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TissueLyser Handbook

For high-throughput disruption of biological samples

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Catalog no.	**85300**
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* The TissueLyser II (cat. no. 85300) is an improved version of the TissueLyser (cat. no. 85200, 85210, or 85220; no longer available). All instructions and protocols in this handbook apply to both the TissueLyser II and the TissueLyser.

Storage

The TissueLyser should be stored upright in a dry environment at room temperature (15–25°C).

Product Use Limitations

The TissueLyser is intended for molecular biology applications. This product is not intended for the diagnosis, prevention, or treatment of a disease.

All due care and attention should be exercised in the handling of many of the materials described in this text. We recommend all users of QIAGEN® products to adhere to the NIH guidelines that have been developed for recombinant DNA experiments, or to other applicable guidelines.

Product Warranty and Satisfaction Guarantee

QIAGEN guarantees the performance of all products in the manner described in our product literature. The purchaser must determine the suitability of the product for its particular use. Should any product fail to perform satisfactorily due to any reason other than misuse, QIAGEN will replace it free of charge or refund the purchase price. We reserve the right to change, alter, or modify any product to enhance its performance and design. If a QIAGEN product does not meet your expectations, simply call your local Technical Service Department or distributor. We will credit your account or exchange the product — as you wish. Separate conditions apply to QIAGEN scientific instruments, service products, and to products shipped on dry ice. Please inquire for more information.

A copy of QIAGEN terms and conditions can be obtained on request, and is also provided on the back of our invoices. If you have questions about product specifications or performance, please call QIAGEN Technical Services or your local distributor (see back cover or visit www.qiagen.com).

Technical Assistance

At QIAGEN, we pride ourselves on the quality and availability of our technical support. Our Technical Service Departments are staffed by experienced scientists with extensive practical and theoretical expertise in sample and assay technologies and the use of QIAGEN products. If you have any questions or experience any difficulties regarding the TissueLyser or QIAGEN products in general, please do not hesitate to contact us.

QIAGEN customers are a major source of information regarding advanced or specialized uses of our products. This information is helpful to other scientists as well as to the researchers at QIAGEN. We therefore encourage you to contact us if you have any suggestions about product performance or new applications and techniques.

For technical assistance and more information, please see our Technical Support Center at www.qiagen.com/Support or call one of the QIAGEN Technical Service Departments or local distributors (see back cover or visit www.qiagen.com).

Safety Information

When working with chemicals, always wear a suitable lab coat, disposable gloves, and protective goggles. For more information, please consult the appropriate material safety data sheets (MSDSs). These are available online in convenient and compact PDF format at www.qiagen.com/Support/MSDS.aspx where you can find, view, and print the MSDS for each QIAGEN kit and kit component.

24-hour emergency information

Emergency medical information in English, French, and German can be obtained 24 hours a day from:

Poison Information Center Mainz, Germany

Tel: +49-6131-19240

Introduction

Principle

The TissueLyser provides rapid and efficient disruption of up to 192 biological samples, including animal and human tissues, plant tissues, bacteria, and yeast. Disruption and homogenization are achieved through the beating and grinding effect of beads on the sample material as they are shaken together in the grinding vessels.

Disruption is critically important in order to release the nucleic acids from the sample material. Homogenization of the material acts to shear the high-molecular-weight cellular proteins and carbohydrates that may otherwise reduce binding of DNA and RNA to silica membranes or magnetic particles. Sample disruption using, for example, a mortar and pestle does not result in efficient homogenization. The TissueLyser both disrupts and homogenizes sample material in one simple and reliable step.

The TissueLyser is easily programmed to provide variable speeds from 3 to 30 Hz (180–1800 oscillations/minute) and run times from 10 seconds to 99 minutes.

Applications

The ability to process up to 192 samples per run makes the TissueLyser the ideal front-end solution to access biological information for genomics, transcriptomics, and proteomics applications. For next-generation high-throughput sequencing technologies such as polony sequencing, the TissueLyser is the disruption instrument of choice.

The TissueLyser enables fast and uniform disruption of animal and human tissues, plant tissues, bacteria, and yeast in various sample volumes in several formats. QIAGEN offers adapter sets for 2 x 96 collection microtubes (1.2 ml) or 2 x 24 microcentrifuge tubes (2 ml) as well as stainless steel and tungsten carbide beads. For disruption of large samples, grinding jar sets (10 ml) with stainless steel or Teflon® grinding balls are also available from QIAGEN. For more details about these and other accessories for the TissueLyser, see Appendix A (page 27).

The TissueLyser provides efficient disruption of biological material in each sample vessel for reproducible, high-quality results in downstream applications such as the purification of total DNA or RNA from a variety of human, animal, and plant tissues. A wide range of QIAGEN sample purification kits are compatible with the TissueLyser (see Tables 1–6, pages 7–10). Sample purification can be performed manually or can be automated using the QIAcube® , QIAsymphony™ SP, EZ1® Advanced, or BioRobot® or BioSprint® workstations. For more information about automated solutions from QIAGEN, see Appendix B (page 29).

This handbook provides guidelines on disrupting and homogenizing various sample materials for subsequent purification of DNA or RNA. Specific details on disruption and homogenization and nucleic acid purification, such as the amount of starting material and lysis buffer to use, can be found in the handbook supplied with each QIAGEN sample purification kit.

Table 1. Kits for RNA purification from animal or human tissues using spin columns

Sample type	Kit	Kit format	Page
Easy-to-lyse tissues (e.g., kidney, liver, and lung)	RNeasy® Micro Kit	Up to 5 mg tissue; automatable on QIAcube	16
	RNeasy Mini Kit	Up to 30 mg tissue; automatable on QIAcube	16
	RNeasy Protect Mini Kit	Up to 20 mg RNA*later*® stabilized tissue; automatable on QIAcube	16
	RNeasy Plus Micro Kit	Up to 5 mg tissue; includes gDNA Eliminator spin columns	16
	RNeasy Plus Mini Kit	Up to 30 mg tissue; includes gDNA Eliminator spin columns; automatable on QIAcube	16
Fiber-rich tissues (e.g., heart and muscle)	RNeasy Fibrous Tissue Mini Kit	Up to 30 mg tissue	16
	RNeasy Fibrous Tissue Midi Kit	Up to 250 mg tissue	16
Any type of tissue, including fatty tissues (e.g., adipose tissue and brain)	RNeasy Lipid Tissue Mini Kit	Up to 100 mg tissue; automatable on QIAcube	16
	miRNeasy Mini Kit	Up to 100 mg tissue; automatable on QIAcube	16

