

# Complete Solutions for Biobanking

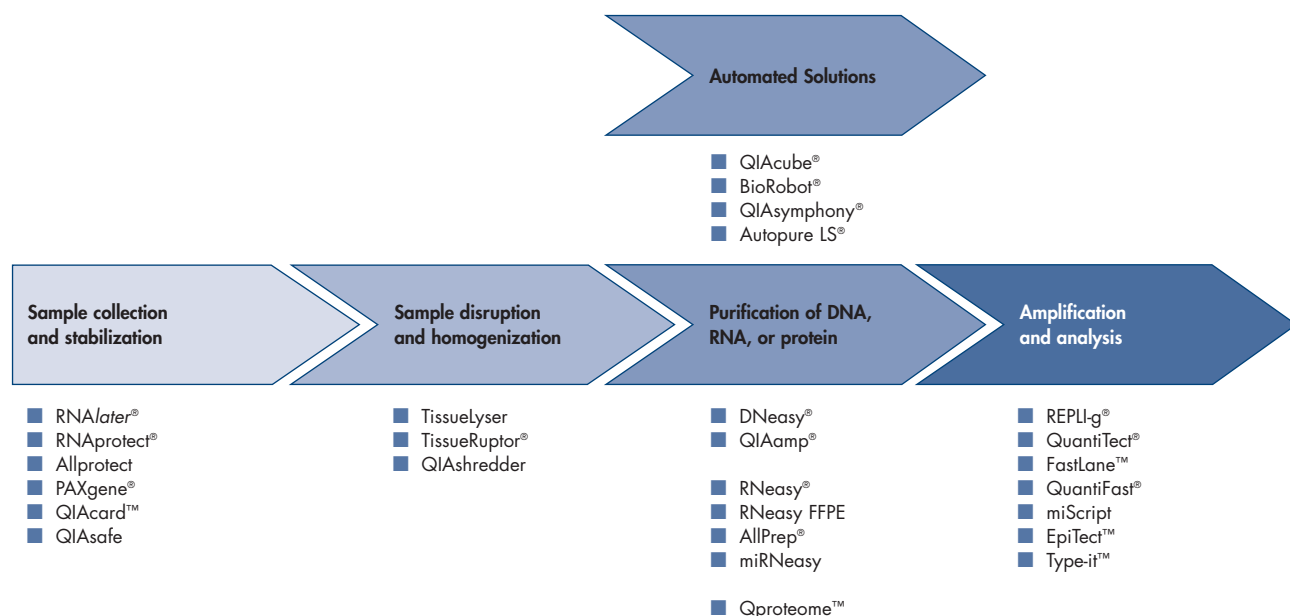


Sample & Assay Technologies

# Technologies for content retrieval and analysis

QIAGEN's Tissue Management System addresses the major issues in sample processing and analysis: the low degree of standardization and insufficient quality-controlled protocols. QIAGEN provides a comprehensive range of solutions for your research studies, from sample collection and stabilization to analyte purification and ready-to-use downstream assays. Up-to-date product information, protocols, news, and articles are available at [www.qiagen.com/tissuemanagement](http://www.qiagen.com/tissuemanagement).

QIAGEN offers more than 20 years of experience in handling, stabilization, and purification of different analytes. Complete matching solutions are available to standardize all steps of the workflow. This ensures comparability and reproducibility of data in clinical case-controlled and population-based studies, facilitating biomarker discovery and the development of diagnostics and therapeutics.



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# Sample collection and stabilization

Effective sample collection is vital to ensure biobank quality and integrity. To obtain a true representation of the sample content in future experiments, analytes must be satisfactorily preserved at the point of collection.

## QIAGEN's sample collection technologies provide:

- Immediate sample stabilization at point of collection
- Standardized solutions to ensure reproducibility
- Easy sample transport after collection
- Integrated solutions for collection and downstream purification

## Immediate stabilization of DNA and/or RNA

### For blood – PAXgene Blood DNA System

The PAXgene Blood DNA System is an integrated and standardized system for collection and stabilization of whole blood specimens and subsequent purification of genomic DNA. The system uses PAXgene Blood DNA Tubes for blood collection and stabilization, and the PAXgene Blood DNA Kit for subsequent DNA purification.

