

Genomic DNA Isolation Kit

Product # 24700

Product Insert

Norgen's **Genomic DNA Isolation Kit** is designed for the rapid preparation of genomic DNA from various tissue samples, cultured cells or bodily fluids. Purification is based on spin column chromatography using Norgen's proprietary resin as the separation matrix. Norgen's resin binds DNA under high salt concentrations and releases the bound DNA under low salt and slightly alkali conditions. The purified genomic DNA is fully digestible with all restriction enzymes tested, and is completely compatible with PCR and Southern Blot analysis.

The Genomic DNA Isolation Kit allows for the isolation of genomic DNA from various types of animal tissues or cell samples. In addition, a protocol is also provided for the purification of viral DNA. In all cases the genomic DNA is preferentially purified from other cellular proteinaceous components. Typical yields of genomic DNA will vary depending on the sample being processed. Preparation time for a single sample is approximately 60 minutes, and each kit contains sufficient materials for 50 preparations.

Kit Components

Component	Product # 24700 (50 samples)
Homogenization Solution	18 mL
Lysis Solution	18 mL
Binding Solution	4 mL
Wash Solution I	30 mL
Wash Solution II	30 mL
Elution Buffer	24 mL
Proteinase K	12 mg
Micro Spin Columns	50
Collection Tubes	50
Elution tubes (1.7 mL)	50
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Storage Conditions and Product Stability

All solutions should be kept tightly sealed and stored at room temperature. These reagents should remain stable for at least 1 year in their unopened containers. The Proteinase K should be stored in aliquots at -20°C upon reconstitution. This product is stable at room temperature in its lyophilized form.

Precautions and Disclaimers

This kit is designed for research purposes only. It is not intended for human or diagnostic use.

Ensure that a suitable lab coat, disposable gloves and protective goggles are worn when working with chemicals. For more information, please consult the appropriate Material Safety Data Sheets (MSDSs). These are available as convenient PDF files online at www.norgenbiotek.com.

The **Binding Solution**, **Wash Solution I** and **Wash Solution II** contain guanidine hydrochloride, and should be handled with care. Guanidine hydrochloride forms highly reactive compounds when combined with bleach, thus care must be taken to properly dispose of any of this solution.

Customer-Supplied Reagents and Equipment

- Benchtop microcentrifuge
- 1.5 mL microcentrifuge tubes
- 55 °C water bath or heating block
- 96 – 100% ethanol
- Cell Disruption Tools such as mortar and pestle, rotor-stator homogenizer
- RNase A (optional)

Procedure

All centrifugation steps are carried out in a benchtop microcentrifuge. Various speeds are required for different steps, so please check your microcentrifuge specifications to ensure that it is capable of the proper speeds. All centrifugation steps are performed at room temperature. The correct rpm can be calculated using the formula:

$$RPM = \sqrt{\frac{RCF}{(1.118 \times 10^{-5}) (r)}}$$

where *RCF* = required gravitational acceleration (relative centrifugal force in units of g); *r* = radius of the rotor in cm; and *RPM* = the number of revolutions per minute required to achieve the necessary *g*-force.

Section 1. Preparation of Lysate From Various Cell Types

Notes Prior to Use:

- The steps for preparing the lysate are different depending on the starting material (**Step 1**). However, the subsequent steps are the same in all cases (**Steps 2 – 4**).
- Please ensure that the correct procedure for preparing the lysate from your starting material is followed.
- A variable speed centrifuge should be used for maximum kit performance. If a variable speed centrifuge is not available a fixed speed centrifuge can be used, however reduced yields may be observed.
- Ensure that all solutions are at room temperature prior to use, and that no precipitates have formed. If necessary, warm the solutions and mix well until the solutions become clear again.
- Reconstitute the Proteinase K in 0.6 mL of molecular biology grade water, aliquot in 120 µL fractions and store the unused portions at -20°C until needed.