Table 2. Kits for RNA purification from animal or human tissues using magnetic particles or 96-well plates

Sample type	Kit	Kit format	Page
Easy-to-lyse tissues (e.g., kidney, liver, and lung)	EZ1 RNA Tissue Mini Kit	Magnetic particles; up to 10 mg tissue; automated on EZ1 Advanced* (1–6 samples per run)	16
	MagAttract® RNA Tissue Mini M48 Kit	Magnetic particles; up to 10 mg tissue; automated on BioRobot M48 (6–48 samples per run)	16
	QIAsymphony RNA Kit	Magnetic particles; up to 50 mg tissue; automated on QIAsymphony SP (1–96 samples per run)	16
Any type of tissue	EZ1 RNA Universal Tissue Kit	Magnetic particles; up to 50 mg tissue; automated on EZ1 Advanced* (1–6 samples per run)	16
	MagAttract RNA Universal Tissue M48 Kit	Magnetic particles; up to 50 mg tissue; automated on BioRobot M48 (6–48 samples per run)	16
	RNeasy 96 Universal Tissue Kits	96-well plate; up to 100 mg tissue; automatable on BioRobot Universal System (up to 80 mg tissue)†	16
	miRNeasy 96 Kit	96-well plate; up to 100 mg tissue	16

* Also automatable on BioRobot EZ1.

† Also automatable on BioRobot Gene Expression — Real-Time RT-PCR and BioRobot 8000.

Table 3. Kits for RNA purification from plant tissues, bacteria, and yeast

Sample type	Kit	Kit format	Page
Plant tissue (e.g., leaf)	RNeasy Plant Mini Kit	Spin column; up to 100 mg tissue; automatable on QIAcube	18
	RNeasy 96 Kit	96-well plate; up to 25 mg tissue	18
Bacteria (Gram-postive and -negative)	RNeasy Protect Bacteria Mini Kit	Spin column; up to 2.5 x 10^8 cells	20
	RNeasy Protect Bacteria Midi Kit	Spin column; up to 1.5 x 10^9 cells	20
Yeast	RNeasy Mini Kit	Spin column; up to 5 x 10^7 cells	21

Table 4. Kits for DNA purification from animal or human tissues

Kit	Kit format	Page
DNeasy® Blood & Tissue Kit	Spin column; up to 25 mg tissue; automatable on QIAcube	22
DNeasy 96 Blood & Tissue Kit	96-well plate; up to 20 mg tissue	22
QIAamp® DNA Mini Kit	Spin column; up to 25 mg tissue; automatable on QIAcube	22
EZ1 DNA Tissue Kit	Magnetic particles; up to 40 mg tissue; automated on EZ1 Advanced* (1–6 samples per run)	22
MagAttract DNA Mini M48 Kit	Magnetic particles; up to 40 mg tissue; automated on BioRobot M48 (6–48 samples per run)	22
QIAsymphony DNA Mini Kit	Magnetic particles; up to 50 mg tissue; automated on QIAsymphony SP (1–96 samples per run)	22

* Also automatable on BioRobot EZ1.

Table 5. Kits for DNA purification from plant tissues

Kit	Kit format	Page
DNeasy Plant Mini Kit	Spin column; up to 100 mg tissue; automatable on QIAcube	23
DNeasy Plant Maxi Kit	Spin column; up to 1 g tissue	25
DNeasy 96 Plant Kit	96-well plate; up to 50 mg tissue	23
MagAttract 96 DNA Plant Core Kit	Magnetic particles; up to 100 mg tissue; automatable on BioRobot Plant Science System — Genotyping*	23
BioSprint 15 DNA Plant Kit	Magnetic particles; up to 50 mg tissue; automated on BioSprint 15 (up to 15 samples per run)	23
BioSprint 96 DNA Plant Kit	Magnetic particles; up to 50 mg tissue; automated on BioSprint 96 (up to 96 samples per run)	23

* No longer available.

Table 6. Kits for simultaneous purification of multiple analytes from animal or human tissues

Analytes purified	Kit	Kit format	Page
DNA, RNA, and protein	AllPrep® DNA/RNA/ Protein Mini Kit	Spin column; up to 30 mg tissue	16
DNA and RNA	AllPrep DNA/RNA Micro Kit	Spin column; up to 5 mg tissue	16
	AllPrep DNA/RNA Mini Kit	Spin column; up to 30 mg tissue	16

QIAGEN Supplementary Protocols

Many of the protocols listed in this handbook are supplementary to the protocols found in the handbook of the specific kit being used. QIAGEN is constantly developing new protocols for existing products. These supplementary protocols can be obtained by contacting one of the QIAGEN Technical Service Departments or local distributors (see back cover or visit www.qiagen.com) or visiting our Technical Support Center at www.qiagen.com/Support . Supplementary protocols can be identified by their reference number, which is made up of 2 letters followed by 2 numbers (e.g., RY23 — *Isolation of total RNA from plants using the RNeasy 96 Kit*).

Note: All protocols for use with the Mixer Mill can be used on the TissueLyser, without modification.

Equipment and Reagents to Be Supplied by User

When working with chemicals, always wear a suitable lab coat, disposable gloves, and protective goggles. For more information, consult the appropriate material safety data sheets (MSDSs), available from the product supplier.

For all protocols

- Kit for purification of DNA and/or RNA (see ordering information on pages 31–36 or visit www.qiagen.com)
- Optional: Reagent DX (see page 15 for details)
- Optional: Liquid nitrogen or dry ice (see the individual protocols)

Disruption of 2 x 48 samples

- TissueLyser Adapter Set 2 x 24*
- 2 ml microcentrifuge tubes (e.g., Eppendorf® Safe-Lock micro test tubes†)
- Stainless steel or tungsten carbide beads*
- Optional: TissueLyser Single-Bead Dispenser, 5 mm* or TissueLyser Single-Bead Dispenser, 7 mm*

Disruption of 2 x 96 samples

- TissueLyser Adapter Set 2 x 96*
- Collection Microtubes (racked)*
- Collection Microtube Caps*
- Optional: TissueLyser 3 mm Bead Dispenser, 96-Well* or TissueLyser 5 mm Bead Dispenser, 96-Well*

Disruption of 2 large samples

- For disruption of hard samples and disruption in liquid nitrogen: Grinding Jar Set, S. Steel*
- For disruption of most samples: Grinding Jar Set, Teflon*

* See page 31 for ordering information.

† This is not a complete list of suppliers and does not include many important vendors of biological supplies.

