</td>
<td>microcentrifuge, vacuum manifold</td>
<td>C1015-25 – 25 pack, C1015-100 – 100 pack</td>
</tr>
</tbody>
</table>

### Zymo-Spin™ II Columns

<table>
<thead>
<tr>
<th>Name</th>
<th>Format</th>
<th>DNA Binding Capacity / RNA Binding Capacity</th>
<th>Elution</th>
<th>Compatibility</th>
<th>Cat. No. / Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zymo-Spin™ II IC</td>
<td>DNA/RNA binding</td>
<td>25 µg / 50 µg</td>
<td>≥ 25 µl</td>
<td>microcentrifuge, vacuum manifold</td>
<td>C1005-50 – 50 pack, C1005-250 – 250 pack</td>
</tr>
<tr>
<td>Zymo-Spin™ II IIC</td>
<td>DNA/RNA binding</td>
<td>25 µg / 50 µg</td>
<td>≥ 25 µl</td>
<td>microcentrifuge, vacuum manifold</td>
<td>C1011-50 – 50 pack, C1011-250 – 250 pack</td>
</tr>
</tbody>
</table>

### Zymo-Spin™ III Columns

<table>
<thead>
<tr>
<th>Name</th>
<th>Format</th>
<th>DNA Binding Capacity / RNA Binding Capacity</th>
<th>Elution</th>
<th>Compatibility</th>
<th>Cat. No. / Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zymo-Spin™ III-F</td>
<td>filtration column</td>
<td>100 µg</td>
<td>≥ 2 ml</td>
<td>microcentrifuge, vacuum manifold</td>
<td>C1007-25 – 25 pack, C1007-50 – 50 pack</td>
</tr>
<tr>
<td>Zymo-Spin™ III-HRC</td>
<td>DNA/RNA inhibitor removal filtration column</td>
<td>125 µg / 250 µg</td>
<td>≥ 2 ml</td>
<td>microcentrifuge, vacuum manifold</td>
<td>C1013-10 – 10 pack, C1013-20 – 20 pack</td>
</tr>
<tr>
<td>Zymo-Spin™ III-P</td>
<td>DNA binding</td>
<td>10 mg / ≥ 2 ml</td>
<td>≥ 2 ml</td>
<td>microcentrifuge, vacuum manifold</td>
<td>C1044-5 – 5 pack</td>
</tr>
</tbody>
</table>

### Zymo-Spin™ IV Columns

<table>
<thead>
<tr>
<th>Name</th>
<th>Format</th>
<th>DNA Binding Capacity / RNA Binding Capacity</th>
<th>Elution</th>
<th>Compatibility</th>
<th>Cat. No. / Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zymo-Spin™ IV-F</td>
<td>filtration column</td>
<td>800 µl</td>
<td>≥ 1 ml</td>
<td>microcentrifuge, vacuum manifold</td>
<td>C1057-50 – 50 pack, C1058-50 – 50 pack</td>
</tr>
<tr>
<td>Zymo-Spin™ IV-HRC</td>
<td>DNA/RNA inhibitor removal filtration column</td>
<td>500 µg / ≥ 2 ml</td>
<td>≥ 1 ml</td>
<td>microcentrifuge, vacuum manifold</td>
<td>C1007-25 – 25 pack, C1007-50 – 50 pack</td>
</tr>
</tbody>
</table>

### Zymo-Spin™ V Columns

<table>
<thead>
<tr>
<th>Name</th>
<th>Format</th>
<th>DNA Binding Capacity / RNA Binding Capacity</th>
<th>Elution</th>
<th>Compatibility</th>
<th>Cat. No. / Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zymo-Spin™ V-F</td>
<td>DNA/RNA binding</td>
<td>100 µg</td>
<td>≥ 1 ml</td>
<td>microcentrifuge, vacuum manifold</td>
<td>C1057-50 – 50 pack, C1058-50 – 50 pack</td>
</tr>
<tr>
<td>Zymo-Spin™ V-HRC</td>
<td>DNA/RNA inhibitor removal filtration column</td>
<td>125 µg / 250 µg</td>
<td>≥ 1 ml</td>
<td>microcentrifuge, vacuum manifold</td>
<td>C1007-25 – 25 pack, C1007-50 – 50 pack</td>
</tr>
</tbody>
</table>

### Zymo-Spin™ VI Columns

<table>
<thead>
<tr>
<th>Name</th>
<th>Format</th>
<th>DNA Binding Capacity / Elution</th>
<th>Binding Capacity / Elution</th>
<th>Elution</th>
<th>Compatibility</th>
<th>Cat. No. / Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zymo-Spin™ VI F</td>
<td>DNA binding</td>
<td>50 µg / ≥ 2 ml</td>
<td>centrifuge, vacuum manifold</td>
<td>≥ 2 ml</td>
<td>microcentrifuge, vacuum manifold</td>
<td>C1057-50 – 50 pack, C1058-50 – 50 pack</td>
</tr>
<tr>
<td>Zymo-Spin™ VI P</td>
<td>Plasmid DNA binding</td>
<td>10 mg / 2 ml</td>
<td>centrifuge, vacuum manifold</td>
<td>≥ 2 ml</td>
<td>microcentrifuge, vacuum manifold</td>
<td>C1057-50 – 50 pack, C1058-50 – 50 pack</td>
</tr>
</tbody>
</table>
**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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1003-50</td>
<td>50 pack</td>
</tr>
<tr>
<td>C1003-250</td>
<td>250 pack</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1004-50</td>
<td>50 pack</td>
</tr>
<tr>
<td>C1004-250</td>
<td>250 pack</td>
</tr>
</tbody>
</table>

**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 fluorescent dye removal. 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, and 20 µg of RNA, in ≥ 10 µl eluate. Capacity is 1 ml.

