NORGEN BIOTEK CORP.

The Sample Preparation Experts

BLOOD SAMPLE PREPARATION

The New Standard in RNA Purification, Best-in-Class, Pure & Simple

Purification of inhibitor-free RNA, microRNA
and genomic DNA for any application

www.norgenbiotek.com

An ISO 13485:2003, ISO 9001:2008 & ISO 15189:2007 Certified Company

Blood Sample Preparation Kits

Isolation of high quality DNA or RNA from blood using Norgen's nucleic acid isolation technologies. DNA can be isolated from fresh or frozen blood using a single column-based preparation (different sizes: Micro, Mini, Midi, Maxi or dried blood spots), alcohol precipitation (0.3 mL to 10 mL) or 96-well plate for high throughput isolations. Blood RNA can be isolated from whole blood or leukocytes using a single column-based preparation. All nucleic acids isolated by Norgen's technology are of the highest quality and are suitable for sensitive downstream applications.

Sample Preparation Selection Table:

Kit	Cat. #	Kit size	Sample size	Yield
Single Preparation - DNA Isolation Kits				
Blood Genomic DNA Isolation Micro Kit	52100	50 preps	1-100 µL	2-6 µg
Blood Genomic DNA Isolation Mini Kit	46300, Dx46300*	50 preps	20-200 µL	4-12 µg
Blood Genomic DNA Isolation Midi Kit	51400	20 preps	300 µL – 2 mL	20-60 µg
Blood Genomic DNA Isolation Maxi Kit	31200	12 preps	3-10 mL	200-600 µg
Dried Blood Spot (DBS) Genomic DNA Isolation Kit	36000	50 preps	3 x 3mm punches	50-150 ng
Alcohol Precipitation - DNA Purification Kits				
Blood DNA Purification Kit - 30 mL	52500	100 preps (0.3 mL)	0.3-10 mL	~24 µg
Single Preparation - RNA Isolation Kits				
Total RNA Purification Kit Specific protocol for blood samples	17200, 37500, Dx17200*	50, 100 preps	Up to 200 µL	1-5 µg
Leukocyte RNA Purification Kit	21200	50 preps	10 µL – 2 mL	Up to 50 µg
High Throughput DNA Preparation				
Blood Genomic DNA Isolation 96-Well Kit	50500	2 x 96-well plates	20-200 µL	4-12 µg
Blood DNA Preservation				
Blood DNA Preservation Buffer (3X)	29111, 29112	25, 100 mL	Variable	Variable

*CE-certified kit for in-vitro diagnostic purposes - not available in all regions - very similar protocol to non-Dx kit.

Blood Genomic DNA Isolation Micro Kit — Cat. # 52100

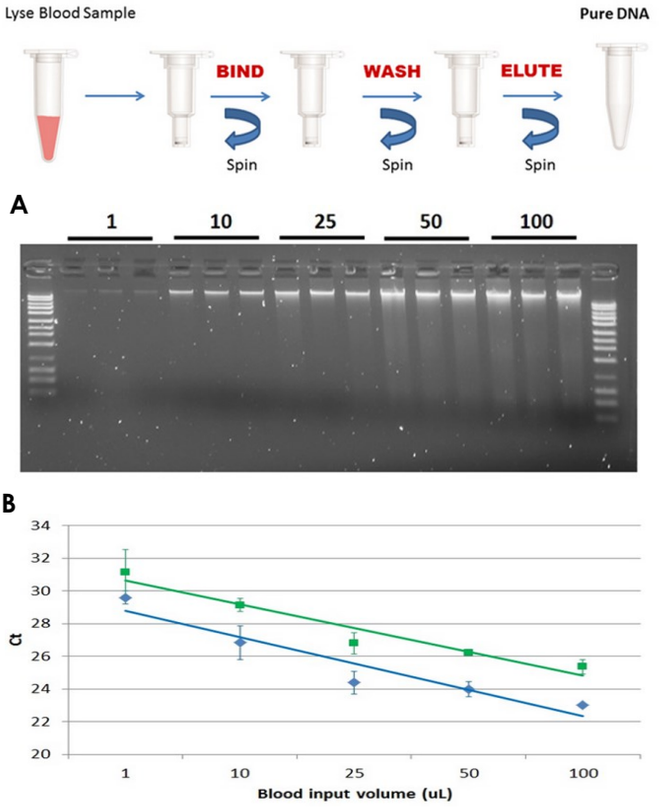


Figure 1. High Yields and amplification efficiency of Genomic DNA Isolated from 1 µL to 100 µL of Whole Blood. Genomic DNA was isolated from 1, 10, 25, 50 and 100 µL of whole blood using Norgen's Blood Genomic DNA Isolation Micro Kit. **(A)** 15 µL from each 100 µL elution was loaded on 1% TAE agarose gel. The kit demonstrated a good DNA yield and integrity. The used ladder is Norgen's UltraRanger 1kb DNA Ladder. **(B)** Five microliters of the DNA from each 100 µL of elution was used in a real-time PCR reaction (total reaction volume of 20 µL) with GAPDH TaqMan probe and primers. The real-time PCR was successful in amplifying the GAPDH gene from both the first elution (blue) and the second elution (green), with a linear decrease in Ct value with the increase in blood input volume, indicating that the DNA is of a high quality and can be used in sensitive downstream applications.

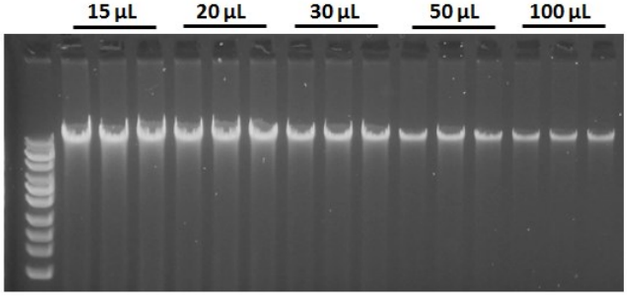


Figure 2. High Concentration of Genomic DNA Eluted in Different Elution Volumes. Genomic DNA was isolated from 100 µL of whole blood and eluted in 20, 30, 50 and 100 µL of Elution Buffer using Norgen's Blood Genomic DNA Isolation Micro Kit. Following isolation, 5 µL from each elution was loaded on 1% TAE agarose gel. Norgen's Blood Genomic DNA Isolation Micro Kit demonstrated a good DNA yield and integrity with increased concentration when using lower elution volumes (20 and 30 µL) compared to the larger elution volumes (50 and 100 µL). Lane M: Norgen's HighRanger 1kb DNA Ladder.

Rapid preparation of genomic DNA from 1 µL to 100 µL of whole blood.

The Blood Genomic DNA Isolation Micro Kit allows for the isolation of genomic DNA from the blood of various species, including humans. Purification is based on spin column technology without the use of organic solvents. Typical yields of genomic DNA will vary depending on the cell density of the blood sample. Preparation time for a single sample is less than 30 minutes, and each kit contains sufficient materials for 50 preparations. The purified genomic DNA is fully digestible with all restriction enzymes tested, and is completely compatible with sensitive downstream applications.

Features and Benefits

- **Isolate DNA from small volumes of blood -** Isolate DNA from inputs of 1µL to 100 µL of blood
- **Isolate DNA from blood pathogens -** Isolate DNA from viral and bacterial blood pathogens
- **No Phenol-Chloroform extraction or alcohol precipitation** - Isolate genomic DNA without the use of harmful chemicals
- **Fast and easy processing** - Rapid spin-column format allows for the processing of multiple samples in 30 minutes.
- **Recovered genomic DNA is suitable for downstream applications** - Purified genomic DNA is fully compatible with restriction enzyme digestions, Southern Blot, PCR analysis, sequencing and microarray analysis.
- **High quality DNA with no RNA contamination** - No contamination or degradation of genomic DNA is observed.