Important Notes

General remarks on disruption and homogenization

Efficient disruption and homogenization of the starting material is an absolute requirement for all nucleic acid purification procedures. Disruption and homogenization are 2 distinct steps:

- **Disruption**: Complete disruption of cell walls and plasma membranes of cells and organelles is absolutely required to release all the nucleic acids contained in the sample. Different samples require different methods to achieve complete disruption. Incomplete disruption results in significantly reduced DNA and RNA yields.
- **Homogenization**: Homogenization is necessary to reduce the viscosity of the cell lysates produced by disruption. Homogenization shears the high-molecular-weight cellular proteins and carbohydrates to create a homogeneous lysate. Incomplete homogenization results in inefficient binding of nucleic acids to QIAGEN silica membranes and magnetic particles and therefore significantly reduced DNA and RNA yields.

Cellular disruption is one of the most critical steps in nucleic acid purification. Disruption in lysis buffer alone, without physical shearing, may result in nucleic acid degradation by endogenous DNases and RNases. Incomplete disruption prevents the lysis buffer, which inactivates nucleases, from contacting nucleic acids within the intact cells. Furthermore, cellular debris that is not disrupted can result in decreased yield and increases the risk of clogging the purification column. After sample disruption, there should be no visible particulates (except when disrupting materials containing hard, noncellular components, such as connective tissue, bone, or woody plant tissue). QIAGEN kits and protocols contain recommendations for the most appropriate method of sample disruption and homogenization to maximize the yield and quality of your DNA and RNA preparation.

Disruption and homogenization using the TissueLyser

In bead-milling, cells and tissues can be disrupted by rapid agitation in the presence of beads. Disruption and simultaneous homogenization occur by the shearing and crushing action of the beads as they collide with the sample. Disruption efficiency is influenced by:

- Size and composition of beads
- Ratio of buffer to samples (if buffer is used)
- Amount of starting material
- Configuration of TissueLyser (i.e., speed and duration)
- Consistency of sample
- Type of disruption vessel

Disruption and homogenization methods

When using the TissueLyser in combination with QIAGEN sample purification kits, one of 2 methods for disruption and homogenization is carried out: samples are either disrupted and homogenized in lysis buffer at room temperature, or precooled and then disrupted and homogenized without lysis buffer. With the latter method, lysis buffer is added after disruption and homogenization.

The method of precooling samples depends on the TissueLyser accessory used. If using the TissueLyser Adapter Set 2 x 24 or TissueLyser Adapter Set 2 x 96, the adapter set should be stored at –80°C for at least 2 hours prior to starting disruption and homogenization, and the tubes containing the samples should be precooled on dry ice. If using a Grinding Jar Set, the jar containing the sample can be frozen in liquid nitrogen prior to starting disruption and homogenization.

Important: When using a TissueLyser Adapter Set, do not freeze the adapter set or the sample tubes in liquid nitrogen, as this may result in breakage of the tubes.

In special cases (e.g., the disruption of teeth or plant seeds), the sample can be disrupted and homogenized at room temperature without lysis buffer, although this increases the risk of nucleic acid degradation by nucleases.

Bead selection

For disruption of small samples, the optimal beads to use are 0.1–0.6 mm (mean diameter) glass beads for bacteria, 0.5 mm glass beads for yeast and unicellular animal cells, and 3–7 mm stainless steel or tungsten carbide beads for plant and animal/human tissues. It is essential that glass beads are pretreated before use by washing in concentrated nitric acid.* Pretreated (acid-washed) beads can be purchased from many vendors of biological supplies (e.g., Sigma, cat. nos. G1145, G1277, and G8772†). Disruption parameters for samples not addressed in this handbook must be determined empirically. For disruption of large samples, a Grinding Jar Set can be used, which is supplied with either stainless steel grinding balls (for disrupting hard samples such as bone or for disrupting samples in liquid nitrogen) or Teflon grinding balls (for disrupting most samples).

Note: Do not use Buffer RLT, Buffer RLT Plus, or QIAzol® Lysis Reagent in conjunction with tungsten carbide beads. These buffers react chemically with tungsten carbide, causing damage to the bead surface.

* When working with chemicals, always wear a suitable lab coat, disposable gloves, and protective goggles. For more information, consult the appropriate material safety data sheets (MSDSs), available from the product supplier.

† This is not a complete list of suppliers and does not include many important vendors of biological supplies.

Operating the TissueLyser

The TissueLyser Adapter Set or Grinding Jar Set should be securely fixed into the clamps (arms) of the TissueLyser. For details, refer to the operating instructions supplied with the TissueLyser.

Disruption is carried out in high-speed (20–30 Hz) shaking steps. Disruption for 2 x 3 minutes at 20–30 Hz is usually sufficient to release RNA. If disrupting samples for subsequent DNA purification, disruption times should be shorter in order to prevent DNA shearing.

When using a TissueLyser Adapter Set, samples nearer to the TissueLyser move more slowly than samples further away from the TissueLyser. To ensure uniform disruption and homogenization, 2 shaking steps should be carried out. After the first shaking step, the TissueLyser Adapter Set should be disassembled and the rack of tubes should be rotated so that the tubes that were nearest to the TissueLyser are now outermost. The TissueLyser Adapter Set should then be reassembled before continuing with the second shaking step.

For optimal operation, the TissueLyser should always be balanced. A balance can be provided by assembling a second TissueLyser Adaptor Set with a rack of tubes containing only disruption beads, and fixing this adaptor set into the empty clamp. If using grinding jars, the balance should consist of a second grinding jar containing a grinding ball.

Disruption and homogenization in Buffer RLT Plus

RNeasy Plus Kits and certain AllPrep Kits are supplied with Buffer RLT Plus, a lysis buffer that provides optimal sample lysis as well as appropriate conditions for DNA binding to gDNA Eliminator columns or AllPrep DNA columns. When disrupting and homogenizing tissues in Buffer RLT Plus, excessive foaming may occur. This foaming is substantially reduced by adding Reagent DX to Buffer RLT Plus at a final concentration of 0.5% (v/v) before starting disruption and homogenization. Reagent DX has been carefully tested with RNeasy Plus Kits and AllPrep Kits, and has no effect on RNA purity or on downstream applications such as real-time RT-PCR. Buffer RLT Plus containing Reagent DX can be stored at room temperature (15–25°C) for at least 9 months. Reagent DX is supplied separately; for ordering information, see page 32.

Protocol: Purification of RNA or Multiple Analytes from Animal and Human Tissues

This protocol provides guidelines on disrupting animal and human tissues for purification of RNA or for simultaneous purification of DNA and RNA or DNA, RNA, and protein. If using a QIAGEN sample purification kit (see Tables 1, 2, and 6 on pages 7, 8, and 10), refer to the supplied handbook, which contains a complete protocol for sample disruption and purification.