**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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1015-50</td>
<td>50 pack</td>
</tr>
<tr>
<td>C1015-25</td>
<td>25 pack</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1014-50</td>
<td>50 pack</td>
</tr>
<tr>
<td>C1014-250</td>
<td>250 pack</td>
</tr>
</tbody>
</table>

**Zymo-Spin™ PI**
The Zymo-Spin™ PI column features durable polypropylene construction and is the same column featured in the His-Spin Protein Miniprep™ (p. 187). Capacity is 800 µl. Note: Column only; does not contain His-Affinity Gel.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>P0009-1</td>
<td>50 pack</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1008-50</td>
<td>50 pack</td>
</tr>
<tr>
<td>C1008-250</td>
<td>250 pack</td>
</tr>
</tbody>
</table>

**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 ≥ 25 µl eluate. Capacity is 800 µl.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1006-50</td>
<td>50 pack</td>
</tr>
<tr>
<td>C1006-250</td>
<td>250 pack</td>
</tr>
</tbody>
</table>

**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 50 µg of RNA, in ≥ 35 µl eluate. Capacity is 900 µl.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1005-50</td>
<td>50 pack</td>
</tr>
<tr>
<td>C1005-250</td>
<td>250 pack</td>
</tr>
</tbody>
</table>

**Zymo-Spin™ III-XL**
The Zymo-Spin™ III-XL column can be used either in microcentrifuges or on vacuum manifolds for the purification of DNA and/or RNA. The Zymo-Spin™ III-XL features durable polypropylene construction and contains a unique silica-based matrix that allows purification of up to 50 µg of DNA, and 100 µg of RNA, in ≥ 50 µl eluate. Capacity is 800 µl.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1006-50</td>
<td>50 pack</td>
</tr>
<tr>
<td>C1006-250</td>
<td>250 pack</td>
</tr>
</tbody>
</table>

**Zymo-Spin™ III-Gel**
The Zymo-Spin™ III-Gel column is a spin column designed for complex protein purification. The Zymo-Spin™ III-Gel 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 ≥ 25 µl eluate. Capacity is 800 µl.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1007-50</td>
<td>50 pack</td>
</tr>
<tr>
<td>C1007-250</td>
<td>250 pack</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1057-50</td>
<td>50 pack</td>
</tr>
<tr>
<td>C1057-250</td>
<td>250 pack</td>
</tr>
</tbody>
</table>

Zymo-Spin™ III-HRC
The Zymo-Spin™ III-HRC 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. The column filtration membrane has an approximate 35 - 125 µm pore size. Capacity is 50 - 200 µl.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1058-50</td>
<td>50 pack</td>
</tr>
</tbody>
</table>

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 100 µl.

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 elution buffer or water. The capacity of the spin column is 400 µl.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1012-25</td>
<td>25 pack</td>
</tr>
<tr>
<td>C1012-50</td>
<td>50 pack</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1024-25</td>
<td>25 pack</td>
</tr>
<tr>
<td>C1024-50</td>
<td>50 pack</td>
</tr>
</tbody>
</table>

Zymo-Spin™ VI
The versatile Zymo-Spin™ VI column can be used either in microcentrifuges, centrifuges, or on-vacuum manifolds for the purification of DNA. Exclusive to this column is a luer-Lock bottom assembly and conical tip. The Zymo-Spin™ VI 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).

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1013-10</td>
<td>10 pack</td>
</tr>
<tr>
<td>C1013-20</td>
<td>20 pack</td>
</tr>
</tbody>
</table>

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).

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1044-5</td>
<td>5 pack</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1056-25</td>
<td>25 pack</td>
</tr>
<tr>
<td>C1056-50</td>
<td>50 pack</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1016-5</td>
<td>5 pack</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1042-25</td>
<td>25 pack</td>
</tr>
</tbody>
</table>

Zymo-Spin™ V-P with Zymo Midi Filter™
The Zymo-Spin™ V-P 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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1021-25</td>
<td>25 pack</td>
</tr>
</tbody>
</table>

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.
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.

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.

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.

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 silicone lubricant for easier handling.

ZRC-GF™
The ZRC-GF™ 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.

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.

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.

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.

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.

DNase/RNase-free Tube (1.5 ml)
DNase/RNase-free 1.5 ml microcentrifuge tubes made of durable polypropylene construction.

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.

Reservoirs and Tubes

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1018-10</td>
<td>10 pack</td>
<td>15 ml Conical Reservoir</td>
<td>25 pack</td>
</tr>
<tr>
<td>C1018-20</td>
<td>20 pack</td>
<td>15 ml Conical Reservoir</td>
<td></td>
</tr>
<tr>
<td>C1017-10</td>
<td>10 pack</td>
<td>50 ml Conical Reservoir</td>
<td>25 pack</td>
</tr>
<tr>
<td>C1017-20</td>
<td>20 pack</td>
<td>50 ml Conical Reservoir</td>
<td></td>
</tr>
<tr>
<td>C1018-25</td>
<td>25 pack</td>
<td>600 ml Reservoir</td>
<td></td>
</tr>
<tr>
<td>C1018-50</td>
<td>50 pack</td>
<td>600 ml Reservoir</td>
<td></td>
</tr>
<tr>
<td>C1036-5</td>
<td>5 pack</td>
<td>ZymoPURE™ Syringe Filter and Plunger Set</td>
<td></td>
</tr>
<tr>
<td>C1037-10</td>
<td>10 pack</td>
<td>ZymoPURE™ Syringe Filter and Plunger Set</td>
<td></td>
</tr>
<tr>
<td>C1037-20</td>
<td>20 pack</td>
<td>ZymoPURE™ Syringe Filter and Plunger Set</td>
<td></td>
</tr>
<tr>
<td>C1037-5</td>
<td>5 pack</td>
<td>ZymoPURE™ Syringe Filter and Plunger Set</td>
<td></td>
</tr>
<tr>
<td>C1038-1</td>
<td>1 pack</td>
<td>ZymoPURE™ Syringe Filter and Plunger Set</td>
<td></td>
</tr>
<tr>
<td>C1038-5</td>
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<td>ZymoPURE™ Syringe Filter and Plunger Set</td>
<td></td>
</tr>
<tr>
<td>C1038-10</td>
<td>10 pack</td>
<td>ZymoPURE™ Syringe Filter and Plunger Set</td>
<td></td>
</tr>
<tr>
<td>C1038-20</td>
<td>20 pack</td>
<td>ZymoPURE™ Syringe Filter and Plunger Set</td>
<td></td>
</tr>
<tr>
<td>C1038-50</td>
<td>50 pack</td>
<td>ZymoPURE™ Syringe Filter and Plunger Set</td>
<td></td>
</tr>
<tr>
<td>C1038-100</td>
<td>100 pack</td>
<td>ZymoPURE™ Syringe Filter and Plunger Set</td>
<td></td>
</tr>
<tr>
<td>C1039-50</td>
<td>50 tubes</td>
<td>Collection Tube (2.0 ml)</td>
<td></td>
</tr>
<tr>
<td>C1039-100</td>
<td>100 tubes</td>
<td>Collection Tube (2.0 ml)</td>
<td></td>
</tr>
<tr>
<td>C1040-50</td>
<td>50 tubes</td>
<td>DNase/RNase-free Tube (1.5 ml)</td>
<td></td>
</tr>
<tr>
<td>C1040-100</td>
<td>100 tubes</td>
<td>DNase/RNase-free Tube (1.5 ml)</td>
<td></td>
</tr>
<tr>
<td>C1041-50</td>
<td>50 tubes</td>
<td>Clear Tubes (2.0 ml)</td>
<td></td>
</tr>
<tr>
<td>C1041-100</td>
<td>100 tubes</td>
<td>Clear Tubes (2.0 ml)</td>
<td></td>
</tr>
</tbody>
</table>
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.