- Add 22.5 mL of 96-100% ethanol to **Wash Solution I**.
- Add 7.5 mL of 96-100% ethanol to **Wash Solution II**.
- Preheat a water bath or heating block to 55°C.

1A. Lysate Preparation from Animal Tissues

Notes Prior to Use

- Fresh or frozen tissues may be used for the procedure. Tissues should be immediately frozen and stored at -20°C or -70°C. Tissues may be stored at -70°C for several months.
- It is recommended that no more than 20 mg of tissue be used, in order to prevent clogging of the column.

1A. Lysate Preparation from Animal Tissues

- Excise the tissue sample.
- Determine the amount of tissue by weighing. It is recommended that no more than 20 mg of tissue be used for the protocol.
- Place the sample in a nuclease-free microcentrifuge tube.

Note: The tissue sample may be homogenized into fine powder in liquid nitrogen at this point to improve lysis efficiency

- Add 250 µL of **Homogenization Solution** to the tissue sample. Homogenize the sample using tools such as a rotor-stator homogenizer or a microfuge-size pestle.

Optional RNase A Treatment:

If RNA-free genomic DNA is required, add the equivalent of 10 KUnitz of RNase A (not to exceed 20 µL) to the cell suspension. Mix well and continue with step **1Ae**.

- Add 250 µL of the **Lysis Solution** and 12 µL of **Proteinase K** to the suspension. Mix well by gentle vortexing and incubate at 55°C for 1 hour.

Note: Incubation times may fluctuate between 45 minutes to over 2 hours depending on the type of tissue being lysed. Lysis is considered complete when a relatively clear lysate is obtained.

- Proceed to Step 2: Binding to Column.

1B. Lysate Preparation from Cultured Animal Cells

Notes Prior to Use

- Cells grown in suspension or monolayer may be used.
- The maximum recommended input of cells is 3×10^6 . A hemocytometer can be used in conjunction with a microscope to count the number of cells. As a general guideline, a confluent 3.5 cm plate of HeLa cells will contain 10^6 cells.
- Cell pellets can be stored at -70°C for later use or used directly in the procedure. Determine the number of cells present before freezing.
- Frozen cell pellets should not be subjected to repeated cycles of freeze and thaw prior to beginning the protocol.

1B(i). Cell Lysate Preparation from Cells Growing in a Monolayer

- a. Detach cells by standard trypsinization method or cell scraper. Transfer an appropriate amount to a 1.5 mL microfuge tube (not provided). The maximum recommended input of cells is 3×10^6 .
- b. Collect cells by centrifugation at no more than $200 \times g$ (~2,000 RPM) for 10 minutes. Discard the supernatant
- c. Add 250 μ L of **Homogenization Solution** to the cell pellet. Mix by gentle vortexing.

Optional RNase A Treatment:

If RNA-free genomic DNA is required, add the equivalent of 10 KUnitz of RNase A (not to exceed 20 μ L) to the cell suspension. Mix well and continue with step **1B(i) e.**

- e. Add 250 μ L of the **Lysis Solution** and 12 μ L of **Proteinase K** to the suspension. Mix well by gentle vortexing and incubate at 55°C for 1 hour.

Note: Incubation times may fluctuate between 45 minutes to over 2 hours depending on the type of cell being lysed. Lysis is considered complete when a relatively clear lysate is obtained.

- f. Proceed to Step 2: Binding to Column.

1B (ii). Cell Lysate Preparation from Cells Growing in Suspension and Lifted Cells

- a. Transfer an appropriate amount of cells to a 1.5 mL microfuge tube (not provided). The maximum recommended input of cells is 3×10^6 .
- b. Collect cells by centrifugation at no more than $200 \times g$ (~2,000 RPM) for 10 minutes. Discard the supernatant.
- c. Add 250 μ L of **Homogenization Solution** to the cell pellet. Mix by gentle vortexing.