Applications

- Quantitative PCR
- Genotyping
- SNP analysis
- Microarray analysis
- Next Generation Sequencing
- PCR-based pathogen detection

Feature	Specifications
Maximum Blood Input	100 µL
Column Binding Capacity	> 25 µg
Average Yield (100 µL of blood)	2-6 µg*
Elution Volume	20-100 µL
Analyte Purified	Genomic DNA, mitochondrial DNA, viral DNA
Format	Spin column
Time to Complete 10 Purifications	30 minutes

*Yield will vary depending on the type of blood processed

Ordering information

Cat #	Quantity
52100	50 preps

Single Preparation - DNA Isolation Kits

Blood Genomic DNA Isolation Mini Kit — Cat. # 46300

Blood Genomic DNA Isolation Mini Kit Dx — Cat. # Dx46300

CE-certified kit for in-vitro diagnostic purposes - not available in all regions

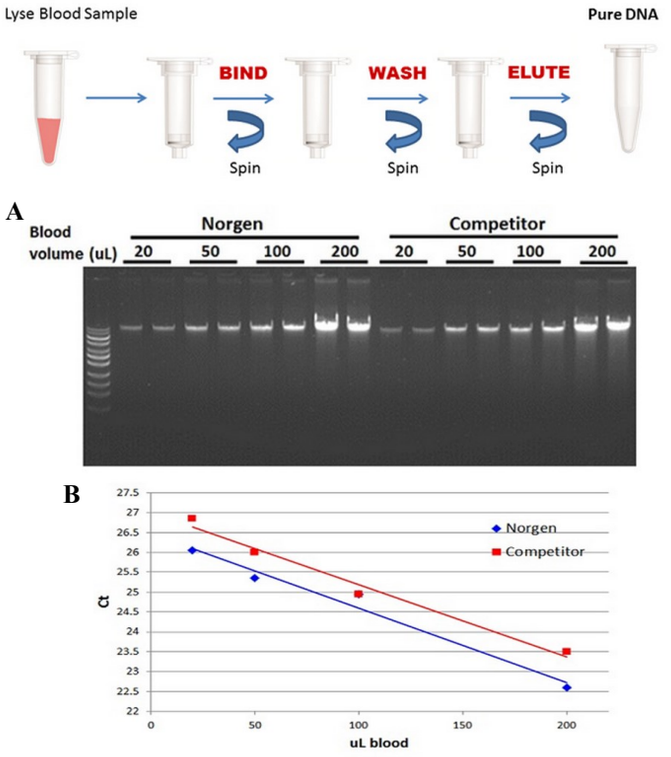


Figure 1. High Yields and amplification efficiency of Genomic DNA Isolated from 20 µL to 200 µL of Whole Blood. Genomic DNA was isolated from 20, 50, 100 and 200 µL of whole blood using Norgen's Blood Genomic DNA Isolation Mini Kit and a leading competitor's kit. **(A)** 15 µL from each 200 µL elution was loaded on 1% TAE agarose gel. Norgen's Blood Genomic DNA Isolation Mini Kit demonstrated a better DNA yield than the leading competitor's kit. The used ladder is Norgen's UltraRanger 1kb DNA Ladder. **(B)** Nine µL of the DNA from each 200 µL of elution was used in a real-time PCR reaction (total reaction volume of 20 µL) with GAPDH TaqMan probe and primers. The real-time PCR was successful in amplifying the GAPDH gene, with a linear decrease in Ct value with the increase in blood input volume. Furthermore, Norgen-isolated DNA was amplified with a lower Ct value from all DNA isolated from the different blood input volumes, indicating the higher yield and purity of DNA isolated using Norgen's kit.

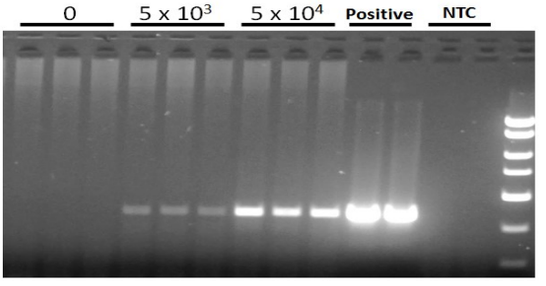


Figure 2. Detection of *Listeria monocytogenes* in DNA isolated with Norgen's Genomic DNA Isolation Mini Kit. DNA was isolated from blood spiked with 5 x 10^3 and 5 x 10^4 *L. Monocytogenes* cells. One microliter of the DNA from each 200 µL of elution was used in a real-time PCR reaction (total reaction volume of 20 µL) with *L. monocytogenes* specific primer set (Norgen Biotek). The real-time PCR was successful in detecting the pathogen from the two spiked amounts. NTC is the no template control and the used ladder is Norgen's FastRunner DNA Ladder.

Rapid preparation of genomic DNA from up to 200 µL of whole blood.

The Blood Genomic DNA Isolation Mini Kit allows for the isolation of genomic DNA from the blood of various species, including humans. Purification is based on spin column technology without the use of organic solvents. Typical yields of genomic DNA will vary depending on the cell density of the blood sample. Preparation time for a single sample is less than 30 minutes, and each kit contains sufficient materials for 50 preparations. The purified genomic DNA is fully digestible with all restriction enzymes tested, and is completely compatible with downstream applications.

Features and Benefits

- **Isolate DNA from small volumes of blood -** Isolate DNA from inputs of up to 200 µL of blood
- **Isolate DNA from blood pathogens -** Isolate DNA from viral and bacterial blood pathogens
- **No Phenol-Chloroform extraction or alcohol precipitation** - Isolate genomic DNA without the use of harmful chemicals
- **Fast and easy processing** - Rapid spin-column format allows for the processing of multiple samples in 30 minutes.
- **Recovered genomic DNA is suitable for downstream applications** - Purified genomic DNA is fully compatible with restriction enzyme digestions, Southern Blot, PCR analysis, sequencing and microarray analysis.
- **High quality DNA with no RNA contamination** - No contamination or degradation of genomic DNA is observed.

Applications

- Quantitative PCR
- Genotyping
- SNP analysis
- Microarray analysis
- Next Generation Sequencing
- PCR-based pathogen detection

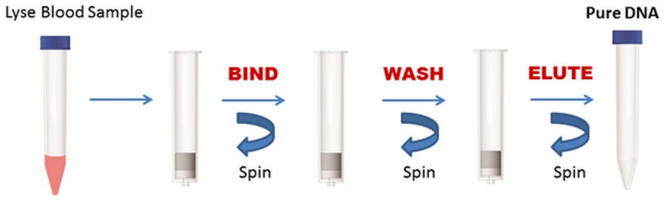
Feature	Specifications
Maximum Blood Input	200 µL
Column Binding Capacity	> 50 µg
Average Yield (200 µL of blood)	4-12 µg*
Elution Volume	50-200 µL
Analyte Purified	Genomic DNA, mitochondrial DNA, viral DNA
Format	Spin column
Time to Complete 10 Purifications	30 minutes

*Yield will vary depending on the type of blood processed

Ordering information

Cat #	Quantity
46300	50 preps
Dx46300	50 preps

Blood Genomic DNA Isolation Midi Kit — Cat. # 51400



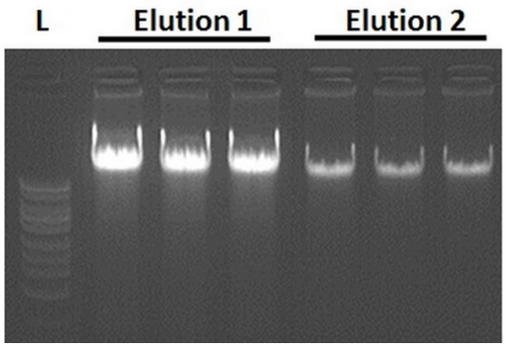


Figure 1. High Yields of Genomic DNA Isolated from 2 mL of Whole Blood. Genomic DNA was isolated from 2 mL of whole blood using Norgen's Blood Genomic DNA Isolation Midi Kit. Following isolation, 20 µL from 300 µL first and second elutions was loaded on 1% TAE agarose gel. Norgen's Blood Genomic DNA Isolation Kit demonstrated a high DNA yield and integrity. Lane L: Norgen's HighRanger 1kb DNA Ladder.

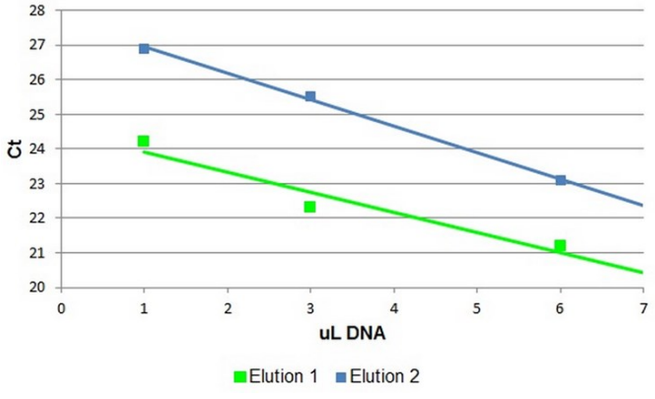


Figure 2. Purified DNA Can be Amplified in a Real-time PCR (TaqMan) Reaction. Genomic DNA was isolated from 2 mL of whole human blood using Norgen's Blood Genomic DNA Isolation Midi Kit. Different imput amounts (1, 3 & 6 µL) of the DNA from each of the 300 µL elutions was used in a real-time PCR reaction (total reaction volume of 20 µL) with GAPDH TaqMan probe and primers. The real-time PCR was successful in amplifying the GAPDH gene with a linear decrease in Ct value with the increased DNA template volume, indicating that the DNA is of a high quality and can be used in sensitive downstream applications.