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.

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.

DNA Affinity Beads

MagBinding Beads
Paramagnetic DNA affinity matrix. Featured in Zyppy™ 96 Plasmid MagBead Miniprep (p. 68) and EZ DNA Methylation™ Magpreps (p. 13-15).

Silicon-A™ Plates

<table>
<thead>
<tr>
<th>Name</th>
<th>Silicon-A™ Plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format</td>
<td>DNA/RNA binding - up to 5 µg of DNA, and 10 µg of RNA, per well</td>
</tr>
<tr>
<td>Capacity / Elution</td>
<td>600 µl per well / ≥ 30 µl</td>
</tr>
<tr>
<td>Dimensions (HxWxL)</td>
<td>19 mm x 83 mm x 125 mm</td>
</tr>
<tr>
<td>Compatibility</td>
<td>centrifuge</td>
</tr>
<tr>
<td>Matrix / Construction</td>
<td>silica-based / polypropylene</td>
</tr>
<tr>
<td>Cat. No. / Size</td>
<td>C2001 – 2 plates</td>
</tr>
</tbody>
</table>

Zymo-Spin™ I-96 Plates

<table>
<thead>
<tr>
<th>Name</th>
<th>Zymo-Spin™ I-96 Plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format</td>
<td>DNA/RNA binding - up to 5 µg of DNA, and 10 µg of RNA, per well</td>
</tr>
<tr>
<td>Capacity / Elution</td>
<td>1.1 ml per well / ≥ 10 µl</td>
</tr>
<tr>
<td>Dimensions (HxWxL)</td>
<td>35 mm x 83 mm x 125 mm</td>
</tr>
<tr>
<td>Compatibility</td>
<td>centrifuge</td>
</tr>
<tr>
<td>Matrix / Construction</td>
<td>silica-based / polypropylene</td>
</tr>
<tr>
<td>Cat. No. / Size</td>
<td>C2004 – 2 plates</td>
</tr>
</tbody>
</table>

Zymo-Spin™ IB-96 Plates

<table>
<thead>
<tr>
<th>Name</th>
<th>Zymo-Spin™ IB-96 Plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format</td>
<td>DNA binding - up to 5 µg of DNA per well</td>
</tr>
<tr>
<td>Capacity / Elution</td>
<td>600 µl per well / ≥ 15 µl</td>
</tr>
<tr>
<td>Dimensions (HxWxL)</td>
<td>19 mm x 83 mm x 125 mm</td>
</tr>
<tr>
<td>Compatibility</td>
<td>centrifuge</td>
</tr>
<tr>
<td>Matrix / Construction</td>
<td>silica-based / polypropylene</td>
</tr>
<tr>
<td>Cat. No. / Size</td>
<td>C2006 – 2 plates</td>
</tr>
</tbody>
</table>

Zymo-Spin™ I-96-XL Plates

<table>
<thead>
<tr>
<th>Name</th>
<th>Zymo-Spin™ I-96-XL Plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format</td>
<td>DNA binding - up to 5 µg of DNA per well</td>
</tr>
<tr>
<td>Capacity / Elution</td>
<td>1.1 ml per well / ≥ 15 µl</td>
</tr>
<tr>
<td>Dimensions (HxWxL)</td>
<td>35 mm x 83 mm x 125 mm</td>
</tr>
<tr>
<td>Compatibility</td>
<td>centrifuge</td>
</tr>
<tr>
<td>Matrix / Construction</td>
<td>silica-based / polypropylene</td>
</tr>
<tr>
<td>Cat. No. / Size</td>
<td>C2010 – 2 plates</td>
</tr>
</tbody>
</table>

Technology Overview: Zymo-Spin™ 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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2001</td>
<td>2 plates</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2004</td>
<td>2 plates</td>
</tr>
<tr>
<td>C2004-SW</td>
<td>2 plates</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2006</td>
<td>2 plates</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2010</td>
<td>2 plates</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2002</td>
<td>2 plates</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2003</td>
<td>2 plates</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2008</td>
<td>2 plates</td>
</tr>
<tr>
<td>C2005</td>
<td>2 plates/foil</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1001-2</td>
<td>2 blocks</td>
</tr>
<tr>
<td>P1005-10</td>
<td>10 blocks</td>
</tr>
</tbody>
</table>
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, presealable foil cover. Capacity is 2 ml per round bottom well.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1002-2</td>
<td>2 blocks/foils</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>S6002-96-3</td>
<td>1 rack</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2007-2</td>
<td>2 foil</td>
</tr>
<tr>
<td>C2007-6</td>
<td>6 foil</td>
</tr>
</tbody>
</table>

96-Well Block with Cover Foil Feature durable, clear polypropylene construction. Each has a level footprint and conforms to laboratory standards. Provided with adhesive, presealable foil cover. Capacity is 2 ml per round bottom well.