Optional RNase A Treatment:

If RNA-free genomic DNA is required, add the equivalent of 10 KUnitz of RNase A (not to exceed 20 μ L) to the cell suspension. Mix well and continue with step **1B(ii) e.**

- e. Add 250 μ L of the **Lysis Solution** and 12 μ L of **Proteinase K** to the suspension. Mix well by gentle vortexing and incubate at 55°C for 1 hour.

Note: Incubation times may fluctuate between 45 minutes to over 2 hours depending on the type of cell being lysed. Lysis is considered complete when a relatively clear lysate is obtained.

- f. Proceed to Step 2: Binding to Column.

1C. Lysate Preparation from Bodily Fluids or Swabs

Notes Prior to Use

- Up to 150 μ L of bodily fluids including blood and saliva can be processed.
- Fresh samples of bodily fluids are recommended. Frozen samples may be used, however the yield of genomic DNA may be decreased.

1C. Lysate Preparation from Bodily Fluids or Swabs

- a. *For Bodily Fluid:* Transfer up to 150 μL of a bodily fluid sample to a 1.5 mL microfuge tube (not provided). Adjust the volume to 250 μL by adding **Homogenization Solution**. Proceed to Step **1Cc**.
- b. *For Swabs:* Using sterile techniques, cut the cotton tip where the cells were collected and place into 300 μL of **Homogenization Solution** in a microcentrifuge tube. Vortex gently and incubate for 5 minutes at room temperature. Proceed to Step **1Cc**.
- c. **Optional RNase A treatment:** If RNA-free genomic DNA is required, add the equivalent of 10 KUnitz of RNase A (not to exceed 20 μL) to the cell suspension. Mix well and continue with step **1Cd**.
- d. Add 250 μL of the **Lysis Solution** and 12 μL of **Proteinase K** to the suspension. Mix well by gentle vortexing and incubate at 55°C for 1 hour.

Note: Incubation times may fluctuate between 45 minutes to over 2 hours depending on the type of cell being lysed. Lysis is considered complete when a relatively clear lysate is obtained.

- e. Proceed to Step 2: Binding to Column.

1D. Lysate Preparation for Viral DNA

Notes Prior to Use

- For the isolation of integrated viral DNA, follow Section **1A** if the starting material is animal tissue, follow Section **1B** if the starting material is cell culture, and follow Section **1C** if the starting material is bodily fluid such as blood.
- For the isolation of DNA from free viral particles, follow the protocol provided below.
- Up to 150 μL of viral suspension or bodily fluids can be processed.
- Fresh samples are recommended. Frozen samples may be used, however the yield of genomic DNA may be decreased.

1D. Lysate Preparation for Viral DNA

- a. Transfer up to 150 μL of a sample to a 1.5 mL microfuge tube (not provided). Adjust the volume to 250 μL by adding **Homogenization Solution**.

Optional RNase A treatment: If RNA-free genomic DNA is required, add the equivalent of 10 KUnitz of RNase A (not to exceed 20 μL) to the cell suspension. Mix well.

- b. Add 250 μL of the **Lysis Solution** and 12 μL of **Proteinase K** to the suspension. Mix well by gentle vortexing and incubate at 55°C for 1 hour.

Note: Incubation times may fluctuate between 45 minutes to over 2 hours depending on the type of cell being lysed. Lysis is considered complete when a relatively clear lysate is obtained.

- c. Proceed to Step 2: Binding to Column.

Section 2. Genomic DNA Purification from All Types of Lysate

Note: The remaining steps of the procedure for the purification of genomic DNA are the same from this point forward for all the different types of lysate.

2. Binding to Column

- a. Add 50 μL of **Binding Solution** to the lysate and mix well with gentle vortexing. Ensure that a homogeneous mixture is obtained.
- b. Assemble a micro spin column with a provided collection tube. Apply the mixture to the spin column assembly. Cap the column, and centrifuge the unit for 3 minutes at $5,200 \times g$ (~8,000 RPM).

Note: Ensure the entire lysate volume has passed through into the collection tube by inspecting the column. If the entire lysate volume has not passed, spin at $14,000 \times g$ (~14,000 RPM) for 2 minutes.