Important points before starting

- Before beginning the procedure, read "Important Notes" (page 13).
- Ensure that you are familiar with operating the TissueLyser by referring to the operating instructions.
- If using a QIAGEN sample purification kit, read the supplied handbook carefully before starting.
- After storage in RNA*later* RNA Stabilization Reagent or Allprotect Tissue Reagent, tissues become slightly hard. If disrupting in Buffer RLT, we recommend increasing the volume of this buffer according to the protocols in the *RNeasy Mini Handbook*. In addition, the disruption time may be need to be extended.

Procedure

1. **Place the tissues in 2 ml microcentrifuge tubes or 1.2 ml collection microtubes containing 1 stainless steel bead (3–7 mm mean diameter).**

   If handling fresh or frozen tissue samples, keep the tubes on dry ice.

2. **Place the tubes at room temperature (15–25°C). Immediately add the appropriate volume of lysis buffer (e.g., Buffer RLT, Buffer RLT Plus, or QIAzol Lysis Reagent) to each tube.**

   Note: Do not use Buffer RLT, Buffer RLT Plus, or QIAzol Lysis Reagent with tungsten carbide beads, as these buffers can react with and damage the bead surface.

   Note: If using Buffer RLT Plus, we recommend adding Reagent DX to prevent excessive foaming. For details, see "Disruption and homogenization in Buffer RLT Plus" (page 15).

3. **Place the tubes in the TissueLyser Adapter Set 2 x 24 (if using 2 ml tubes) or the TissueLyser Adapter Set 2 x 96 (if using 1.2 ml tubes).**

4. **Operate the TissueLyser for 2 min at 20–30 Hz. Disassemble the adapter set, rotate the rack of tubes so that the tubes nearest to the TissueLyser are now outermost, and reassemble the adapter set. Operate the TissueLyser for another 2 min at 20–30 Hz.**

   The duration of disruption and homogenization depends on the tissue being processed and can be extended until no tissue debris is visible.

   Rearranging the tubes ensures uniform disruption and homogenization.

   If processing fiber-rich tissues, complete disruption and homogenization may sometimes not be possible. However, small amounts of debris have no effect on subsequent RNA purification with QIAGEN kits and are usually digested in the proteinase K step.

5. **Proceed with RNA, DNA/RNA, or DNA/RNA/protein purification.**

   Do not reuse the stainless steel beads.

Protocol: Purification of RNA from Plant Tissues

This protocol provides guidelines on disrupting plant tissues for subsequent RNA purification. If using a QIAGEN kit for RNA purification (see Table 3, page 9), refer to the supplied handbook, which contains a complete protocol for sample disruption and RNA purification.*

Important points before starting

- Before beginning the procedure, read "Important Notes" (page 13).
- Ensure that you are familiar with operating the TissueLyser by referring to the operating instructions.
- If using a QIAGEN kit for RNA purification, read the supplied handbook carefully before starting.
- Soft, fresh tissues from plants such as Nicotiana and Arabidopsis can often be disrupted and homogenized in lysis buffer. Hard tissues (e.g., woody plant materials) may require freezing and disruption under frozen conditions.

Procedure

1. **If handling frozen tissues, precool the TissueLyser Adapter Set 2 x 24 or TissueLyser Adapter Set 2 x 96 by storing at –80°C for at least 2 h.**

   The adapter sets do not need to be precooled if handling fresh tissues.

2. **Place the tissues in 2 ml microcentrifuge tubes or 1.2 ml collection microtubes containing 1 stainless steel bead (3–7 mm mean diameter). If handling frozen tissues, keep the tubes on dry ice.**

   Note: Do not freeze the tubes in liquid nitrogen, as this may lead to breakage of the tubes.

3. **Immediately add the appropriate volume of lysis buffer (e.g., Buffer RLT or Buffer RLC) to each tube. If handling frozen tissues, do not add lysis buffer.**

   Note: Do not use Buffer RLT or Buffer RLC with tungsten carbide beads, as these buffers can react with and damage the bead surface.

4. **Place the tubes in the TissueLyser Adapter Set 2 x 24 (if using 2 ml tubes) or the TissueLyser Adapter Set 2 x 96 (if using 1.2 ml tubes).**

* If using the RNeasy 96 Kit, refer to supplementary protocol *Isolation of total RNA from plants using the RNeasy 96 Kit* (RY23).

5. **Operate the TissueLyser for 1 min at 30 Hz. Disassemble the adapter set, rotate the rack of tubes so that the tubes nearest to the TissueLyser are now outermost, and reassemble the adapter set. Operate the TissueLyser for another 1 min at 30 Hz.**

   The duration of disruption and homogenization depends on the tissue being processed and can be extended until no tissue debris is visible. If necessary, keep the samples on dry ice for several minutes in between the individual disruption steps to avoid thawing of the samples.

   Rearranging the tubes ensures uniform disruption and homogenization.

6. **Proceed with RNA purification. If frozen samples were disrupted, add lysis buffer, and proceed with RNA purification.**

   Do not reuse the stainless steel beads.

Protocol: Purification of RNA from Bacteria

This protocol provides guidelines on disrupting bacteria for subsequent RNA purification. If using an RNeasy Protect Bactera Kit for RNA purification (see Table 3, page 9), refer to the supplied *RNAprotect® Bacteria Reagent Handbook*, which contains complete protocols for sample disruption and RNA purification.

Important points before starting

- Before beginning the procedure, read "Important Notes" (page 13).
- Ensure that you are familiar with operating the TissueLyser by referring to the operating instructions.
- If using an RNeasy Protect Bacteria Kit for RNA purification, read the supplied handbook carefully before starting.
- Bead milling will disrupt most Gram-positive and Gram-negative bacteria, including mycobacteria. Gram-positive bacteria usually require more rigorous digestion (e.g., increased enzyme digestion time and temperature) and mechanical treatment than Gram-negative bacteria. For details, see the *RNAprotect Bacteria Reagent Handbook*.