### For blood – PAXgene Blood RNA System

The PAXgene Blood RNA System consists of PAXgene Blood RNA Tubes for blood collection and stabilization, and the PAXgene Blood RNA Kit for silica-membrane-based RNA purification (Figure 1). The system provides exact performance specifications, ensuring highly reliable RNA stabilization and purification for diagnostic purposes.

### For blood, cells, and tissue – QIAcard FTA® Spots

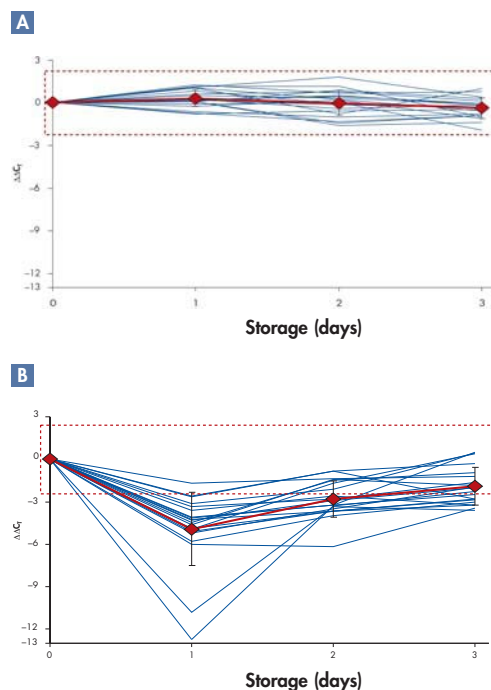
QIAcard FTA Spots use proven Whatman® FTA technology to simplify handling and processing of nucleic acids. After applying samples (such as blood, bone marrow aspirates, buccal cells, buffy coat, cultured cells, plasma, or tissue) to QIAcard FTA Spots, DNA is stabilized in situ for years at room temperature.

### For tissue – RNA<sup>later</sup> RNA Stabilization Reagent

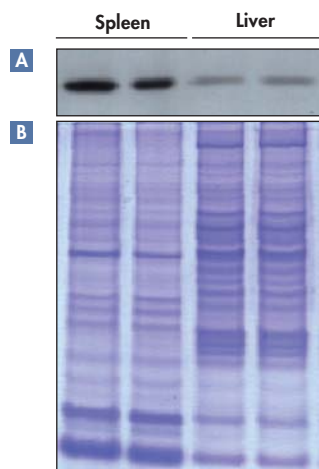
RNA<sup>later</sup> RNA Stabilization Reagent quickly permeates tissues, stabilizing and protecting the RNA expression pattern. Samples can be archived without risk of RNA degradation, even after multiple freeze-thaw cycles.

### For cells – RNAprotect Cell Reagent

RNAprotect Cell Reagent enables immediate RNA stabilization in sorted or cultured cells with no need to remove medium. Cells are stabilized at room temperature and can be transported at ambient temperature or stored prior to RNA purification.



**Figure 1. Blood RNA stable at 18–25°C.** Blood was drawn from 10 donors, with duplicate samples, and stored at 18–25°C for the indicated number of days, followed by total RNA purification. **A** Blood was collected and stored in PAXgene Blood RNA Tubes, and total RNA was purified using the PAXgene Blood RNA Kit. **B** Blood was collected and stored in standard blood collection tubes with EDTA as an anticoagulant, and total RNA was purified using a standard organic-extraction method with silica-membrane-based RNA cleanup. Relative transcript levels of FOS were determined by real-time, duplex RT-PCR, using 18S rRNA as an internal standard. The values for all samples are plotted, with means and standard deviations of all samples shown. The dashed lines indicate the  $\pm 3 \times$  total precision of the assay (2.34 C<sub>t</sub>).



**Figure 2. Reliable western blotting and SDS-PAGE.** Rat tissues were stabilized in Allprotect Reagent, and protein was purified using the AllPrep DNA/RNA/Protein Mini Kit. Duplicates were run on an SDS-PAGE gel, followed by **A** western blotting for ERK2 and **B** Coomassie staining.