- c. After centrifugation, discard the flowthrough, and reassemble the spin column with its collection tube.

3. Washing Bound DNA

- a. Apply 500 μL of **Wash Solution I** to the column, and centrifuge the unit for 1 minute at $14,000 \times g$ (~14,000 RPM).
- b. After centrifugation, discard the flowthrough and reassemble the spin column with its collection tube.
- c. Apply 500 μL of **Wash Solution II** to the column, and centrifuge the unit for 2 minutes at $14,000 \times g$ (~14,000 RPM).
- d. Carefully detach the spin column from the collection tube and discard the collection tube and flowthrough.

Note: If any liquid is left on the side of the spin column, discard the flowthrough and reassemble the spin column with its collection tube. Spin for an additional 1 minute at $14,000 \times g$ (~14,000 RPM) in order to completely dry the column.

4. Elution of Clean DNA

- a. Assemble the spin column (with DNA bound to the resin) with a provided 1.7 mL **Elution tube**.
- b. Add 200 μL of **Elution Buffer** to the center of the resin bed. Centrifuge for 1 minute at $3,000 \times g$ (~6,000 RPM). A portion of the **Elution Buffer** will pass through the column which allows for hydration of the DNA to occur.
- c. Centrifuge at $14,000 \times g$ (~14,000 RPM) for an additional 2 minutes to collect the total elution volume.
- d. **(Optional):** An additional elution may be performed if desired. Another 200 μL of **Elution Buffer** may be added to the column and centrifuged at $3,000 \times g$ for 1 minute into a new elution tube. Then, centrifuge the column at $14,000 \times g$ for an additional 2 minutes. The yield can be improved by an additional 20-30% when this second elution is performed.

The purified genomic DNA can be stored at 2-8°C for a few days. For longer term storage, -20°C is recommended.

Troubleshooting Guide

Problem	Possible Cause	Solution and Explanation
The micro spin column is clogged	The sample is too large	Do not exceed the recommended amount of starting materials. The amount of starting material may need to be decreased if the column shows clogging below the recommended levels. Clogging can also be alleviated by increasing the g-force and/or centrifuging for a longer period of time until the lysate passes through the column.
The lysate is very gelatinous prior to loading onto the column	The lysate/binding solution mixture is not homogeneous	To ensure a homogeneous solution, vortex for 10-15 seconds before applying the lysate to the spin column.
	Maximum number of cells or amount of tissue exceeds kit specifications	Refer to specifications to determine if amount of starting material falls within kit specifications.
The yield of genomic DNA is low	Improper storage of samples.	Tissue samples and cell pellets may be frozen and stored at -20°C or -70°C. Repeated freezing and thawing of stored samples should be avoided, as this may lead to decreased yields of DNA.
	Incomplete lysis of cells	Extend the incubation time of Proteinase K digestion or reduce the amount of tissue or cells used for lysis.
	The DNA elution is incomplete	Ensure that centrifugation at 14,000 x g is performed after the 3,000 x g centrifugation cycle, to ensure that all the DNA is eluted.
The genomic DNA is sheared	The genomic DNA was handled improperly	Pipetting steps should be handled as gently as possible. Reduce vortexing times during mixing steps (no more than 10-15 seconds).
	Improper storage of sample	Repeated freezing and thawing of stored samples should be avoided as this may lead to decreased DNA size.
	The sample is old	Sheared DNA may be obtained from old tissue or cell samples. Fresh samples are recommended for maximum genomic DNA yield

Related Products	Product #
HighRanger 1kb DNA Ladder	11900
UltraRanger 1kb DNA Ladder	12100
Bacterial Genomic DNA Isolation Kit	17900

Technical Support

Contact our Technical Support Team between the hours of 8:30 and 5:30 (Eastern Standard Time) at (905) 227-8848 or Toll Free at 1-866-667-4362.

Technical support can also be obtained from our website (www.norgenbiotek.com) or through email at techsupport@norgenbiotek.com.

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