Procedure

1. **Pellet the bacterial cells by centrifugation. Immediately add the appropriate volume of lysis buffer (e.g., Buffer RLT) to each sample and vortex vigorously.**
2. **Transfer each sample to 2 ml microcentrifuge tubes containing 25–50 mg acid-washed glass beads (150–600 µm mean diameter).**
3. **Place the tubes in the TissueLyser Adapter Set 2 x 24.**
4. **Operate the TissueLyser for 5 min at 30 Hz.**

   The duration of disruption and homogenization depends on the sample being processed and can be extended until no debris is visible.
5. **Proceed with RNA purification.**

Protocol: Purification of RNA from Yeast

This protocol provides guidelines on disrupting yeast cells for subsequent RNA purification. If using the RNeasy Mini Kit for RNA purification (see Table 3, page 9), refer to the supplied *RNeasy Mini Handbook*, which contains a complete protocol for sample disruption and RNA purification.

Important points before starting

- Before beginning the procedure, read "Important Notes" (page 13).
- Ensure that you are familiar with operating the TissueLyser by referring to the operating instructions.
- If using the RNeasy Mini Kit for RNA purification, read the supplied handbook carefully before starting.

Procedure

1. **Pellet the yeast cells by centrifugation. Immediately add the appropriate volume of lysis buffer (e.g., Buffer RLT) to each sample and vortex vigorously.**
2. **Transfer each sample to 2 ml microcentrifuge tubes containing 600 µl acid-washed glass beads (450–550 µm mean diameter).**
3. **Place the tubes in the TissueLyser Adapter Set 2 x 24.**
4. **Operate the TissueLyser for 5 min at 30 Hz.**

   The duration of disruption and homogenization depends on the sample being processed and can be extended until no debris is visible.
5. **Proceed with RNA purification.**

Protocol: Purification of DNA from Animal and Human Tissues

This protocol provides guidelines on disrupting animal and human tissues for subsequent DNA purification. If using a QIAGEN kit for DNA purification (see Table 4, page 9), refer to the following supplementary protocols for the complete procedure for sample disruption and DNA purification:

- **DNeasy Blood & Tissue Kit**: *Purification of total DNA from soft tissues using the TissueLyser and the DNeasy Blood & Tissue Kit* (DY11)
- **QIAamp DNA Mini Kit**: *Isolation of DNA from soft tissues using the TissueLyser and QIAamp DNA Mini Kit* (QA31)
- **EZ1 DNA Tissue Kit**: *Isolation of DNA from soft tissue using the TissueLyser and EZ1 DNA Tissue Kit* (MA23)
- **MagAttract DNA Mini M48 Kit**: *Isolation of DNA from soft tissue using the TissueLyser and MagAttract Mini M48 Kit* (MA22)

Important points before starting

- Before beginning the procedure, read "Important Notes" (page 13).
- Ensure that you are familiar with operating the TissueLyser by referring to the operating instructions.
- If using a QIAGEN kit for DNA purification, read the supplied handbook and appropriate supplementary protocol carefully before starting.

Procedure

1. **Place the tissues in 2 ml microcentrifuge tubes containing 1 stainless steel bead (5 mm mean diameter).**
2. **Add the appropriate volume of lysis buffer (e.g., Buffer ATL) to each tube.**
3. **Place the tubes in the TissueLyser Adapter Set 2 x 24.**
4. **Operate the TissueLyser for 20 s at 15 Hz.**

   Note: Exceeding this homogenization time and intensity may lead to significant fragmentation of genomic DNA.

   If working with fibrous tissues, cutting the tissue into smaller pieces before starting disruption will improve disruption efficiency.
5. **Proceed with DNA purification.**

Protocol: Purification of DNA from Plant Tissues (Mini Protocol)

This protocol provides guidelines on using TissueLyser Adapter Sets to disrupt plant tissues for subsequent DNA purification. If using a QIAGEN kit for DNA purification (see Table 5, page 10), refer to the supplied handbook, which contains a complete protocol for sample disruption and DNA purification.

Important points before starting

- Before beginning the procedure, read "Important Notes" (page 13).
- Ensure that you are familiar with operating the TissueLyser by referring to the operating instructions.
- If using a QIAGEN kit for DNA purification, read the supplied handbook carefully before starting.
- Fresh, frozen, or lyophilized tissues can be processed. Fresh tissues can be disrupted in lysis buffer at ambient temperature. Alternatively, fresh or frozen tissues can be disrupted without lysis buffer if they are precooled on dry ice and if the adapter sets are precooled at –80°C for at least 2 h. Lyophilized tissues can be disrupted without lysis buffer at ambient temperature. Disruption of tissues in lysis buffer yields DNA ideal for PCR, while disruption of tissues in liquid nitrogen yields DNA of a higher molecular weight. We do not recommend disrupting frozen tissues in lysis buffer as this results in low yields and degraded DNA.

Procedure

1. **If purifying DNA of higher molecular weight from fresh or frozen tissues, precool the TissueLyser Adapter Set 2 x 24 or TissueLyser Adapter Set 2 x 96 by storing at –80°C for at least 2 h.**

   The adapter sets do not need to be precooled if disrupting fresh tissues in lysis buffer or if disrupting lyophilized tissues.

2. **Place the tissues in 2 ml microcentrifuge tubes or 1.2 ml collection microtubes containing 1 tungsten carbide bead (3 mm mean diameter).**

3. **If purifying DNA of higher molecular weight from fresh or frozen tissues, precool the tubes by storing on dry ice.**

   Note: Do not freeze the tubes in liquid nitrogen, as this may lead to breakage of the tubes.

   The tubes do not need to be precooled if disrupting fresh tissues in lysis buffer or if disrupting lyophilized tissues.

4. **If necessary, add an appropriate volume of lysis buffer (e.g., Buffer AP1) to each tube.**

   Lysis buffer must not be added if disrupting precooled tissues or if disrupting lyophilized tissues.

5. **Place the tubes in the TissueLyser Adapter Set 2 x 24 (if using 2 ml tubes) or TissueLyser Adapter Set 2 x 96 (if using 1.2 ml tubes).**

6. **Operate the TissueLyser for 1 min at 25 Hz. Disassemble the adapter set, rotate the rack of tubes so that the tubes nearest to the TissueLyser are now outermost, and reassemble the adapter set. Operate the TissueLyser for another 1 min at 25 Hz.**

   Note: If processing precooled tissues, increasing the disruption time may lead to thawing and reduced DNA yield and quality.

7. **Add lysis buffer (e.g., Buffer AP1) if necessary, and proceed with DNA purification.**

   The tungsten carbide beads can be reused. For details on recovering and cleaning beads, refer to the *DNeasy Plant Handbook*.

Protocol: Purification of DNA from Plant Tissues (Maxi Protocol)

This protocol provides guidelines on using a Grinding Jar Set to disrupt plant tissues for subsequent DNA purification. If using the DNeasy Plant Maxi Kit for DNA purification (see Table 5, page 10), refer to the supplied *DNeasy Plant Handbook*, which contains a complete protocol for sample disruption and DNA purification.