Rapid preparation of genomic DNA from up to 0.3 to 2 mL of whole blood.

The Blood Genomic DNA Isolation Midi Kit allows for the isolation of genomic DNA from the blood of various species, including humans. Purification is based on spin column technology without the use of organic solvents. Typical yields of genomic DNA will vary depending on the cell density of the blood sample. Preparation time for a single sample is less than 45 minutes, and each kit contains sufficient materials for 20 preparations. The purified genomic DNA is fully digestible with all restriction enzymes tested, and is completely compatible with downstream applications.

Features and Benefits

- **No Phenol-Chloroform extraction or alcohol precipitation** - Isolate genomic DNA without the use of harmful chemicals
- **Isolate DNA from blood pathogens -** Isolate DNA from viral and bacterial blood pathogens
- **Fast and easy processing** - Rapid spin-column format allows for the processing of multiple samples in 45 minutes.
- **Recovered genomic DNA is suitable for downstream applications** - Purified genomic DNA is fully compatible with restriction enzyme digestions, Southern Blot, PCR analysis, sequencing and microarray analysis.
- **High quality DNA with no RNA contamination** - No contamination or degradation of genomic DNA is observed.

Applications

- Quantitative PCR
- Genotyping
- SNP analysis
- Microarray analysis
- Next Generation Sequencing
- PCR-based pathogen detection

Feature	Specifications
Maximum Blood Input	2 mL
Column Binding Capacity	> 100 µg
Average Yield	60 µg*
Elution Volume	500 µL
Analyte Purified	Genomic DNA, mitochondrial DNA, viral DNA
Format	Spin column
Time to Complete 10 Purifications	45 minutes

*Yield will vary depending on the type of blood processed

Ordering information

Cat #	Quantity
51400	20 preps

Single Preparation - DNA Isolation Kits

Blood Genomic DNA Isolation Maxi Kit — Cat. # 31200

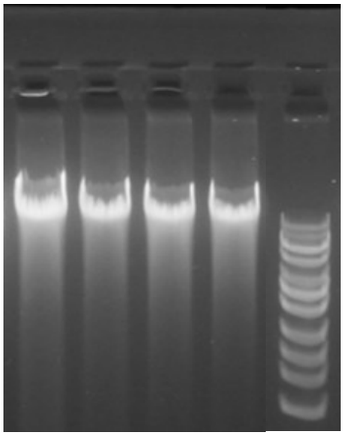


Figure 1. High Yields of Genomic DNA Isolated from Whole Blood. Genomic DNA was isolated from four different 10 mL whole blood samples using Norgen's Blood Genomic DNA Isolation Maxi Kit. Following isolation, 15 µL from each 2 mL elution was loaded on 1% TAE agarose gel. The used ladder is Norgen's UltraRanger 1kb DNA Ladder. Norgen's Blood Genomic DNA Isolation Maxi Kit demonstrated a high yield of intact genomic DNA.

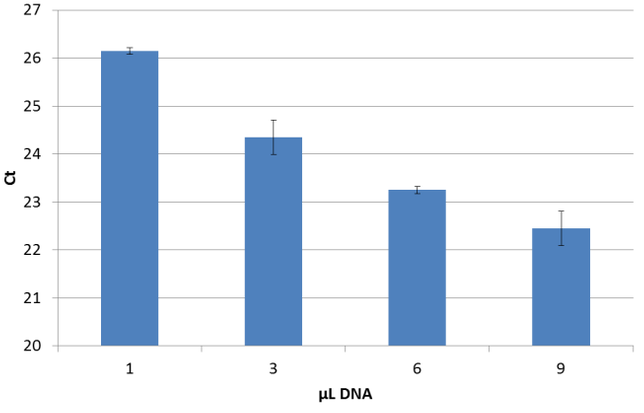


Figure 2. Purified DNA Can be Amplified in a Real-time PCR (TaqMan) Reaction at different template volumes. Genomic DNA was isolated from triplicate samples of 10 mL each of whole human blood using Norgen's Blood Genomic DNA Isolation Maxi Kit. Different DNA template volumes (1, 3, 6 & 9 µL) from each elution was used in a real-time PCR reaction (total reaction volume of 20 µL) with GAPDH TaqMan probe and primers. The real-time PCR was successful in amplifying the GAPDH gene, with a linear decrease in Ct value with the increase in DNA template volume. This indicates the DNA is of a high quality, free of PCR inhibitors and can be used in sensitive downstream applications.

Rapid preparation of genomic DNA from up to 3 to 10 mL of whole blood.

The Blood Genomic DNA Isolation Maxi Kit allows for the isolation of genomic DNA from the blood of various species, including humans. Purification is based on spin column technology without the use of organic solvents. Typical yields of genomic DNA will vary depending on the cell density of the blood sample. Preparation time for a single sample is less than 50 minutes, and each kit contains sufficient materials for 12 preparations. The purified genomic DNA is fully digestible with all restriction enzymes tested, and is completely compatible with downstream applications.

Features and Benefits

- **No Phenol-Chloroform extraction or alcohol precipitation** - Isolate genomic DNA without the use of harmful chemicals
- **Isolate DNA from blood pathogens -** Isolate DNA from viral and bacterial blood pathogens
- **Fast and easy processing** - Rapid spin-column format allows for the processing of multiple samples in 50 minutes.
- **Recovered genomic DNA is suitable for downstream applications** - Purified genomic DNA is fully compatible with restriction enzyme digestions, Southern Blot, PCR analysis, sequencing and microarray analysis.
- **High quality DNA with no RNA contamination** - No contamination or degradation of genomic DNA is observed.

Applications

- Quantitative PCR
- Genotyping
- SNP analysis
- Microarray analysis
- Next Generation Sequencing
- PCR-based pathogen detection

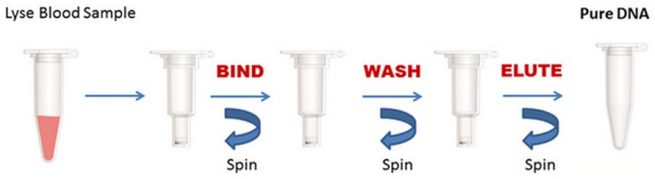
Feature	Specifications
Maximum Blood Input	10 mL
Column Binding Capacity	> 500 µg
Average Yield	200-600 µg*
Elution Volume	1-2 mL
Analyte Purified	Genomic DNA, mitochondrial DNA, viral DNA
Format	Spin column
Time to Complete 10 Purifications	50-70 minutes

*Yield will vary depending on the type of blood processed

Ordering information

Cat #	Quantity
31200	12 preps

Dried Blood Spot (DBS) Genomic DNA Isolation Kit Cat. # 36000



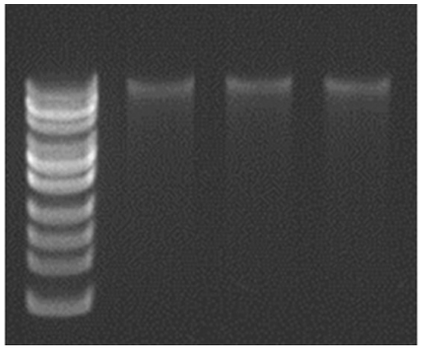


Figure 1. Genomic DNA Isolated from 3 x 3mm Diameter Circles. Blood collected on EDTA was applied to Whatman's 903 Protein Saver Card and allowed to dry for 1 week. DNA was isolated from 3 x 3 mm diameter circles per sample using Norgen's Dried Blood spot Genomic DNA Isolation Kit. Following isolation, 15 µL from each 150 µL elution was loaded on 1% TAE agarose gel. Norgen's Blood Genomic DNA Isolation Kit demonstrated a good DNA yield and integrity. The ladder corresonds to Norgen's UltraRanger 1kb DNA Ladder.