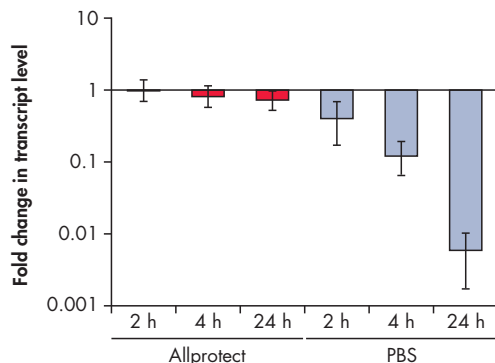
### For purified DNA — QIAsafe DNA Tubes and Plates

QIAsafe DNA Tubes and 96-Well Plates provide innovative technology for stable room-temperature storage of purified DNA. The QIAsafe matrix forms a protective seal around DNA as it dries, effectively “shrink-wrapping” the sample in a protective coating.

### Simultaneous stabilization of DNA, RNA, and protein

#### For tissue — Allprotect system

The combination of Allprotect and AllPrep technologies provides a complete solution for sample preparation in systems biology (Figures 2 and 3). Allprotect Tissue Reagent delivers immediate stabilization of DNA, RNA, and protein in tissue samples for long-term storage without freezing, while the AllPrep DNA/RNA/Protein Mini Kit allows simultaneous purification of these 3 analytes from the same precious sample (see also page 6).



**Figure 3. Prevention of RNA degradation.** Rat intestine was stored at 25°C in Allprotect Reagent or in PBS for the indicated times prior to real-time RT-PCR analysis of Madh7 expression. Transcript levels relative to those of liquid nitrogen stabilized intestine were calculated. The data show that Allprotect Reagent prevents RNA degradation.

# Analyte purification

Purification of nucleic acids and/or protein is a critical step in sample manipulation for a wide variety of applications.

## QIAGEN's purification technologies provide:

- High-quality analytes suitable for all downstream applications
- High yields to maximize results from precious samples
- Rapid procedures to eliminate or minimize the use of hazardous chemicals
- Flexible formats to match your experimental requirements

## Efficient purification of DNA

### From blood — PAXgene Blood system

The PAXgene Blood DNA Kit and the PAXgene Blood RNA Kit enable purification of high-quality nucleic acids from blood collected in PAXgene Blood Tubes (see page 3).

**Automation:** PAXgene Blood RNA Kits can be automated on the QIAcube and the BioRobot Universal System (page 7).

### From blood — QIAamp DNA Blood Kits

Available in mini, maxi, and 96-well formats, QIAamp DNA Blood Kits provide rapid DNA purification from fresh or frozen blood and related body fluids collected in your choice of tubes.

**Automation:** QIAamp DNA Blood Kits can be automated on the QIAcube and the BioRobot Universal System (page 7).

### From tissue — QIAamp DNA Mini Kit

The QIAamp DNA Mini Kit simplifies isolation of DNA from human tissue samples with fast spin-column or vacuum procedures. QIAamp DNA technology delivers high yields of genomic, mitochondrial, bacterial, parasite, or viral DNA from human tissue samples. Purified DNA is free of contaminants or inhibitors and ready to use in downstream applications.

**Automation:** The QIAamp DNA Mini Kit can be automated on the QIAcube (page 7).

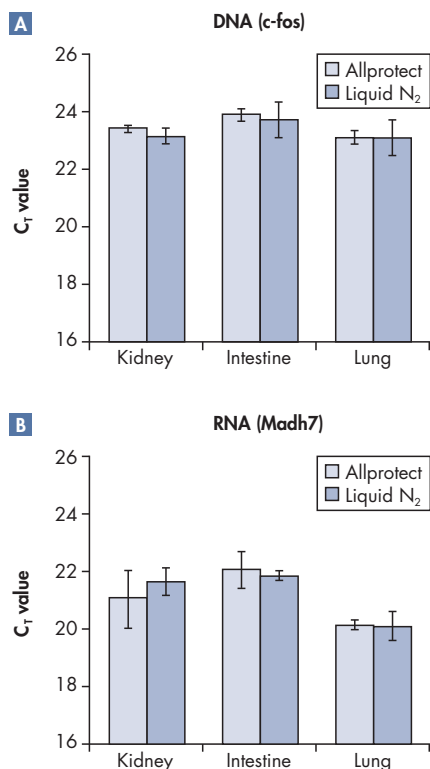
## Standardized purification of RNA or miRNA