Important points before starting

- Before beginning the procedure, read "Important Notes" (page 13).
- Ensure that you are familiar with operating the TissueLyser by referring to the operating instructions.
- If using the DNeasy Plant Maxi Kit for DNA purification, read the supplied handbook carefully before starting.
- Fresh, frozen, or lyophilized tissues can be processed. Fresh tissues can be disrupted in lysis buffer at ambient temperature. Alternatively, fresh or frozen tissues can be disrupted without lysis buffer if the jar containing the sample is frozen in liquid nitrogen. Lyophilized tissues can be disrupted without lysis buffer at ambient temperature. Disruption of tissues in lysis buffer yields DNA ideal for PCR, while disruption of tissues frozen in liquid nitrogen yields DNA of a higher molecular weight. We do not recommend disrupting frozen tissues in lysis buffer as this results in low yields and degraded DNA.

Procedure

1. **Place the tissues in 10 ml grinding jars containing 1 stainless steel grinding ball (20 mm mean diameter).**
2. **If purifying DNA of higher molecular weight from fresh or frozen tissues, freeze the jars in liquid nitrogen for 1 min.**

   The grinding jars do not need to be frozen if disrupting fresh tissues in lysis buffer or if disrupting lyophilized tissues.
3. **If necessary, add an appropriate volume of lysis buffer (e.g., Buffer AP1) to each jar.**

   Lysis buffer must not be added if processing frozen grinding jar sets or if disrupting lyophilized tissues.
4. **Operate the TissueLyser for 1 min at 30 Hz.**
5. **If purifying DNA of higher molecular weight from fresh or frozen tissues, freeze the jars in liquid nitrogen for 1 min.**

   The grinding jars do not need to be frozen if disrupting fresh tissues in lysis buffer or if disrupting lyophilized tissues.

6. **Operate the TissueLyser for 1 min at 30 Hz.**
7. **Add lysis buffer (e.g., Buffer AP1) if necessary, and proceed with DNA purification.**

   The stainless steel grinding balls can be reused. For details on recovering and cleaning grinding balls, refer to the *DNeasy Plant Handbook*.

Appendix A: TissueLyser Accessories

TissueLyser Adapter Set 2 x 24

This adapter set allows disruption of 48 (2 x 24) samples in parallel using standard 2 ml microcentrifuge tubes (e.g., Eppendorf Safe-Lock micro test tubes). Sample disruption can be carried out at room temperature or after storing the adapter set at –80°C for at least 2 hours. The adapter set can be cleaned with detergent, microbicides, or up to 96% ethanol. For more information, see the product sheet supplied with the TissueLyser Adapter Set.

TissueLyser Adapter Set 2 x 96

This adapter set allows disruption of 192 (2 x 96) samples in parallel using Collection Microtubes (racked). Sample disruption can be carried out at room temperature or after storing the adapter set at –80°C for at least 2 hours. The adapter set can be cleaned with detergent, microbicides, or up to 96% ethanol. For more information, see the product sheet supplied with the TissueLyser Adapter Set.

TissueLyser Single-Bead Dispenser, 5 mm

This bead dispenser dispenses individual beads (5 mm diameter) into any sample container. The reservoir holds approximately 150 beads. The TissueLyser Single-Bead Dispenser can be cleaned with water or detergent. For more information, see the product sheet supplied with the TissueLyser Single-Bead Dispenser.

TissueLyser Single-Bead Dispenser, 7 mm

This bead dispenser dispenses individual beads (7 mm diameter) into any sample container. The reservoir holds approximately 45 beads. The TissueLyser Single-Bead Dispenser can be cleaned with water or detergent. For more information, see the product sheet supplied with the TissueLyser Single-Bead Dispenser.

TissueLyser 3 mm Bead Dispenser, 96-well

This bead dispenser dispenses 96 beads (3 mm diameter) in parallel into Collection Microtubes (racked), enabling high-throughput disruption and homogenization. The reservoir holds approximately 1000 beads. The dispenser can be cleaned with water or detergent. For more information, see the product sheet supplied with the TissueLyser Bead Dispenser, 96-well.

TissueLyser 5 mm Bead Dispenser, 96-well

This bead dispenser dispenses 96 beads (5 mm diameter) in parallel into Collection Microtubes (racked), enabling high-throughput disruption and homogenization. The reservoir holds approximately 300 beads. The dispenser can be cleaned with water or detergent. For more information, see the product sheet supplied with the TissueLyser Bead Dispenser, 96-well.

Grinding Jar Set, S. Steel

The grinding jars allow disruption of 2 large samples in parallel using stainless steel grinding balls. Sample disruption can be carried out at room temperature or after freezing the grinding jars in liquid nitrogen. For more information, see the product sheet supplied with the Grinding Jar Set.

Grinding Jar Set, Teflon

The grinding jars allow disruption of 2 large samples in parallel using Teflon grinding balls. Sample disruption can be carried out at room temperature. For more information, see the product sheet supplied with the Grinding Jar Set.

Appendix B: Automated Solutions

Automated purification using QIAGEN spin-column kits

Purification of genomic DNA or total RNA from tissues can be fully automated on the QIAcube. The innovative QIAcube uses advanced technology to process QIAGEN spin columns, enabling seamless integration of automated, low-throughput sample prep into your laboratory workflow. Sample preparation using the QIAcube follows the same steps as the manual procedure (i.e., lyse, bind, wash, and elute), enabling you to continue using DNeasy Kits, QIAamp Kits, RNeasy Kits, and the miRNeasy Mini Kit for purification of high-quality DNA or RNA. For more information about the automated procedure, see the relevant protocol sheet available at www.qiagen.com/MyQIAcube .

The QIAcube.

The QIAcube is preinstalled with protocols for purification of plasmid DNA, genomic DNA, RNA, viral nucleic acids, and proteins, plus DNA and RNA cleanup. The range of protocols available is continually expanding, and additional QIAGEN protocols can be downloaded free of charge at www.qiagen.com/MyQIAcube .

Automated purification using magnetic particles and 96-well plates

Complete automated solutions from QIAGEN allow purification of genomic DNA or total RNA from human, animal, or plant tissues at a range of different throughputs using magnetic particles or 96-well plates (see Table 7, page 30). QIAGEN Instrument Service provides comprehensive support services to ensure the continued success of your automated applications. For more information about QIAGEN automation and QIAGEN Instrument Service, visit www.qiagen.com/automation .