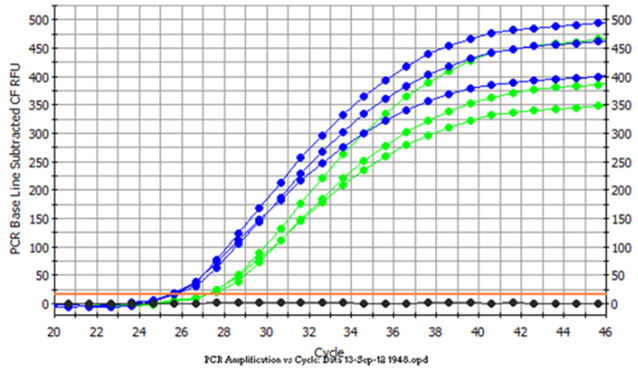


Figure 2. Purified DNA can be Amplified in a Real-time PCR (TaqMan) Reaction. Genomic DNA was isolated from 3 x 3mm diameter circles per sample using Norgen's Dried Blood Spot Genomic DNA Isolation Kit. Next, 3 µL (green line) & 9 µL (blue line) of the DNA from each of the 150 µL elutions was used in a real-time PCR reaction (total reaction volume of 20 µL) with GAPDH TaqMan probe and primers. The real-time PCR was successful in amplifying the GAPDH gene, indicating that the DNA is of a high quality and can be used in sensitive downstream applications. The black line is a no-template control.

Rapid preparation of genomic DNA from dried blood spots

The Dried Blood Spot (DBS) Genomic DNA Isolation Kit allows for the isolation of genomic DNA from the blood of various species, including humans. Purification is based on spin column technology without the use of organic solvents. The blood should be spotted and dried on suitable filter paper or specimen collection cards. Typical yields of genomic DNA will vary depending on the cell density of the blood sample. Preparation time for a single sample is 35 minutes. The purified genomic DNA is fully digestible with all restriction enzymes tested, and is completely compatible with downstream applications including Southern Blot analysis.

Features and Benefits

- **Isolate DNA from small volumes of blood -** Isolate DNA from dried blood spots, blood smears and blood spotted on most materials
- **No Phenol-Chloroform extraction or alcohol precipitation** - Isolate genomic DNA without the use of harmful chemicals
- **Fast and easy processing** - Rapid spin-column format allows for the processing of multiple samples in 35 minutes.
- **Recovered genomic DNA is suitable for downstream applications** - Purified genomic DNA is fully compatible with Southern Blot and PCR analysis.
- **High quality DNA with no RNA contamination** - No contamination or degradation of genomic DNA is observed.

Applications

- Quantitative PCR
- Genotyping
- SNP analysis
- PCR-based pathogen detection

Feature	Specifications
Input	3 x 3 mm diameter punches
Column Binding Capacity	> 25 µg
Average Yield	150 ng*
Elution Volume	20-100 µL
Analyte Purified	Genomic DNA, mitochondrial DNA, viral DNA
Format	Spin column
Time to Complete 10 Purifications	35 minutes

*Yield will vary depending on the type of blood processed

Ordering information

Cat #	Quantity
36000	50 preps

Blood DNA Purification Kit - 30 mL

Cat. # 52500

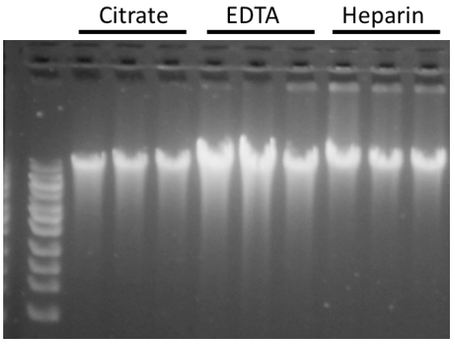


Figure 1. High Yields of Genomic DNA Isolated from 300 µL of Whole Blood. Genomic DNA was isolated from 300 µL of whole blood collected on different anticoagulants (Citrate, EDTA and Heparin, different donors) using Norgen's Blood Genomic DNA Purification Kit. Following isolation, 10 µL from each 100 µL elution was loaded on 1% TAE agarose gel. Purified DNA has a good yield and integrity. The used ladder is Norgen's UltraRanger 1kb DNA Ladder.

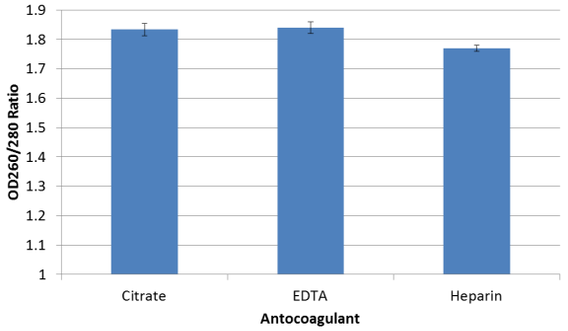


Figure 2. High purity of Genomic DNA Isolated from 300 µL of Whole Blood. Genomic DNA was isolated from 300 µL of whole blood collected on different anticoagulants (Citrate, EDTA and Heparin, different donors) using Norgen's Blood Genomic DNA Purification Kit. Following isolation, OD260/280 ratio was measured using spectrophotometric method. Purified DNA from blood collected on the different anticoagulants has a good OD260/280 ratio > 1.7.

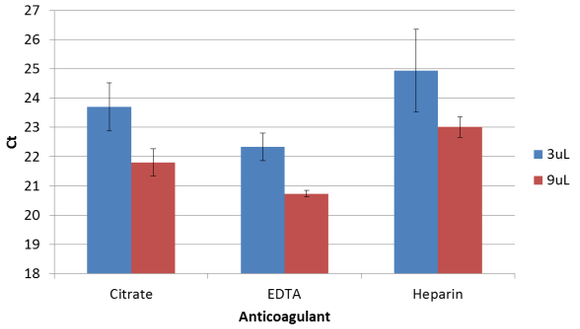


Figure 3. Purified DNA Can be Amplified in a Real-time PCR (TaqMan) reaction. Genomic DNA was isolated from 300 µL of whole blood collected on different anticoagulants (Citrate, EDTA and Heparin, different donors) using Norgen's Blood Genomic DNA Purification Kit. Three and nine µL of the DNA from each 100 µL elution was used in a real-time PCR reaction (reaction volume of 20 µL) with GAPDH TaqMan probe and primers. The real-time PCR was successful in amplifying the GAPDH gene, indicating that the DNA is of a high quality and can be used in sensitive downstream applications. Furthermore, the 9 µL template showed lower Ct value than the 3 µL template, indicating that purified DNA is free of PCR contaminants.

Fast and simple procedure for purifying high molecular weight genomic DNA from up to 10 mL of blood using alcohol-precipitation

The Blood DNA Purification Kit allows for the isolation of high molecular weight genomic DNA from the blood of various species, including humans. The kit can be used with blood inputs of 0.3 mL and up to 10 mL. Typical yields of genomic DNA will vary depending on the cell density of the blood sample. Preparation time for a single sample is less than 30 minutes, and each kit contains sufficient materials to process 30 mL of blood (100 preparations from 0.3 mL of blood). The purified genomic DNA is fully digestible with all restriction enzymes tested, and is completely compatible with downstream applications.

Features and Benefits

- **Fast and Easy Processing** - Rapid alcohol precipitation format allows for the processing of multiple samples in 30 minutes.
- **Isolate a Diversity of DNA Species -** Isolate high quality and high molecular weight genomic DNA
- **Variable Volume Input -** Isolate genomic DNA from 300 µL up to 10 mL of blood
- **Recovered genomic DNA is suitable for downstream applications** - Purified genomic DNA is fully compatible with restriction enzyme digestions, Southern Blot, PCR analysis, sequencing and microarray analysis.
- **High quality DNA with no RNA contamination** - No contamination of genomic DNA is observed.