### From tissue and cells — RNeasy Kits

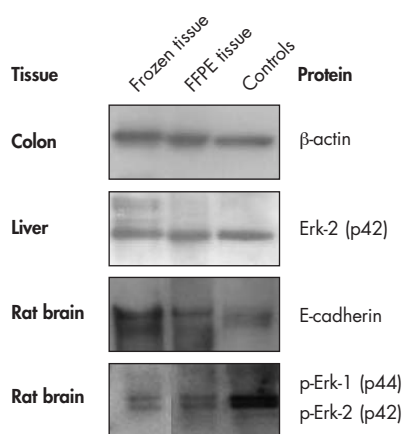
The comprehensive range of RNeasy Kits allows efficient purification of total RNA from various sample types, including a wide range of tissue and cell types, and from very small samples, such as laser-microdissected tissues, fine-needle aspirates, and small numbers of cells.

RNeasy technology simplifies total RNA isolation by combining the stringency of guanidine-isothiocyanate lysis with the speed and purity of silica-membrane purification developed by QIAGEN.

**Automation:** Many RNeasy Kits can be automated on the QIAcube and the BioRobot Universal System (page 7).



**Figure 4. Reliable real-time PCR and RT-PCR analysis.** Rat tissues were stabilized in Allprotect Reagent, and DNA and RNA were purified using the AllPrep DNA/RNA/Protein Mini Kit. The  $C_T$  values in **A** real-time PCR and **B** real-time RT-PCR analyses were similar to those achieved with tissues stabilized in liquid nitrogen.



**Figure 5. Yields comparable to frozen material.** Frozen and FFPE tissues of the types indicated were processed in parallel using the Qproteome FFPE Tissue Kit, separated by SDS-PAGE, and analyzed by western blotting. (Internal controls were lysates from cell lines processed using the Qproteome Mammalian Protein Prep Kit.) Protein yields from FFPE tissues using the Qproteome FFPE Tissue Kit were comparable to those from frozen material.

### From tissue and cells — miRNeasy Kits

miRNeasy Kits enable the preparation of miRNA from all animal tissues and cells, providing either purified total RNA containing miRNA or enrichment of miRNA in a separate fraction. The miRNeasy Mini Kit is used for low-throughput RNA purification using spin columns, while the miRNeasy 96 Kit enables high-throughput purification in a 96-well format. Purified RNA is ideal for use in miRNA profiling using the miScript PCR System (page 9).

**Automation:** The miRNeasy Mini Kit can be automated on the QIAcube (page 7).

### Simultaneous purification of RNA, DNA, and protein

#### From tissue and cells — AllPrep DNA/RNA/Protein Mini Kit

The AllPrep DNA/RNA/Protein Mini Kit streamlines sample preparation by enabling simultaneous purification of genomic DNA, total RNA, and total protein from the same cell or tissue sample. Purified genomic DNA and total RNA deliver optimal results in all downstream applications, such as real-time PCR and RT-PCR analyses (Figure 4). Total protein purified using the kit is suitable for SDS-PAGE and western blotting.

## Content release from formalin-fixed, paraffin-embedded tissue

QIAGEN's portfolio of kits for analyte purification from FFPE tissue use innovative procedures to reverse the cross-linking process, which would otherwise block downstream applications (Table 1).

**Table 1. FFPE Kits**

Kit	Purpose	Automatable on QIAcube
QIAamp DNA FFPE Tissue Kit	Purification of DNA	Yes
RNeasy FFPE Kit	Purification of total RNA down to 70 nucleotides	Yes
miRNeasy FFPE Kit	Purification of total RNA down to approximately 18 nucleotides	–
Qproteome FFPE Tissue Kit	Isolation of full-length proteins (Figure 5)	–
REPLI-g FFPE Kit	Whole genome amplification (page 8)	–

## Solutions for automation

Whatever your application requirements and throughput needs, QIAGEN provides cutting-edge automation solutions to fit your workflow and free up your time.

### QIAGEN automated solutions provide:

- Freedom from tedious manual tasks
- Increased productivity and standardized results



The QIAcube.

### Low-throughput purification of DNA, RNA, or proteins with the QIAcube

The award-winning QIAcube uses advanced technology to process QIAGEN spin columns, enabling seamless integration of automated nucleic acid or protein purification into your laboratory workflow. All steps in the purification procedure are fully automated and up to 12 samples can be processed per run.



The BioRobot Universal System.