Table 7. Automated purification of genomic DNA and total RNA from tissues

Workstation	Capability
EZ1 Advanced	Purification of genomic DNA or total RNA from 1–6 human samples per run
QIAsymphony SP	Purification of genomic DNA or total RNA from 1–96 animal or human samples per run
BioRobot Universal System	Purification of genomic DNA or total RNA in 96-well format from animal or human samples, plus downstream reaction setup
BioSprint 96	Purification of genomic DNA from up to 96 animal or plant samples per run

Low-throughput sample disruption

The TissueRuptor® is a handheld rotor–stator homogenizer that provides rapid and efficient disruption of individual samples for a wide range of downstream applications. The TissueRuptor uses transparent disposable probes, which helps to minimize the risk of cross-contamination and enables visual control of the sample disruption process. The TissueRuptor is an integral part of QIAGEN's complete solution for tissue management in gene expression, genotyping, and proteomics applications. Optimized protocols are available for sample disruption prior to manual or automated nucleic acid or protein purification, enabling a streamlined, efficient workflow. Purification of RNA, DNA, total nucleic acids, or protein can then be performed using QIAGEN kits. For more information about the TissueRuptor, visit www.qiagen.com/TissueRuptor .

Automated multicapillary gel electrophoresis

The revolutionary QIAxcel System enables fully automated and sensitive, high-resolution capillary electrophoresis for up to 96 samples per run. Ready-to-go gel cartridges reduce manual handling errors and eliminate the need for tedious gel preparation. With the QIAxcel System, analysis of DNA fragments, single- or multiplex PCR products, and qualitative and quantitative RNA analysis is now easier and faster than ever. To find out more, visit www.qiagen.com/QIAxcel .

Ordering Information

Product	Contents	Cat. no.
TissueLyser II	Universal laboratory mixer-mill disruptor, 100–120/220–240 V, 50/60 Hz	85300
Accessories		
TissueLyser Adapter Set 2 x 24	2 sets of Adapter Plates and 2 racks for use with 2 ml microcentrifuge tubes on the TissueLyser	69982
TissueLyser Adapter Set 2 x 96	2 sets of Adapter Plates for use with Collection Microtubes (racked) on the TissueLyser	69984
Grinding Jar Set, S. Steel (2 x 10 ml)	2 Grinding Jars (10 ml), 2 Stainless Steel Grinding Balls (20 mm)	69985
Grinding Jar Set, Teflon (2 x 10 ml)	2 Grinding Jars (10 ml), 2 Teflon Grinding Balls (20 mm)	69986
Stainless Steel Beads, 5 mm (200)	Stainless Steel Beads, suitable for use with the TissueLyser system	69989
Tungsten Carbide Beads, 3 mm (200)	Tungsten Carbide Beads, suitable for use with the TissueLyser system	69997
TissueLyser Single-Bead Dispenser, 5 mm	For dispensing individual beads (5 mm diameter)	69965
TissueLyser Single-Bead Dispenser, 7 mm	For dispensing individual beads (7 mm diameter)	69967
TissueLyser 3 mm Bead Dispenser, 96-Well	For dispensing 96 beads (3 mm diameter) in parallel	69973
TissueLyser 5 mm Bead Dispenser, 96-Well	For dispensing 96 beads (5 mm diameter) in parallel	69975
Collection Microtubes (racked)	Nonsterile polypropylene tubes (1.2 ml), 960 in racks of 96	19560
Collection Microtube Caps	Nonsterile polypropylene caps for collection microtubes (1.2 ml) and round-well blocks, 960 in strips of 8	19566

Ordering Information

Product	Contents	Cat. no.
Related products		
RNeasy Kits — for purification of total RNA from cells, tissues, and yeast		
RNeasy Micro Kit (50)	For 50 preps: RNeasy MinElute® Spin Columns, Collection Tubes, DNase I, Carrier RNA, Buffers	74004
RNeasy Mini Kit (50)	For 50 preps: RNeasy Spin Columns, Collection Tubes, Buffers	74104
RNeasy Protect Kits — for stabilization and purification of total RNA from tissues		
RNeasy Protect Mini Kit (50)	For 50 preps: RNA*later* RNA Stabilization Reagent, RNeasy Spin Columns, Collection Tubes, Buffers	74124
RNeasy Plus Kits — for purification of total RNA from cells and tissues using gDNA Eliminator spin columns		
RNeasy Plus Micro Kit (50)	For 50 preps: RNeasy MinElute Spin Columns, gDNA Eliminator Spin Columns, Collection Tubes, Carrier RNA, Buffers	74034
RNeasy Plus Mini Kit (50)	For 50 preps: RNeasy Spin Columns, gDNA Eliminator Spin Columns, Collection Tubes, Buffers	74134
Reagent DX	1 ml Reagent DX in a screw-cap tube	19088
RNeasy Fibrous Tissue Kits — for purification of total RNA from fiber-rich tissues		
RNeasy Fibrous Tissue Mini Kit (50)	For 50 preps: RNeasy Spin Columns, Collection Tubes, Proteinase K, DNase I, Buffers	74704
RNeasy Fibrous Tissue Midi Kit (10)	For 10 preps: RNeasy Spin Columns, Collection Tubes, Proteinase K, DNase I, Buffers	75742
RNeasy Lipid Tissue Kits — for purification of total RNA from all types of tissue, including fatty tissues		
RNeasy Lipid Tissue Mini Kit (50)	For 50 preps: RNeasy Spin Columns, Collection Tubes, QIAzol Lysis Reagent, Buffers	74804

Ordering Information

Product	Contents	Cat. no.
RNeasy 96 Universal Tissue Kits — for purification of total RNA from all types of tissue in 96-well format		
RNeasy 96 Universal Tissue Kit (4)	For 4 x 96 preps: RNeasy 96 Plates, Elution Microtubes CL, Caps, S-Blocks, Airpore Tape Sheets, QIAzol Lysis Reagent, Buffers	74881
RNeasy 96 Universal Tissue 8000 Kit (12)	For 12 x 96 preps on the BioRobot Universal System: RNeasy 96 Plates, Collection Microtubes, Elution Microtubes CL, Caps, S-Blocks, QIAzol Lysis Reagent, Buffers	967852
EZ1 RNA Tissue Mini Kit — for purification of total RNA from easy-to-lyse tissues on the BioRobot EZ1 workstation		
EZ1 RNA Tissue Mini Kit (48)	For 48 preps: Reagent Cartridges, Tips, Tip-Holders, Tubes, DNase I, Buffer RLT	959034
EZ1 RNA Universal Tissue Kit — for purification of total RNA from all types of tissue on the BioRobot EZ1 workstation		
EZ1 RNA Universal Tissue Kit (48)	For 48 preps: Reagent Cartridges, Tips, Tip-Holders, Tubes, QIAzol Lysis Reagent	956034
MagAttract RNA Tissue Mini M48 Kit — for purification of total RNA from easy-to-lyse tissues on the BioRobot M48 workstation		
MagAttract RNA Tissue Mini M48 Kit (192)	For 192 preps: MagAttract Suspension E, DNase I, Buffers	959236
MagAttract RNA Universal Tissue M48 Kit — for purification of total RNA from all types of tissue on the BioRobot M48 workstation		
MagAttract RNA Universal Tissue M48 Kit (192)	For 192 preps: MagAttract Suspension E, DNase I, QIAzol Lysis Reagent, Buffers	956336
QIAsymphony RNA Kit — for purification of total RNA from cells and tissues on the QIAsymphony SP		
QIAsymphony RNA Kit (192)	For 192 preps: 2 Reagent Cartridges, and Enzyme Racks	931636