Cat. No. Size
P1002-2 2 blocks/foils

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.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>S6002-96-2</td>
<td>1 rack</td>
</tr>
</tbody>
</table>

Cell Disruptors & Accessories

TerraLyzer™
The TerraLyzer™ can be used to lyse microbes in soil, sediment, sludge, and fecal samples and can effectively process tough-to-lyse fungal, algal, plant, and animal tissues. It can be used at any remote location and in most weather conditions when immediate sample collection, processing, and preservation are required by the researcher. The device is compatible with most 2.0 ml tubes containing lysis matrix, though ZR BashingBead™ Tubes should be used to obtain maximum yields of DNA/RNA/Protein from tough-to-lyse and environmental sample sources.

<table>
<thead>
<tr>
<th>Description</th>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>TerraLyzer™</td>
<td>S6002</td>
<td>1 unit</td>
</tr>
</tbody>
</table>

Disruptor Genie®
The Disruptor Genie® is an automated cell disruption device that is commonly used for the disruption and lysis of yeast, bacteria, and plant and animal tissue. Provided with a head assembly to accommodate up to twelve 2 ml tubes. Intended for use with ZR BashingBead™ Lysis Tubes.

<table>
<thead>
<tr>
<th>Description</th>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. HiPrep™ Adapter (48 x 2 ml tubes)</td>
<td>S6005-1</td>
<td>1 unit</td>
</tr>
<tr>
<td>B. CoolPrep™ Adapter (24 x 2 ml tubes)</td>
<td>S6005-2</td>
<td>1 unit</td>
</tr>
<tr>
<td>C. TeenPrep™ Adapter (12 x 15 ml tubes)</td>
<td>S6005-3</td>
<td>1 unit</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Description</th>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>S6005 1 unit</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FastPrep® Accessories

For more information, please visit www.zymoresearch.com | info@zymoresearch.com | tel: (949) 679-1190 | toll-free: (888) 882-9682 | fax: (949) 266-9452
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 small insects. Intended for use with conventional style 1.5 ml microcentrifuge tubes.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1001</td>
<td>10 pack</td>
</tr>
<tr>
<td>M1001-50</td>
<td>50 pack</td>
</tr>
</tbody>
</table>

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 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 mouse tail snips and small insects. Comes with 96-Well deep well blocks for efficient sample recovery.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1002-5</td>
<td>5 pk/1 blocks</td>
</tr>
<tr>
<td>M1002-20</td>
<td>20 pk/2 blocks</td>
</tr>
</tbody>
</table>

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 mouse tail snips and small insects. Comes with 96-Well deep well blocks for efficient sample recovery.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1004-2</td>
<td>2 pk/2 blocks</td>
</tr>
<tr>
<td>M1004-5</td>
<td>5 pk/5 blocks</td>
</tr>
</tbody>
</table>

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. See p. 152 for more details.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1001</td>
<td>1 bottle</td>
</tr>
<tr>
<td>S1001-5</td>
<td>5 bottles</td>
</tr>
<tr>
<td>S1001-B</td>
<td>27kg bag (bulk)</td>
</tr>
</tbody>
</table>

Other Instruments & Accessories

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. See next page.

<table>
<thead>
<tr>
<th>Description</th>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>120V</td>
<td>S5009</td>
<td>1 unit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>230V, European Plug</td>
<td>S5002</td>
<td>1 unit</td>
</tr>
</tbody>
</table>

Vortex-Genie® is a registered trademark of Scientific Industries, Inc.

Vortex-Genie® Family Accessories

<table>
<thead>
<tr>
<th>Description</th>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Microplate Foam Inserts: Accommodates up to 35 microplates. Fits into 6 in. platform</td>
<td>S5001-1</td>
<td>2 units</td>
</tr>
<tr>
<td>B. Microplate Foam Inserts: Accommodates one microplate. Fits into 6 in. platform</td>
<td>S5001-2</td>
<td>2 units</td>
</tr>
<tr>
<td>C. 29.5 mm Tube Foam Inserts: Fits into round platform</td>
<td>S5001-3</td>
<td>2 units</td>
</tr>
<tr>
<td>D. Pop-off Cup: Mixing and vortexing in single tubes. Use with Vortex-Genie®, Disruptor Genie®, and the Vortex-Genie® Family</td>
<td>S5001-4</td>
<td>1 unit</td>
</tr>
</tbody>
</table>

E. Horizontal 5 ml Tube Holder: Holds 12 tubes. Use with any Vortex-Genie®
F. Horizontal 15 ml Tube Holder: Holds 12 tubes. Use with any Vortex-Genie®
G. Horizontal Microtube Holder: Holds 36 microtubes. Use with any Vortex-Genie®

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.

<table>
<thead>
<tr>
<th>Description</th>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>120V</td>
<td>S5000</td>
<td>1 unit</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Description</th>
<th>Cat. No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>120V</td>
<td>S5000</td>
<td>1 unit</td>
</tr>
</tbody>
</table>

Vortex-Genie®, Disruptor Genie®, and MagStir Genie® are registered trademarks of Scientific Industries, Inc.
### DNA Clean-up

**Product Chart**

| Specifications | Format | Spin-Column | 96-Well | Spin-Column | 96-Well | Spin-Column | 96-Well | Spin-Column | 96-Well | Spin-Column | 96-Well | Spin-Column | 96-Well | Spin-Column | 96-Well | Spin-Column | 96-Well |
|----------------|--------|-------------|---------|-------------|---------|-------------|---------|-------------|---------|-------------|---------|-------------|---------|-------------|---------|-------------|---------|-------------|
| Binding Capacity | 5 µg    | 5 µg        | 25 µg   | 100 µg      | 5 µg    | 5 µg        | 3 µg    | 10 µg       | 16 mg   |
| Elution Volume  | ≥ 6 µl  | ≥ 6 µl      | ≥ 25 µl | ≥ 150 µl    | ≥ 6 µl  | ≥ 6 µl      | ≥ 10 µl | ≥ 10 µl     | ≥ 10 µl |
| Processing Time | 2 min   | 15 min      | 2 min   | 15 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 Cleanup
- Size Selection (eg. Library Prep, primer dimer removal)