Applications

- Quantitative PCR
- Genotyping
- SNP analysis
- DNA archiving

Feature	Specifications
Minimum Blood Input	0.3 mL
Maximum Blood Input	10 mL
Average Yield from 1 mL of whole blood	24 µg*
DNA Size	Up to 200 kbp
Average Purity (OD260/280)	> 1.7
Format	Alcohol precipitation
Time to Complete 10 Purifications	30-60 minutes (+ DNA rehydration)

*Yield will vary depending on the type of blood processed

Ordering information

Cat #	Quantity
52500	100 preps (0.3 mL blood)

Single Preparation - RNA Isolation Kits

Total RNA Purification Kit — Cat. # 17200 & 37500

Specific protocol for total RNA isolation from different types of blood samples

Total RNA Purification Kit Dx — Cat. # Dx17200

CE

CE-certified kit for in-vitro diagnostic purposes - not available in all regions

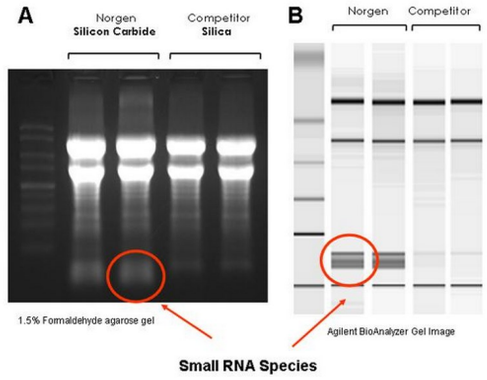


Figure 1. High Quality of Isolated RNA with Complete Size Range. Unlike most competitors' kits, Norgen's Total RNA Purification Kit allows for the isolation of all sizes of RNA, from the very large RNA down to the microRNA without the use of phenol. Total RNA was isolated from 1 x 10^9 *E. coli* cells using Norgen's Total RNA Purification Kit and a competitor's kit. **Panel A:** Five microliters of the 50 µL isolated RNA was analyzed on an agarose gel. **Panel B:** One microliters of the 50 µL isolated RNA was analyzed on the Agilent® 2100 BioAnalyzer RNA Nano 6000 chip. Note the presence of small RNA species (red circle) in the samples isolated via Norgen's kit and the absence of these RNA species in the competitor RNA preparation.

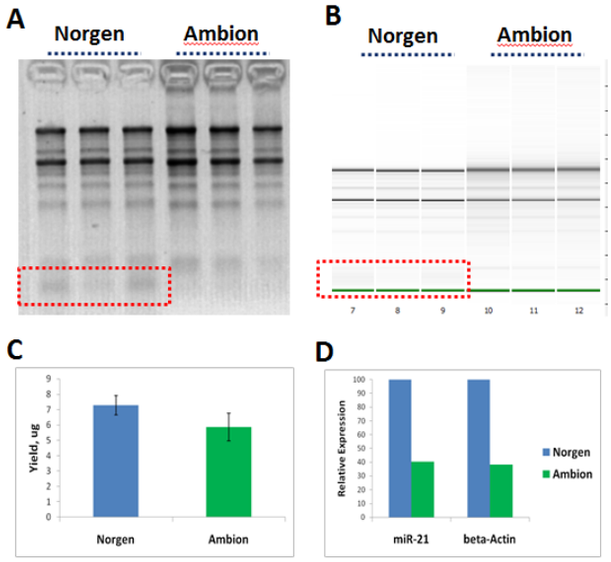


Figure 2. Recovery of True Total RNA including microRNA from 100 mL of Hamster Blood. Panel A is a 1X MOPS 1% agarose gel showing the RNA that was isolated from 3 different samples of 100 mL of Hamster using either Norgen's Total RNA Purification Kit or Ambion *RiboPure*™-Blood Kit. Both kits isolated large RNA (represented by 28S and 18S rRNA) with high integrity but Norgen's Total RNA Purification Kit provided the added benefit of recovering small RNA without any additional protocol (highlighted). **Panel B** is a result from a bioanalyzer resolution of the eluted RNA. Similar to the agarose gel, Norgen's Total RNA Purification Kit showed the added benefit of recovering small RNA. **Panel C** showed that Norgen's Total RNA Purification Kit recovered higher RNA yield. **Panel** D showed Norgen's Total RNA Purification Kit recovered high quality RNA for sensitive downstream application. that One microgram of RNA was used in RT-qPCR reactions for beta-Actin (for Large RNA) and miR-21 (for microRNA) genes. The RNA isolated by Norgen's Total RNA Purification Kit showed much better relative expression of the genes studied.

Rapid preparation of blood total RNA - including microRNA - without phenol

Principle

Purification is based on spin column using Norgen's proprietary resin as the separation matrix. Briefly, the blood sample of interest is first lysed using the provided Lysis Solution, ethanol is added and the RNA is bound to Norgen's column. Under these conditions only the RNA will bind to Norgen's resin while most of the contaminating cellular proteins are removed in the flowthrough or retained on top of the resin. The bound RNA is then washed to remove any remaining impurities. Lastly, the purified total RNA is eluted into 50 µL of the provided Elution Buffer.

Norgen's proprietary resin provides superior affinity to the full size range of RNA molecules, resulting in large and small RNA (miRNA) purification with better linearity and sensitivity. The purified RNA is of the highest integrity, and can be used in a number of downstream applications including real time RT-PCR, RT-PCR, Northern blotting, RNase protection and primer extension, expression profiling, miRNA cloning and amplification and Next Generation Sequencing.

Performance

Norgen's Total RNA Purification Kit provides a rapid method for the isolation and purification of total RNA in as little as 20 minutes. The kit purifies all sizes of RNA, from large mRNA and ribosomal RNA down to microRNA (miRNA) and small interfering RNA (siRNA), without the use of phenol or chloroform. Norgen's kit is the only kit on the market that isolates true total RNA, as other kits must use phenol to recover all sizes of RNA. Therefore Norgen's kit offers significant advantages in functionality, savings on cost, ease-of-use, no hazardous organic waste, and no inhibitory effect on PCR amplifications as a result of residual phenol. With this kit both miRNA and mRNA can be studied from the same sample without further purifications, thus offering considerable advantages when comparing and relating expression of miRNA to other RNA. Furthermore, this is an excellent kit for the extraction of miRNA from all samples including plasma.

Applications

- Quantitative, real-time RT-PCR for both large mRNA and small RNA including miRNA
- RT-PCR for both large mRNA and small RNA including miRNA
- Expression profiling
- Next Generation Sequencing for RNA and miRNA
- miRNA from plasma for discovery
- microRNA cloning and amplification
- PCR-based virus detection
- PCR-based viable bacteria detection
- Northern blotting
- RNase protection
- Primer extension

Single Preparation - RNA Isolation Kits

Total RNA Purification Kit — Cat. # 17200 & 37500

Specific protocol for total RNA isolation from different types of blood samples

Total RNA Purification Kit Dx — Cat. # Dx17200

CE

CE-certified kit for in-vitro diagnostic purposes - not available in all regions

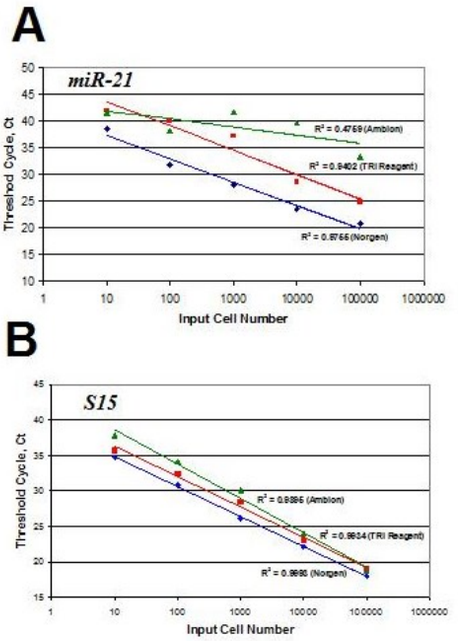


Figure 3. Linear and Sensitive Isolation of Both Large and Small RNA. Norgen's Total RNA Purification Kit allows consistent isolation of both large and small RNA from different input amounts. Total RNA was isolated from 10 to 100,000 HeLa cells using Norgen's Total RNA Purification Kit (**blue**), a competitor's silica-based kit (**green**) and a phenol-based RNA extraction method (**red**). **Panel A:** Relative expression of *miR-21* **Panel B:** Relative expression of *S15*. Both were determined by RT-qPCR of total RNA samples. In brief, 1 µL of the 50 µL isolated RNA was then subjected to a 20 µL reverse transcription using miR-21 stem-loop reverse primer or oligo dT primer. Two microliters of the reverse transcription was used in a 20 µL real-time PCR reaction with primers to detect the human *miR-21* (Panel A) and the *S15* transcripts (Panel B). The resulting threshold cycle (*Ct*) values were plotted against input cell number. RNA isolated using Norgen's Total RNA Purification had the best linearity (higher R^2) and sensitivity (lower *Ct*) for both large RNA (*S15*) and small RNA (*miR-21*).