### Fully automated medium- to high-throughput applications with the BioRobot Universal System

The BioRobot Universal System integrates all the instrumentation, software, purification, and enzyme technologies that are required for medium- to high-throughput applications in 96-well format. Application Packs are available for gene expression, genotyping, sequencing, and forensic applications. Optimized protocols enable automated RNA or DNA purification, as well as PCR cleanup. Downstream reaction setup includes RT-PCR, PCR, sequencing reaction, and forensic assay setup.



The QIASymphony SP.

### QIASymphony SP for high-performance in molecular biology

The QIASymphony SP meets the demand for a high-performance automated system with flexible processing of a wide range of samples. Up to 96 samples, in batches of up to 24 samples, can be processed per run. Innovative functions, optimized protocols, unrivaled flexibility, plus a novel kit concept place the QIASymphony SP at the cutting edge of laboratory automation for all disciplines in molecular biology.



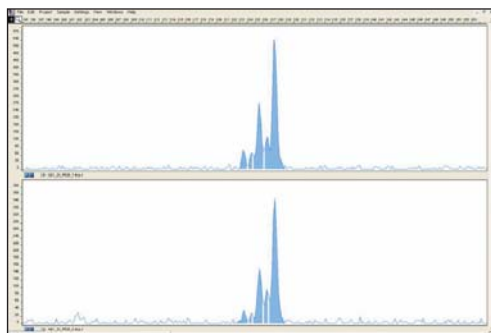
The Autopure LS workstation.

### Archive-quality genomic DNA from large-volume samples with the Autopure LS

The Autopure LS workstation fully automates purification of genomic DNA from large-volume samples. Proven Puregene® chemistries together with optimized protocols provide high yields of pure DNA from a broad range of sample types and sizes. Purified genomic DNA is ready to use in sensitive downstream assays or can be archived for long-term storage.

# Downstream analysis

Whether you want to perform rapid gene expression analysis or harness the power of exciting new techniques, QIAGEN's assay technologies provide innovative and reliable solutions for your research.



**Figure 6. Reliable microsatellite analysis.** DNA from a 3.5-year-old FFPE carcinoma tissue sample was analyzed at a single microsatellite locus prior to and after DNA amplification using the REPLI-g FFPE Kit. Identical results were obtained for the original and REPLI-g amplified genomic DNA. (Data kindly provided by Hartmut Schmidt, Gerhard Domagk Institute for Pathology, Münster, Germany.)

**QIAGEN's assay technologies include solutions for:**

- Accurate whole genome amplification
- Sensitive methylation analysis
- Fast and sensitive real-time PCR analysis
- Quantification of multiple miRNAs from a single cDNA sample

## Whole genome/transcriptome amplification

### REPLI-g Kits

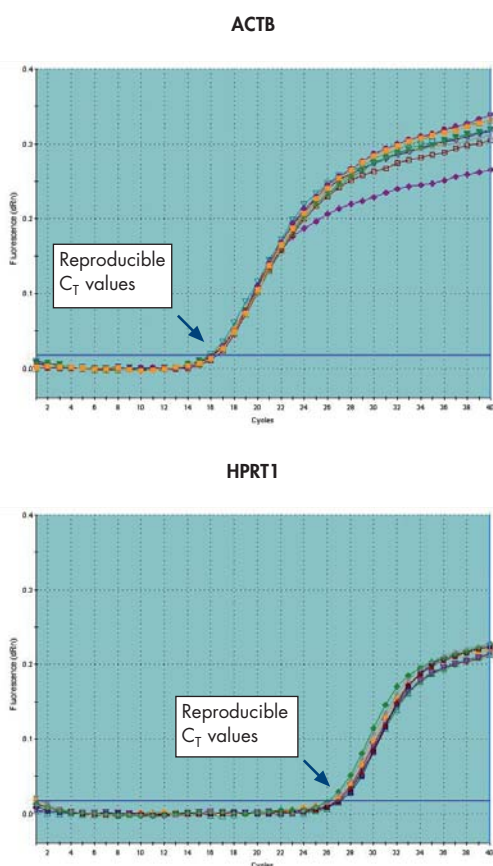
REPLI-g Kits provide highly uniform whole genome amplification with minimal sequence bias from a variety of sample types. The REPLI-g UltraFast Mini Kit allows fast, accurate amplification in just 60–90 minutes. Amplified DNA is suitable for a wide range of genetic analyses, including genotyping, comparative genome hybridization, and real-time PCR.