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- Page 88
- Page 89
- Page 89

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### DNA Clean-up

**Product Chart**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Format</th>
<th>Spin-Column</th>
<th>96-Well</th>
<th>Spin-Column</th>
<th>96-Well</th>
<th>Spin-Column</th>
<th>96-Well</th>
<th>Spin-Column</th>
<th>96-Well</th>
<th>Spin-Column</th>
<th>96-Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binding Capacity</td>
<td>10 µg</td>
<td>25 µg</td>
<td>5 µg</td>
<td>5 µg</td>
<td>5 µg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elution Volume</td>
<td>≥ 10 µl</td>
<td>≥ 15 µl</td>
<td>≥ 10 µl</td>
<td>≥ 6 µl</td>
<td>≥ 15 µl</td>
<td>≥ 10 µl</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processing Time</td>
<td>5 min</td>
<td>5 min</td>
<td>20 min</td>
<td>2 min</td>
<td>10 min</td>
<td>5 min</td>
<td>10 min</td>
<td>15 min</td>
<td>20 min</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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

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## Plasmid DNA Purification

### Product Chart

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Format</strong></td>
<td>Spin-Column</td>
<td>Spin-Column</td>
<td>Spin-Column</td>
<td>Spin-Column</td>
<td>Spin-Column</td>
<td>Spin-Column</td>
<td>Spin-Column</td>
</tr>
<tr>
<td><strong>Elution Volume</strong></td>
<td>≥ 30 µl</td>
<td>≥ 30 µl</td>
<td>≥ 30 µl</td>
<td>≥ 30 µl</td>
<td>≥ 10 µl</td>
<td>≥ 10 µl</td>
<td>≥ 10 µl</td>
</tr>
<tr>
<td><strong>Processing Time</strong></td>
<td>15 min</td>
<td>18 min</td>
<td>18 min</td>
<td>30 min</td>
<td>15 min</td>
<td>15 min</td>
<td>25 min</td>
</tr>
<tr>
<td><strong>Culture Input</strong></td>
<td>5 ml</td>
<td>50 ml</td>
<td>150 ml</td>
<td>2.5 L</td>
<td>25 ml</td>
<td>25 ml</td>
<td>25 ml</td>
</tr>
<tr>
<td><strong>DNA Yield</strong></td>
<td>up to 100 µg</td>
<td>up to 300 µg</td>
<td>up to 1.2 mg</td>
<td>up to 10 mg</td>
<td>up to 1.2 mg</td>
<td>up to 10 mg</td>
<td>up to 25 µg</td>
</tr>
<tr>
<td><strong>Endotoxins</strong></td>
<td>≤ 0.9 EU/µg</td>
<td>≤ 0.025 EU/µg</td>
<td>≤ 0.025 EU/µg</td>
<td>≤ 0.025 EU/µg</td>
<td>≤ 0.025 EU/µg</td>
<td>≤ 0.025 EU/µg</td>
<td>≤ 0.025 EU/µg</td>
</tr>
</tbody>
</table>

### Applications

- For Use In Transfection
- For Use in Highly Sensitive Applications
- Pellet-free (Direct From Culture)
- Plasmid Recovery From E. coli

### Page Number

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### Plasmid DNA Purification

### Product Chart

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Format</strong></td>
<td>Spin-Column</td>
<td>96-Well</td>
<td>Magnetic Beads</td>
<td>Spin-Column</td>
<td>Spin-Column</td>
<td>Spin-Column</td>
<td>Spin-Column</td>
<td>Spin-Column</td>
</tr>
<tr>
<td><strong>Elution Volume</strong></td>
<td>≥ 25 µl</td>
<td>≥ 100 µl</td>
<td>≥ 200 µl</td>
<td>≥ 2 ml</td>
<td>≥ 200 µl</td>
<td>≥ 200 µl</td>
<td>≥ 100 µl</td>
<td>≥ 100 µl</td>
</tr>
<tr>
<td><strong>Processing Time</strong></td>
<td>15 min</td>
<td>18 min</td>
<td>18 min</td>
<td>50 min</td>
<td>15 min</td>
<td>15 min</td>
<td>25 min</td>
<td>25 min</td>
</tr>
<tr>
<td><strong>Culture Input</strong></td>
<td>500 µl - 3 ml</td>
<td>750 µl</td>
<td>750 µl</td>
<td>2.5 L</td>
<td>0.5 - 1 ml</td>
<td>0.5 - 1 ml</td>
<td>0.5 - 1 ml</td>
<td>0.5 - 1 ml</td>
</tr>
<tr>
<td><strong>DNA Yield</strong></td>
<td>up to 25 µg</td>
<td>up to 100 µg</td>
<td>up to 10 µg</td>
<td>20 - 100 µg</td>
<td>0.01 - 0.3 ng</td>
<td>0.01 - 0.3 ng</td>
<td>0.01 - 0.3 ng</td>
<td>0.01 - 0.3 ng</td>
</tr>
<tr>
<td><strong>Endotoxins</strong></td>
<td>≤ 0.9 EU/µg</td>
<td>≤ 0.025 EU/µg</td>
<td>≤ 0.025 EU/µg</td>
<td>≤ 0.025 EU/µg</td>
<td>≤ 0.025 EU/µg</td>
<td>≤ 0.025 EU/µg</td>
<td>≤ 0.025 EU/µg</td>
<td>≤ 0.025 EU/µg</td>
</tr>
</tbody>
</table>