Ordering Information

Product	Contents	Cat. no.
RNeasy Plant Mini Kit — for purification of total RNA from plants and fungi		
RNeasy Plant Mini Kit (20)	For 20 preps: RNeasy Spin Columns, QIAshredder Spin Columns, Collection Tubes, Buffers	74903
RNeasy 96 Kit — for purification of total RNA from cells in 96-well format		
RNeasy 96 Kit (4)	For 4 x 96 preps: RNeasy 96 Plates, Elution Microtubes CL, Caps, S-Blocks, Airpore Tape Sheets, Buffers	74181
RNeasy Protect Bacteria Kits — for stabilization and purification of total RNA from bacteria		
RNeasy Protect Bacteria Mini Kit (50)	For 50 preps: RNAprotect Bacteria Reagent, RNeasy Mini Kit	74524
RNeasy Protect Bacteria Midi Kit (10)	For 10 preps: RNAprotect Bacteria Reagent, RNeasy Midi Kit	75552
AllPrep DNA/RNA/Protein Mini Kit — for simultaneous purification of DNA, RNA, and protein from cells and tissues		
AllPrep DNA/RNA/ Protein Mini Kit (50)	For 50 preps: AllPrep DNA Spin Columns, RNeasy Spin Columns, Collection Tubes, Buffers	80004
AllPrep DNA/RNA Kits — for simultaneous purification of DNA and RNA from cells and tissues		
AllPrep DNA/RNA Micro Kit (50)	For 50 preps: AllPrep DNA Spin Columns, RNeasy MinElute Spin Columns, Collection Tubes, Carrier RNA, Buffers	80284
AllPrep DNA/RNA Mini Kit (50)	For 50 preps: AllPrep DNA Spin Columns, RNeasy Spin Columns, Collection Tubes, Buffers	80204
QIAamp DNA Mini Kit — for purification of genomic, mitochondrial, bacterial, parasite, or viral DNA		
QIAamp DNA Mini Kit (50)	For 50 preps: QIAamp Spin Columns, Collection Tubes, Proteinase K, Buffers	51304

Ordering Information

Product	Contents	Cat. no.
EZ1 DNA Tissue Kit — for automated purification of genomic DNA from 1–6 human samples on the BioRobot EZ1 workstation		
EZ1 DNA Tissue Kit (48)	For 48 preps: Reagent Cartridges, Tips, Tip-Holders, Tubes, Proteinase K, Buffer G2	953034
MagAttract DNA Mini M48 Kit — for automated purification of genomic DNA from 6–48 human samples on the BioRobot M48 workstation		
MagAttract DNA Mini M48 Kit (192)	For 192 preps: MagAttract Suspension B, Proteinase K, Buffers	953336
QIAsymphony DNA Kits — for purification of DNA from a wide range of sample types on the QIAsymphony SP		
QIAsymphony DNA Mini Kit (96)	For 96 preps of 400 µl each: 2 Reagent Cartridges, and Enzyme Racks	931235
QIAsymphony DNA Midi Kit (96)	For 96 preps of 1000 µl each: 2 Reagent Cartridges, and Enzyme Racks	931255
DNeasy Blood & Tissue Kit — for purification of total DNA from animal blood and tissues, and from cells, yeast, bacteria, or viruses		
DNeasy Blood & Tissue Kit (50)	For 50 preps: DNeasy Spin Columns, Collection Tubes, Proteinase K, Buffers	69504
DNeasy 96 Blood & Tissue Kit — for purification of total DNA from animal blood and tissues, and from cells, yeast, bacteria, or viruses in 96-well format		
DNeasy 96 Blood & Tissue Kit (4)	For 4 x 96 preps: DNeasy 96 Plates, Collection Microtubes, Caps, S-Blocks, Elution Microtubes RS, AirPore Tape Sheets, Proteinase K, Buffers	69581
DNeasy Plant Kits — for purification of total DNA from plants and fungi		
DNeasy Plant Mini Kit (50)	For 50 preps: DNeasy Spin Columns, QIAshredder Spin Columns, Collection Tubes, RNase A, Buffers	69104

Ordering Information

Product	Contents	Cat. no.
DNeasy Plant Maxi Kit (6)	For 6 preps: DNeasy Spin Columns, QIAshredder Spin Columns, Collection Tubes, RNase A, Buffers	68161
DNeasy 96 Plant Kit — for purification of total DNA from plants in 96-well format		
DNeasy 96 Plant Kit (6)	For 6 x 96 preps: DNeasy 96 Plates, Collection Microtubes, Caps, S-Blocks, Elution Microtubes RS, AirPore Tape Sheets, RNase A, Reagent DX, Buffers	69181
MagAttract 96 DNA Plant Core Kit — for manual or automated purification of total DNA from plants in 96-well format		
MagAttract 96 DNA Plant Core Kit (6)	For 6 x 96 preps: MagAttract Suspension A, RNase A, Buffers	67161
BioSprint 15 DNA Plant Kit — for automated purification of total DNA from plant tissue on the BioSprint 15 workstation		
BioSprint 15 DNA Plant Kit (60)	For 60 preps: MagAttract Suspension G, Rod Covers, Tube Strips, RNase A, Buffers	941514
BioSprint 96 DNA Plant Kit — for automated purification of total DNA from plant tissue on the BioSprint 96 workstation		
BioSprint 96 DNA Plant Kit (576)	For 576 preps: MagAttract Suspension G, Rod Covers, Microplates MP, S-Blocks, RNase A, Buffer RPW	941557

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Notes

Notes

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