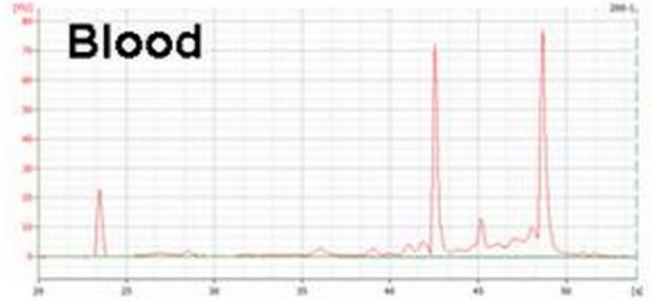


Figure 4. High Quality of RNA from Blood. Total RNA was isolated from 100 µL rat blood using Norgen's Total RNA Purification Kit. One microliter of the 50 µL isolated RNA was analyzed on the Agilent® 2100 BioAnalyzer using an RNA Nano 6000 chip. Note the integrity of RNA from all inputs with the presence of small RNA species. Norgen's Total RNA Purification Kit consistently isolates high quality RNA from various inputs that score a RIN value between 8 and 10.

Features and Benefits

- **No phenol:chloroform extractions** - Total RNA is isolated from blood without the use of harmful chemicals such as phenol or chloroform
- **Isolate total RNA from very small samples -** Total RNA has been isolated and detected from as little as 10 µL of blood
- **Extremely efficient isolation of low abundance microRNA -** Norgen's Total RNA Purification Kit has been shown to be extremely efficient at recovering low abundance microRNA from plasma samples
- **Isolate a diversity of RNA species** - All RNA species can be isolated, from large mRNA and ribosomal RNA down to microRNA (miRNA) and small interfering RNA (siRNA)
- **Fast and easy processing** - Rapid spin-column format allows for the processing of 10 samples in 20 minutes
- **Isolate total RNA from a broad input source -** Total RNA has been isolated from cultured animal cells, small tissue samples, LCM samples, bacteria, yeast, fungi, plants, viruses and various bodily fluids including blood, plasma, serum, saliva, nasal or throat swabs
- **No need for carrier RNA** - Isolate all sizes of RNA without the use of carrier RNA
- **Multiple kit sizes available** - This kit is available in both 50 prep and 100 prep sizes

Feature	Specifications
Column binding capacity	Up to 50 µg RNA
Maximum Loading Volume Per Spin Column	650 µL
Size of RNA Purified	All sizes, including < 200 nt
Time to Complete 10 Purifications	20 minutes
RNA Yield 100 µL human blood 100 µL hamster blood	 1 µg 5 µg
Format	Spin columns

Ordering information

Cat #	Quantity
17200	50 preps
Dx17200	50 preps
37500	100 preps

Leukocyte RNA Purification Kit

Cat. # 21200

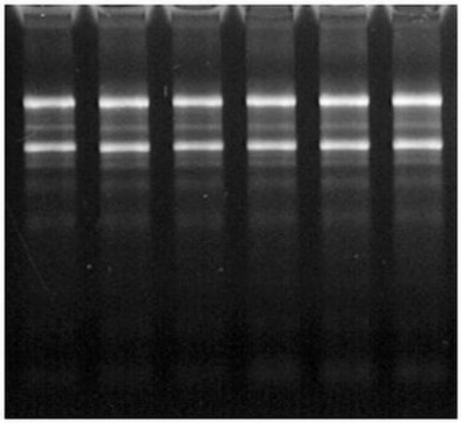


Figure 1. Consistent Isolation of High Quality Leukocyte RNA. Norgen's Leukocyte RNA Purification Kit isolates leukocyte RNA of high quality with great consistency. Total leukocyte RNA was isolated from 100 µL of hamster blood using Norgen's Leukocyte RNA Purification Kit. A total of 6 replicates were performed, and 7 µL of the 50 µL purified RNA was then resolved on a 1.2% formaldehyde-agarose gel. As it can be seen, Norgen's kit not only isolated high and consistent yields of total RNA, but the RNA was also of high quality as evidenced by intactness of the major 28S and 18S rRNA.

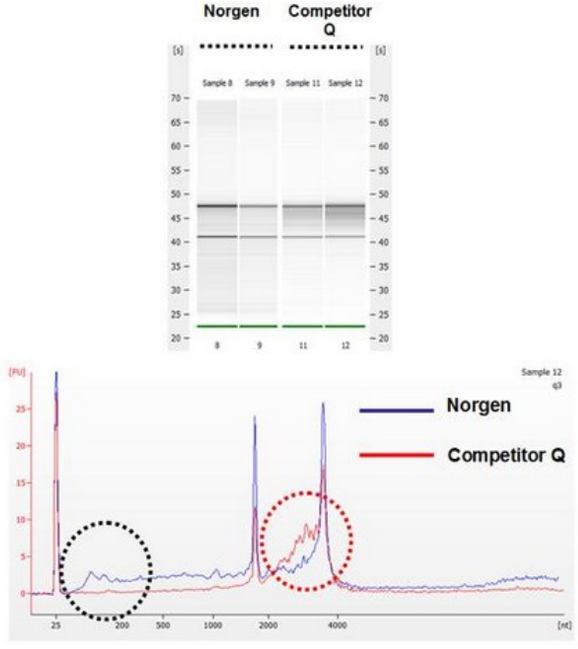


Figure 2. Higher Yield and Quality of Leukocyte RNA Isolated by Norgen's Leukocyte RNA Purification Kit. Norgen's Leukocyte RNA Purification Kit isolates Leukocyte RNA that exceeds the yield and quality of competitors. Total RNA was isolated from 200 µL of hamster blood using Norgen's Leukocyte RNA Purification Kit and a leading competitor's kit. One microliter of the 50 µL purified RNA was resolved on an Agilent RNA Nano 6000 chip. The gel diagram (Upper panel) and the electropherogram (Lower panel) showed better quality of RNA isolated by Norgen's kit. In particular, RNA isolated by Norgen's Leukocyte RNA Purification Kit did not have any evidence of the RNA degradation that was present in RNA isolated by the competitor's kit (Red Circle). In addition, Norgen's kit isolated higher amounts of RNA (Blue Line) with the additional recovery of small RNAs including miRNA (Black Circle) which were not present in RNA isolated by the competitor's kit.

Rapid extraction and purification of total RNA from leukocytes

Principle

Purification is based on spin column chromatography using Norgen's proprietary resin as the separation matrix. Briefly, the red blood cells are first removed from the sample through differential red blood cell lysis, and the leukocytes are recovered through centrifugation. The leukocytes are lysed, and the leukocyte RNA is bound to Norgen's column. Under these conditions only the RNA will bind to Norgen's resin, while the DNA, proteins and other contaminants will be removed in the flowthrough. The bound RNA is then washed to remove any remaining impurities. Lastly, the purified RNA will be eluted into 50 µL of the provided Elution Buffer or water.

Performance

Norgen's Leukocyte RNA Purification Kit provides a rapid method for the isolation and purification of total leukocyte RNA from mammalian blood samples in 40 minutes. Selective isolation of leukocyte RNA results in improved expression profiling and other downstream applications by removing the masking effects of some RNAs which are very abundant in whole blood, such as globin mRNAs. The kit is able to isolate total leukocyte RNA, including both large mRNA and all small RNA species containing microRNA (miRNA) and small silencing RNA (siRNA). The purified RNA is of the highest quality and can be used in a number of downstream applications.

Features and Benefits

- **Fast and easy processing -** Rapid spin-column format allows for the processing of 10 samples in 40 minutes.
- **No phenol:chloroform extractions** - Norgen's Leukocyte RNA Purification Kit isolates RNA without the use of harmful chemicals such as phenol or chloroform.
- **Recovered RNA is suitable for downstream applications -** Purified RNA can be used in a number of downstream applications including real-time PCR, reverse transcription PCR, Northern blotting, RNase protection and primer extension, and expression array analysis requiring the use of intact RNA.
- **Isolate total leukocyte RNA** - All leukocyte RNA species are isolated, from large mRNA down to microRNA.
- **Fractionate leukocytes from whole blood in minutes -** Rapid removal of red blood cells from whole blood samples using differential red blood cell lysis.