### REPLI-g FFPE Kit

The REPLI-g FFPE Kit provides highly uniform whole genome amplification from FFPE tissue in as little as 2 hours, without the need for prior DNA purification. Fragmented DNA from FFPE tissue is ligated prior to amplification using proven REPLI-g technology. The amplified DNA is suitable for direct use in a range of genetic analyses (Figure 6).

### QuantiTect Whole Transcriptome Kit

The QuantiTect Whole Transcriptome Kit is a complete set of enzymes and buffers that delivers high cDNA yields from limited amounts of RNA by whole transcriptome amplification. The cDNA is intended for use in real-time PCR and contains uniformly amplified targets to ensure reliable gene expression analysis (Figure 7).



**Figure 7. Reliable real-time PCR analysis.** Replicate RNA samples (10 ng each) were amplified using the QuantiTect Whole Transcriptome Kit. Real-time PCR of the indicated targets was then performed using 10 ng cDNA and the QuantiFast Probe PCR Kit on the Mx3005P® system. The overlapping curves indicate highly reproducible whole transcriptome amplification. **ACTB:**  $\beta$ -actin; **HPRT1:** Hypoxanthine phosphoribosyltransferase 1.



## DNA methylation analysis

### EpiTect Kits

The comprehensive EpiTect portfolio includes kits for bisulfite conversion and cleanup of DNA, whole bisulfite amplification, methylation-specific PCR, and quantitative real-time probe-based methylation analysis. This extensive range ensures successful results for every step of experiments studying methylation of genomic DNA.

## Real-time PCR analysis

### QuantiFast Kits

QuantiFast PCR and RT-PCR Kits provide fast results with time savings of up to 60% on any real-time cyclers. An optimized and unique chemistry delivers rapid and sensitive quantification using SYBR® Green detection, probe detection, or multiplex detection methods with no need for optimization of reaction and cycling conditions (Figure 8). The handbook provides a single protocol which can be used with all available real-time cyclers.

### QuantiTect Primer Assays

QuantiTect Primer Assays are predesigned, genome-wide primer pairs that provide highly specific and sensitive results in SYBR Green-based real-time RT-PCR. The assays, which are ideal for gene expression analysis applications, are available for every human, mouse, and rat gene and many other species at the GeneGlobe® Web portal ([www.qiagen.com/GeneGlobe](http://www.qiagen.com/GeneGlobe)).

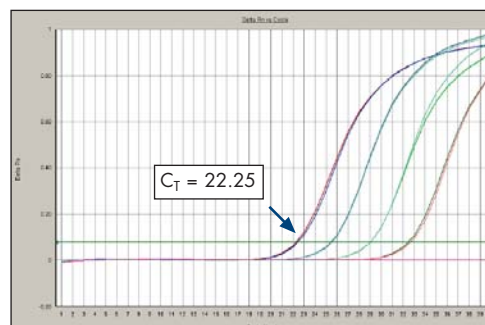
### Type-it PCR Kits

Type-it PCR Kits are a collection of reliable PCR-based kits that have been developed specifically for genotyping applications ranging from analysis of SNPs to detection of mutations and identification of microsatellite loci (Figure 9). These dedicated kits overcome the challenges faced in genotyping studies, such as the need for extensive optimization and the use of limiting or difficult sample types.

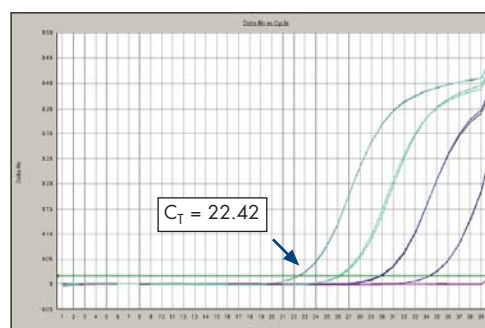
### The miScript PCR System

The miScript PCR System provides a vital tool in the exciting, emerging field of miRNA research. The system covers all the steps from conversion of miRNA and mRNA into cDNA and quantification of miRNAs in SYBR Green-based real-time PCR. Hundreds of miRNAs, as well as mRNA, can be detected from a single cDNA synthesis reaction, resulting in minimal variability and maximum results from precious samples ([www.qiagen.com/miRNA](http://www.qiagen.com/miRNA)).