### 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
- Large Plasmid Recovery From Yeast

### Page Number

67 | 67 | 68 | 69 | 69 | 177 | 177
## Genomic DNA Purification

### Product Chart

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Format</th>
<th>Spin-Column</th>
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<th>Spin-Column</th>
<th>96-Well</th>
<th>Magbead</th>
<th>Spin-Column</th>
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<th>96-Well</th>
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<tbody>
<tr>
<td>Binding Capacity</td>
<td>5 µg</td>
<td>25 µg</td>
<td>125 µg</td>
<td>5 µg</td>
<td>10 mg</td>
<td>5 µg</td>
<td>25 µg</td>
<td>5 µg</td>
<td>100 µg</td>
</tr>
<tr>
<td>Elution Volume</td>
<td>≥10 µl</td>
<td>≥10 µl</td>
<td>≥150 µl</td>
<td>≥10 µl</td>
<td>≥10 µl</td>
<td>≥10 µl</td>
<td>≥50 µl</td>
<td>≥10 µl</td>
<td>≥30 µl</td>
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<tr>
<td>Processing Time</td>
<td>15 min.</td>
<td>15 min.</td>
<td>30 min.</td>
<td>45 min.</td>
<td>1 hr</td>
<td>15 min.</td>
<td>15 min.</td>
<td>30 min.</td>
<td></td>
</tr>
</tbody>
</table>

### Applications/Samples

- Cultured Cells
- Buccal Cells/Swabs/Saliva
- Whole Blood
- Semen
- Fresh/Frozen Soft Tissue
- Fresh/Frozen Solid Tissue
- Tail Snips/Ear Punches
- Hair and Feathers
- Glass Slide
- FFPE Tissue Sections
- Tissue Sections
- 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

73 73 73 73 73 73 73 73

## Genomic DNA Purification

### Product Chart

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Format</th>
<th>Spin-Column</th>
<th>Spin-Column</th>
<th>Spin-Column</th>
<th>Spin-Column</th>
<th>Spin-Column</th>
<th>Spin-Column</th>
<th>96-Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binding Capacity</td>
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<td>5 µg</td>
<td>≤100 ng</td>
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<td>5 µg</td>
<td>25 µg</td>
<td>5 µg</td>
<td>5 µg</td>
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<tr>
<td>Elution Volume</td>
<td>≥10 µl</td>
<td>≥35 µl</td>
<td>≥30 µl</td>
<td>≥10 µl</td>
<td>≥60 µl</td>
<td>≥6 µl</td>
<td>≥10 µl</td>
<td></td>
</tr>
<tr>
<td>Processing Time</td>
<td>15 min.</td>
<td>varies</td>
<td>1 hr</td>
<td>5 hr</td>
<td>30 min.</td>
<td>15 min.</td>
<td>25 min.</td>
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### Applications/Samples

- Cultured Cells
- Buccal Cells/Swabs/Saliva
- Whole Blood
- Semen
- Fresh/Frozen Soft Tissue
- Fresh/Frozen Solid Tissue
- Tail Snips/Ear Punches
- Hair and Feathers
- Glass Slide
- FFPE Tissue Sections
- Tissue Sections
- 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

76 77 74 75 178 78 78 78
## Environmental DNA Purification

### Product Chart

### Specifications

<table>
<thead>
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<th>ZR BashingBead™ Lysis</th>
<th>• • • • •</th>
<th>• • • • •</th>
<th>• • • • •</th>
<th>• • • • •</th>
<th>• • • • •</th>
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</tr>
</thead>
<tbody>
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<td>96-Well Spin-Column</td>
<td>Spin-Column</td>
<td>Spin-Column</td>
<td>96-Well Spin-Column</td>
</tr>
<tr>
<td><strong>Binding Capacity</strong></td>
<td>5 µg</td>
<td>25 µg</td>
<td>125 µg</td>
<td>5 µg</td>
<td>5 µg</td>
<td>25 µg</td>
</tr>
<tr>
<td><strong>Elution Volume</strong></td>
<td>≥ 10 µl</td>
<td>≥ 25 µl</td>
<td>≥ 150 µl</td>
<td>≥ 50 µl</td>
<td>≥ 25 µl</td>
<td>≥ 150 µl</td>
</tr>
<tr>
<td><strong>Removal of Humic, Fulvic, and Polyphenolic Substances</strong></td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td><strong>Processing Time</strong></td>
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<td>15 min.</td>
<td>25 min.</td>
<td>50 min.</td>
<td>10 min.</td>
<td>10 min.</td>
</tr>
</tbody>
</table>

### Applications

#### Environmental Sources
- Soils: • • • •
- Sediments: • • • •
- Sludges: • • • •
- Feces: • • • •

#### Microorganisms
- Bacteria: • • • • • • • •
- Fungi: • • • • • • • •
- Algae: • • • • • • • •
- Protists: • • • • • • • •

#### Tough-to-Lyse Tissues
- Soft Tissues: some, some, some, some, some, some, some, some
- Solid Tissues (Food): • • • •
- Tough-to-Lyse Tissues: • • • •
- Tough-to-Lyse Organisms: • • • •
- Insects/Arthropods: • • • •
- Plant Material: • • • •
- Seeds: • • • •
- Fruits: • •

### Page Number
- 81 81 81 81 82 82 82 82
## RNA Clean-up

<table>
<thead>
<tr>
<th>Format</th>
<th>Spin-Column</th>
<th>Spin-Column</th>
<th>Spin-Column</th>
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<th>Spin-Column</th>
<th>Spin-Column</th>
<th>Spin-Column</th>
<th>96-Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binding Capacity</td>
<td>10 µg</td>
<td>50 µg</td>
<td>100 µg</td>
<td>10 µg</td>
<td>10 µg</td>
<td>10 µg</td>
<td>No DNA/RNA</td>
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<tr>
<td>Elution Volume</td>
<td>≥ 6 µl</td>
<td>≥ 25 µl</td>
<td>≥ 100 µl</td>
<td>≥ 10 µl</td>
<td>≥ 6 µl</td>
<td>≥ 6 µl</td>
<td>50 - 200 µl</td>
<td>50 - 100µl</td>
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<tr>
<td>Processing Time</td>
<td>10 min.</td>
<td>10 min.</td>
<td>10 min.</td>
<td>30 min.</td>
<td>45 min.</td>
<td>5 min.</td>
<td>5 min.</td>
<td>10 min.</td>
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## RNA Isolation