Single Preparation - RNA Isolation Kits

Leukocyte RNA Purification Kit — Cat. # 21200

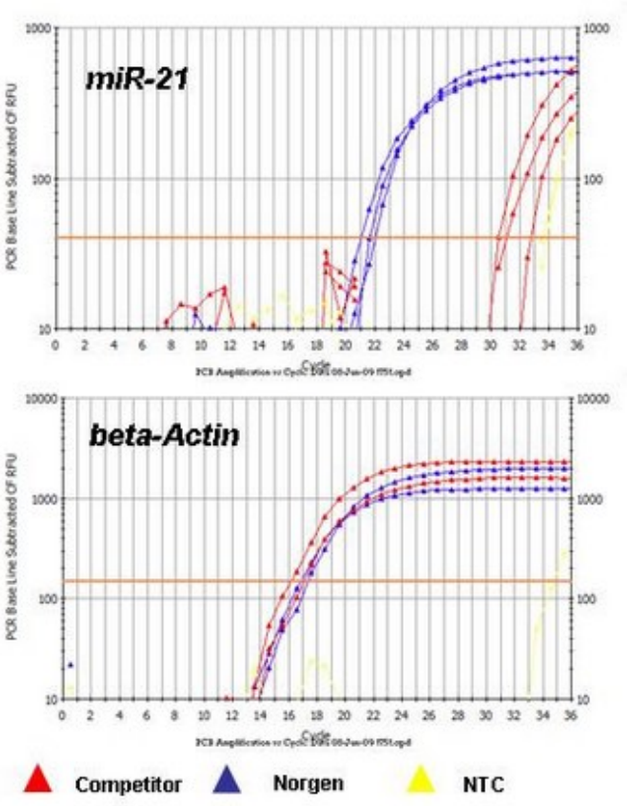


Figure 3. High Yield of a Diversity of RNA Species. Norgen's Leukocyte RNA Purification Kit effectively recovers all sizes of RNA from large mRNA to small RNA including microRNAs. Total RNA was isolated from 200 µL of hamster blood sample using Norgen's Leukocyte RNA Purification Kit and a leading competitor's kit as illustrated in Figure 2. Two hundred nanograms of the purified RNA (both 50 µL elution volumes) was then used as the template in an RT-qPCR for detecting miR-21(Upper Panel) and for detecting the beta-actin gene (Lower Panel). In both graphs the blue lines correspond to Norgen isolated-RNA and the red lines correspond to competitor-isolated RNA.
Upper Panel: detection of the miR-21. Norgen's kit isolated higher yields of microRNA, as indicated by the lower Ct values of the blue lines.
Lower Panel: detection of the beta-actin gene. Norgen's kit successfully isolated a similar amount of the large RNA compared to the competitor's kit indicating the full diversity of RNA species isolated.

Applications

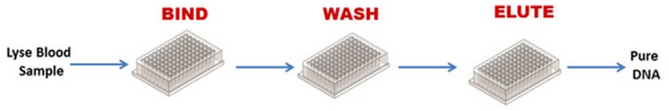
- Bioanalyzer
- Quantitative, real-time RT-PCR for large RNA and small RNA including miRNA
- RT-PCR for large RNA and small RNA including miRNA
- Northern blotting
- RNase protection
- Primer extension
- Expression array assays
- Next Generation Sequencing
- microRNA Cloning

Feature	Specifications
Column binding capacity	Up to 50 µg RNA
Maximum Loading Volume Per Spin Column	650 µL
Size of RNA Purified	All sizes, including < 200 nt
Minimum Blood Input Volume	10 µL
Maximum Blood Input Volume	2 mL or 3 x 10^6 leukocytes
Time to Complete 10 Purifications	20 minutes
Input Type	Blood from Human, Hamster, Mouse, Rabbit and Rat
Yield from Human Blood (500 µL)	1.5 µg
Yield from Hamster Blood (100 µL)	2.5 µg
Format	Spin columns

Ordering information

Cat #	Quantity
21200	50 preps

Blood Genomic DNA Isolation 96-Well Kit — Cat. # 46350



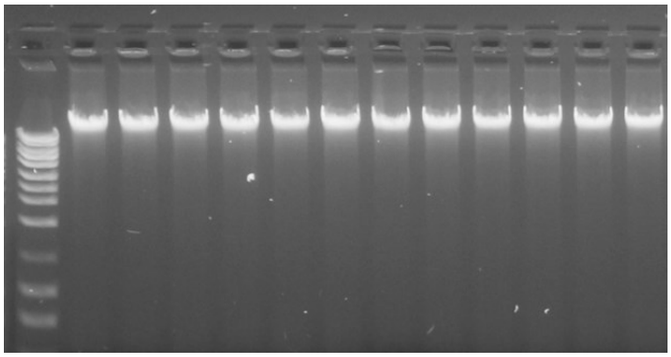


Figure 1. High Yields of Genomic DNA Isolated from 200 µL of Whole Blood. Genomic DNA was isolated from 200 µL of whole blood using Norgen's Blood Genomic DNA Isolation 96-Well Kit. Following isolation of 12 samples, 15 µL from each 200 µL elution was loaded on 1% TAE agarose gel. Norgen's Blood Genomic DNA Isolation 96-Well Kit demonstrated a good and consistent DNA yield and integrity. The used ladder is Norgen's HighRanger 1kb DNA Ladder.

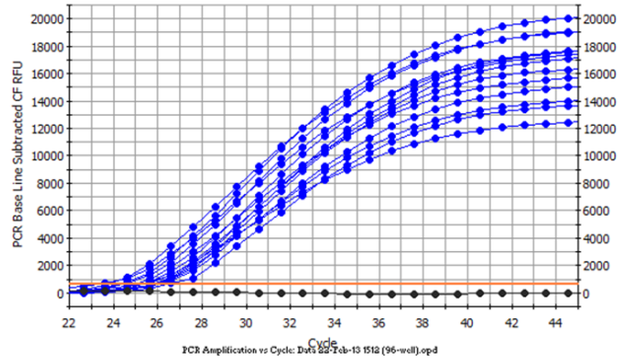


Figure 2. Purified DNA Can be Amplified in a Real-time PCR (TaqMan) Reaction. Genomic DNA was isolated from 200 µL of whole human blood using Norgen's Blood Genomic DNA Isolation 96-Well Kit. Five µL of the DNA from each 200 µL elution was used in a real-time PCR reaction (total reaction volume of 20 µL) with GAPDH TaqMan probe and primers. The real-time PCR was successful in amplifying the GAPDH gene from all the isolated 12 samples (blue). This indicates that the isolated DNA from all samples is of a high quality and can be used in sensitive downstream applications. The black line is a no-template control.

Rapid high-throughput preparation of genomic DNA from up to 200 µL of whole blood.

The Blood Genomic DNA Isolation 96-Well Kit allows for the isolation of genomic DNA from the blood of various species, including humans. Purification is based on 96-well spin column technology without the use of organic solvents. Typical yields of genomic DNA will vary depending on the cell density of the blood sample. Preparation time for 96 samples is about 45 minutes, and each kit contains sufficient materials for 192 preparations. The purified genomic DNA is compatible with sensitive downstream applications.

Features and Benefits

- **No Phenol-Chloroform extraction or alcohol precipitation** - Isolate genomic DNA without the use of harmful chemicals
- **Isolate DNA from blood pathogens -** Isolate DNA from viral and bacterial blood pathogens
- **Fast and easy processing** - Rapid spin-column format allows for the processing of 96 samples in 45 minutes.
- **Recovered genomic DNA is suitable for downstream applications** - Purified genomic DNA is fully compatible with restriction enzyme digestions, Southern Blot, PCR analysis, sequencing and microarray analysis.
- **High quality DNA with no RNA contamination** - No contamination or degradation of genomic DNA is observed.

Applications

- Quantitative PCR
- Genotyping
- SNP analysis
- Microarray analysis
- Next Generation Sequencing
- PCR-based pathogen detection

Feature	Specifications
Maximum Blood Input	200 µL
Binding Capacity	> 50 µg
Average Yield (200 µL of blood)	2-8 µg*
Elution Volume	50-200 µL
Analyte Purified	Genomic DNA, mitochondrial DNA, viral DNA
Format	96-Well plate
Time to Complete 96 Purifications	45 minutes

*Yield will vary depending on the type of blood processed

Ordering information

Cat #	Quantity
46350	2 x 96-well plates

Blood DNA Preservation

Blood DNA Preservation Buffer (3X) Cat. # 29111, 29112

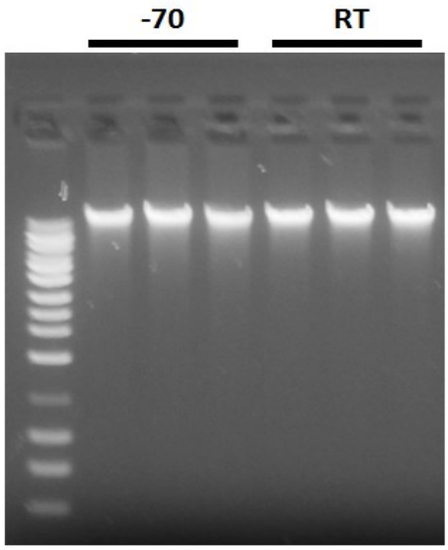


Figure 1. High Yields and integrity of Genomic DNA Isolated from 200 µL of preserved Whole Blood after 1 week preservation at room temperature. Blood was collected on EDTA and either directly stored at -70 or mixed with Norgen's Blood DNA Preservation Buffer (2 volumes of blood + 1 volume of preservation buffer). Genomic DNA was isolated from 133 µL of blood stored at -70 or 200 µL of preserved blood, using Norgen's Blood Genomic DNA Isolation Mini Kit (# 46300). Following isolation of 3 samples from each condition, 15 µL from each 200 µL elution was loaded on 1% TAE agarose gel. The isolated DNA after 8 week preservation at room temperature shows equivalent yield and integrity to that stored at -70°C. The used ladder is Norgen's UltraRanger 1kb DNA Ladder.