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<th>Spin-Column</th>
<th>Spin-Column</th>
<th>Spin-Column</th>
<th>Spin-Column</th>
<th>Spin-Column</th>
<th>96-Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binding Capacity</td>
<td>10 µg</td>
<td>50 µg</td>
<td>100 µg</td>
<td>10 µg</td>
<td>10 µg</td>
<td>50 µg</td>
<td>50 µg</td>
<td>200 µl</td>
</tr>
<tr>
<td>Elution Volume</td>
<td>≥ 6 µl</td>
<td>≥ 25 µl</td>
<td>≥ 50 µl</td>
<td>≥ 10 µl</td>
<td>≥ 6 µl</td>
<td>≥ 6 µl</td>
<td>≥ 50 µl</td>
<td>≥ 25 µl</td>
</tr>
<tr>
<td>Processing Time</td>
<td>10 min.</td>
<td>10 min.</td>
<td>10 min.</td>
<td>30 min.</td>
<td>2 hr.</td>
<td>10 min.</td>
<td>10 min.</td>
<td>30 min.</td>
</tr>
</tbody>
</table>

## Specifications

### RNA Clean-up

- **RNA Clean & Concentrator™ -5**
- **RNA Clean & Concentrator™ -25**
- **RNA Clean & Concentrator™ -100**
- **ZR-96 RNA Clean & Concentrator™**
- **Zymoclean™ Gel RNA Recovery Kit**
- **ZR small-RNA™ PAGE Recovery Kit**
- **OneStep™ PCR Inhibitor Removal**
- **Quick-z™ 96 PCR Inhibitor Removal**

### RNA Isolation

- **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 Plus Kit**
- **Quick-RNA™ Midiprep Kit**
- **Quick-RNA™ 96 Kit**

## Applications

### RNA Clean-up

- 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

### RNA Isolation

- **Isolation from TRIzol®, TRI Reagent®, etc.**
- **Non-Organic RNA Extraction**
- **Viral Inactivation**
- **Small RNA Purification (miRNA)**
- **DNA/RNA Shield™ Compatible**
- **Fresh/Frozen Soft Tissue**
- **Cultured Cells**
- ** Buccal Cells/Swabs**
- **Buffy Coat**
- **Whole Blood**
- **Plasma/Serum**
- **Virus**
- **Biological Fluids**

### Page Numbers

- RNA Clean-up: 119, 119, 119, 119, 120, 121, 93, 93
- RNA Isolation: 105, 105, 105, 105, 106, 110, 110, 111, 110, 110
### RNA Isolation

#### Product Chart

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Format</th>
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<th>Spin-Column</th>
<th>Spin-Column</th>
<th>Spin-Column</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binding Capacity</td>
<td>10 µg</td>
<td>10 µg</td>
<td>10 µg</td>
<td>10 µg</td>
<td>10 µg</td>
<td>50 µg</td>
<td>≤ 100 ng</td>
<td>25 µg</td>
<td>≥ 6 µl</td>
</tr>
<tr>
<td>Elution Volume</td>
<td>≥ 6 µl</td>
<td>≥ 6 µl</td>
<td>≥ 6 µl</td>
<td>≥ 6 µl</td>
<td>≥ 25 µl</td>
<td>15 µl</td>
<td>&gt; 60 µl</td>
<td>15 µl</td>
<td>≥ 25 µl</td>
</tr>
<tr>
<td>Processing Time</td>
<td>6 min</td>
<td>15 min</td>
<td>45 min</td>
<td>15 min</td>
<td>15 min</td>
<td>6.5 hr</td>
<td>2 hr</td>
<td>1 hr</td>
<td></td>
</tr>
</tbody>
</table>

#### Applications

- Frozen Tissue Sections
- Fixed Tissue Sections
- Buccal Cells/Seabs
- Plasma/Serum
- Urine
- Virus
- Microvesicles
- Exosomes
- Fungi Susceptible to Yeast Lytic Enzyme

#### Page Number

|         | 112 | 112 | 113 | 114 | 114 | 114 | 115 | 115 | 183 |

### Environmental RNA Purification

#### Product Chart

<table>
<thead>
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<th>Spin-Column</th>
<th>Spin-Column</th>
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</thead>
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<tr>
<td>Binding Capacity</td>
<td>10 µg</td>
<td>10 µg</td>
<td>10 µg</td>
<td>10 µg</td>
<td>10 µg</td>
<td>10 µg</td>
<td>10 µg</td>
</tr>
<tr>
<td>Elution Volume</td>
<td>≥ 6 µl</td>
<td>≥ 6 µl</td>
<td>≥ 25 µl</td>
<td>≥ 6 µl</td>
<td>≥ 25 µl</td>
<td>15 µl</td>
<td>15 µl</td>
</tr>
<tr>
<td>Processing Time</td>
<td>15 min</td>
<td>15 min</td>
<td>15 min</td>
<td>15 min</td>
<td>15 min</td>
<td>2 hr</td>
<td>1 hr</td>
</tr>
</tbody>
</table>

#### 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

|         | 117 | 117 | 117 | 118 | 118 | 183 |
**DNA/RNA Co-Purification**

**Product Chart**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Quick-DNA/RNA™ Miniprep Kit</th>
<th>Quick-DNA/RNA Clean &amp; Concentrator™</th>
<th>Quick-DNA/RNA™ Viral Kit</th>
<th>Quick-DNA/RNA™ Viral 96 Kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format</td>
<td>Spin-Column</td>
<td>Spin-Column</td>
<td>Spin-Column</td>
<td>96-Well</td>
</tr>
<tr>
<td>Binding Capacity</td>
<td>25 μg DNA</td>
<td>10 μg</td>
<td>25 μg RNA</td>
<td>10 μg</td>
</tr>
<tr>
<td>Elution Volume</td>
<td>≥ 50 μl DNA</td>
<td>≥ 6 μl</td>
<td>≥ 25 μl RNA</td>
<td>≥ 10 μl</td>
</tr>
<tr>
<td>Processing Time</td>
<td>15 min</td>
<td>10 min</td>
<td>5 min</td>
<td>15 min</td>
</tr>
</tbody>
</table>

**Applications**

- Parallel Purification
- Co-Purification
- Fresh/Frozen Soft Tissue
- Fresh/Frozen Solid Tissue
- Bacteria
- Yeast
- Buffy Coat
- Cultured Cells
- Small RNA
- Probe Purification
- Whole Blood (≤ 50 μl)
- Plasma/Serum
- Virus

| Page Number | 126 | 133 | 130 | 130 |

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**DNA/RNA Co-Purification**

**Product Chart**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Quick-DNA/RNA™ Magbead</th>
<th>Quick-DNA/RNA Viral Tube</th>
<th>Quick-DNA/RNA™ FFPE</th>
<th>Zero Capacity DNA/RNA Prep</th>
<th>Quick-DNA/RNA™ Magnetic Bead</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format</td>
<td>Magbead</td>
<td>Spin Column</td>
<td>Spin Column</td>
<td>Spin Column</td>
<td>Column</td>
</tr>
<tr>
<td>Binding Capacity</td>
<td>20 μg</td>
<td>50 μg</td>
<td>100 μg</td>
<td>10 μg</td>
<td>10 μg</td>
</tr>
<tr>
<td>Elution Volume</td>
<td>≥ 50 μl</td>
<td>&gt; 25 μl</td>
<td>50 μl</td>
<td>25 μl</td>
<td>25 μl</td>
</tr>
<tr>
<td>Processing Time</td>
<td>60 min</td>
<td>50 min</td>
<td>90 min</td>
<td>25 min</td>
<td>10 min</td>
</tr>
</tbody>
</table>

**Applications**

- Parallel Purification
- Co-Purification
- Fresh/Frozen soft tissue
- Fresh/Frozen solid tissue
- Bacteria
- Yeast
- Buffy Coat
- Cultured Cells
- Liquid Biopsies
- Small RNA
- Probe Purification
- Whole Blood (<50 μl)
- Blood Tube (< 3 ml)
- Plasma/Serum
- Virus
- Plants
- Insects
- Soil
- Swabs
- FFPE
- Water
- Urine

| Page Number | 126 | 129 | 132 | 127 | 131 | 131 |

---

**DNA/RNA Co-Purification**

**Product Chart**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Quick-DNA/RNA™ Magbead</th>
<th>Quick-DNA/RNA Viral Tube</th>
<th>Quick-DNA/RNA™ FFPE</th>
<th>Zero Capacity DNA/RNA Prep</th>
<th>Quick-DNA/RNA™ Magnetic Bead</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format</td>
<td>Magbead</td>
<td>Spin Column</td>
<td>Spin Column</td>
<td>Spin Column</td>
<td>Column</td>
</tr>
<tr>
<td>Binding Capacity</td>
<td>20 μg</td>
<td>50 μg</td>
<td>100 μg</td>
<td>10 μg</td>
<td>10 μg</td>
</tr>
<tr>
<td>Elution Volume</td>
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<td>&gt; 25 μl</td>
<td>50 μl</td>
<td>25 μl</td>
<td>25 μl</td>
</tr>
<tr>
<td>Processing Time</td>
<td>60 min</td>
<td>50 min</td>
<td>90 min</td>
<td>25 min</td>
<td>10 min</td>
</tr>
</tbody>
</table>

**Applications**

- Parallel Purification
- Co-Purification
- Fresh/Frozen soft tissue
- Fresh/Frozen solid tissue
- Bacteria
- Yeast
- Buffy Coat
- Cultured Cells
- Liquid Biopsies
- Small RNA
- Probe Purification
- Whole Blood (<50 μl)
- Blood Tube (< 3 ml)
- Plasma/Serum
- Virus
- Plants
- Insects
- Soil
- Swabs
- FFPE
- Water
- Urine

| Page Number | 126 | 129 | 132 | 127 | 131 | 131 |
## Sample Collection & Storage

### Product Chart

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Format</th>
<th>Bottle or Tube Size</th>
<th>Uses</th>
<th>Applications</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>10 ml</td>
<td>Blood Samples</td>
<td>Microbiomic Analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 ml</td>
<td>Fecal Samples</td>
<td>Gene Expression Analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 ml (0.1 mm beads)</td>
<td>Swab Samples</td>
<td>Pathogen Detection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 ml (0.5 mm beads)</td>
<td>Environmental Samples</td>
<td>miRNA Analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 x 80 mm screwcap tube</td>
<td>Pathogen Samples</td>
<td>Page Number 141</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 or 140 ml</td>
<td>Tissue &amp; Insect Samples</td>
<td>142</td>
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<td></td>
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<td>50 or 250 ml</td>
<td>Urine Samples</td>
<td>143</td>
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<tr>
<td></td>
<td></td>
<td>25 or 125 ml</td>
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</tr>
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<tr>
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<td>Bottle or Tube Size</td>
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</tr>
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## Microbiomics

### Product Chart

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Size</th>
<th>Storage solution</th>
<th>Source</th>
<th>Applications</th>
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<tr>
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<td>DNA-RNA Shield™</td>
<td>A mixture of ten inactivated microorganisms (bacterial and fungal)</td>
<td>Assessment of bias that comes from DNA Extraction protocol and all other downstream steps</td>
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<tr>
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<td>200 ng</td>
<td>10 mM Tris-HCl and 0.1 mM EDTA, pH 8.0</td>
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<td>2,000 ng</td>
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<td>Assessment of bias within library preparation and whole-genome sequencing</td>
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### Source

- DNA-RNA Shield™: Impurity level < 0.01% foreign microbial DNA
- A mixture of genomic DNA from ten microbial strains: Source
- A mixture of ten inactivated microorganisms (bacterial and fungal): Source

### 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 logarithmic distribution
- Assessment of profiling accuracy across a broad range of abundance

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**Product Chart**

### Specifications

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### Features

- Mixed Beads For Accurate Lysis From Diverse Microbial Communities
- Low Bioburden
- PCR Inhibitor Removal Technology

### Applications

- Fecal
- Soil
- Water
- Body Fluids
- Seaweed
- Biological Fluids

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### Product Chart

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<tr>
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### Index by Catalog Number

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234 235 www.zymoresearch.com | info@zymoresearch.com | tel: (949) 679-1190 | toll-free: (888) 882-9682 | fax: (949) 266-9452
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