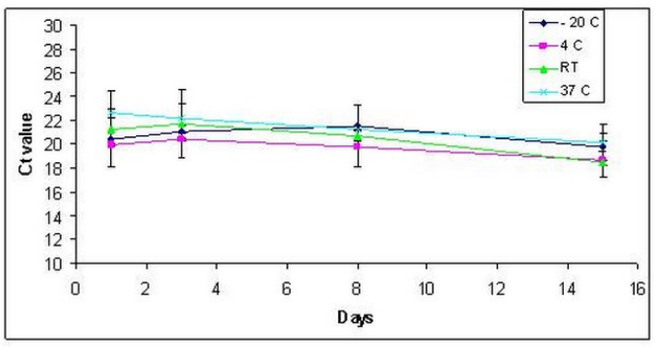


Figure 2. Stability of DNA Isolated from Preserved Blood Samples Stored up to 2 Weeks at Different Temperatures. A 0.5 mL sample of blood was mixed with 0.25 mL of Norgen's Blood DNA Preservation Buffer (3X) and stored at different temperatures (-20 °C, 4 °C, room temperature and 37 °C) for 2 weeks. Aliquots of the stored blood were removed at various time points (1 day, 3 days, 8 days and 15 days) and the DNA was isolated using Norgen's Blood Genomic DNA Isolation Mini Kit (Cat #46300). The purified DNA was then used as the template in a real-time PCR using 5S specific primers. As indicated from the Ct value, all the DNA templates were successfully amplified without significant change in the Ct values over the 15 days.

Rapid and simple preservation of blood DNA at ambient temperatures

Norgen's Blood DNA Preservation Buffer (3X) is a 3X aqueous storage buffer designed for rapid cellular lysis and subsequent preservation of DNA from fresh blood samples. The buffer prevents the growth of Gram-negative and Gram-positive bacteria and fungi, and also inactivates viruses allowing the resulting non-infectious samples to be handled and shipped safely. In addition, the buffer eliminates the need to immediately process or freeze samples and allows the samples to be shipped to centralized testing facilities at ambient temperature. The components of the buffer allow samples to be stored for one week under conditions where DNA degradation would occur normally. The buffer is intended to be used in clinical laboratories with the ability to preserve samples for use in downstream diagnostic assays.

Performance

- Norgen's Blood DNA Preservation Buffer (3X) is a 3X solution. One volume of the buffer is added to two volumes of fresh blood followed by mixing by inversion for ten times.
- Specimens may be held or shipped to the testing laboratory at room temperature for up to 8 weeks. Specimens held longer should be kept at -20°C or lower until testing.
- Storage at -20°C or lower is recommended for archival samples and will provide optimal preservation. The preservation buffer will freeze at -20°C. Samples can be stored indefinitely at -80°C.
- Samples can be stored at room temperature (22°C) for up to 8 weeks without significant loss of DNA quality.
- DNA has also been successfully isolated from samples stored at 37°C for 2 week.

Features and Benefits

- **No need to immediately process samples** - The buffer eliminates the need to immediately process or freeze samples
- **DNA preservation for 2 weeks at room temperature** – Intact, biologically active blood DNA has been isolated from samples stored in the Blood DNA Preservation Buffer (3X) for 8 weeks.
- **Ship blood samples at room temperature** – Blood samples stored in the Blood DNA Preservation Buffer (3X) can be safely shipped at room temperature with no signs of DNA degradation
- **Compatible with most DNA isolation methods** – Blood DNA can be isolated from the preserved samples using a number of different methods, including Norgen's Blood Genomic DNA Isolation Kits.

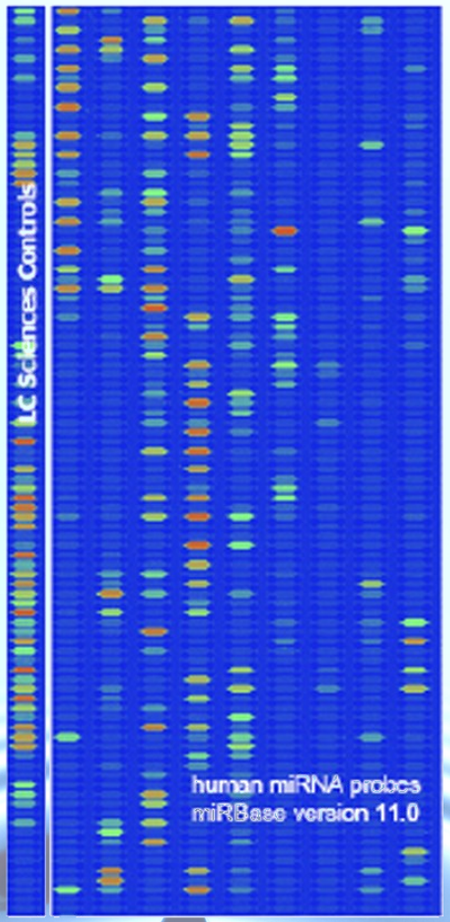
Ordering information

Cat #	Quantity
29111	25 mL
29112	100 mL

A proportion of samples isolated by phenol-based methods are inhibited during enzymatic downstream analysis such as PCR, arrays and NGS

TRY THE NON-PHENOL BASED METHOD

Non-phenol based method
Norgen



Phenol based method
Competitor

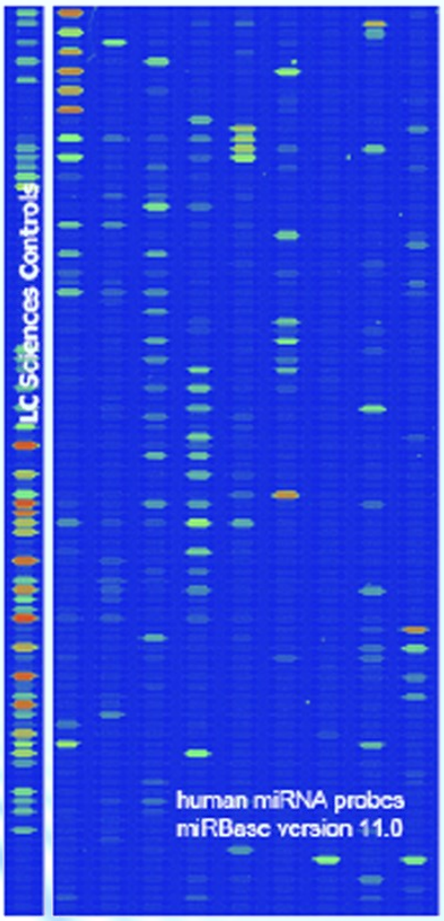


Image courtesy of LC Sciences

Better Diversity of miRNA Detected from Plasma. Norgen's Total RNA Purification Kit isolates miRNA from plasma with better diversity than a leading competitor. Total RNA including miRNA was isolated from 100 µL of plasma using Norgen's Total RNA Purification Kit or 625 µL of plasma using Competitor A's leading miRNA Kit, and was applied to an NCode expression profiling kit. Microarray images suggested that Norgen's Total RNA Purification Kit (left) isolates a better diversity of miRNA from a smaller input amount of plasma than the competitor's miRNA kit (right). Image courtesy of LC Sciences, Houston. (www.lcsciences.com).

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Phone: (905) 227-8848
Toll Free: 1-866-NORGENB (667-4362)
Fax: (905) 227-1061
email: info@norgenbiotek.com

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