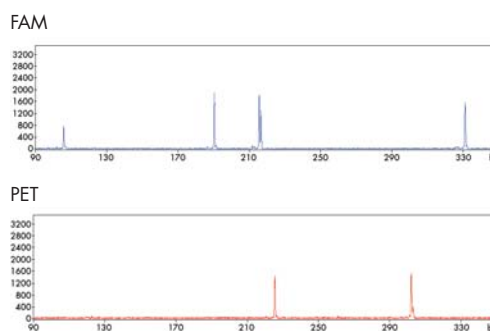
**A**  
QuantiFast SYBR Green PCR Kit (fast cycling mode)



**B**  
QuantiTect SYBR Green PCR Kit (standard cycling mode)



**Figure 8. Faster results without compromising sensitivity on the Applied Biosystems® 7500 Fast Real-Time PCR System.** Expression of MYC (a proto-oncogene) in human leukocytes was analyzed by real-time two-step RT-PCR. Duplicate reactions were run using 10-fold cDNA dilutions (10 ng to 10 pg) **A** Fast-cycling mode with the QuantiFast Kit gave similar  $C_T$  values to **B** standard-cycling mode with the QuantiTect Kit.



**Figure 9. Successful 13-plex STR analysis using the Type-it Microsatellite PCR Kit.** Only the FAM and PET channel representing 6 of 13 analyzed loci of the respective four channels of a 3730 xl Capillary Sequencer (ABI) are shown.

## Ordering Information

Product	Contents	Cat. no.
PAXgene Blood DNA Tubes (100)	100 tubes	761125
PAXgene Blood DNA Kit (25)	For 25 preps: tubes and reagents	761133
Available from BD and BD authorized distributors: PAXgene Blood RNA Tubes (100)	100 tubes	762165
PAXgene Blood RNA Kit (50)	For 50 preps: plasticware and reagents	762174
QIAcard FTA One Spot (100)*	For 100 samples: 100 QIAcard FTA One Spots	159201
Allprotect Tissue Reagent (100 ml)	100 ml reagent and pump	76405
AllPrep DNA/RNA/Protein Mini Kit (50)	For 50 preps: plasticware and reagents	80004
QIAsafe DNA Tubes (50)	50 tubes in moisture-barrier foil packages	159104
QIAsafe DNA 96-Well Plates (10)	10 plates in moisture-barrier foil packages, 10 QIAsafe Seals	159112
QIAamp DNA Mini Kit (50)†	For 50 preps: plasticware and reagents	51304
RNeasy Mini Kit (50)‡	For 50 preps: plasticware and reagents	74104
RNeasy FFPE Kit (50)	For 50 preps: plasticware and reagents	74404
miRNeasy Mini Kit (50)	For 50 preps: plasticware and reagents	217004
miRNeasy 96 Kit (4)	For 4 x 96 preps: plasticware and reagents	217061
miRNeasy FFPE Kit (50)	For 50 preps: plasticware and reagents	217404
QIAamp DNA FFPE Tissue Kit (50)	For 50 preps: plasticware and reagents	56404
Qproteome FFPE Tissue Kit (20)†	For 20 preps: plasticware and reagents	37623
QIAcube (110 V)	Robotic workstation for automated purification of DNA, RNA, or proteins using QIAGEN spin-column kits, 1-year warranty on parts and labor	9001292
(230 V)		9001293
PAXgene Bone Marrow RNA Tubes (50)	50 Bone Marrow Collection Tubes for use with the PAXgene Bone Marrow RNA Kit	764114
PAXgene Bone Marrow RNA Kit (30)	For 30 RNA preps: plasticware and reagents, to be used with PAXgene Bone Marrow RNA Tubes	764133
QuantiTect Whole Transcriptome Kit (25)†	For 25 x 50 µl reactions: Enzymes and Buffers	207043
QuantiFast SYBR Green PCR Kit (80)‡§	Trial kit for 80 x 25 µl reactions: Master Mix and RNase-Free Water	204052
QuantiFast Probe PCR Kit (80)‡§	Trial kit for 80 x 25 µl reactions: Master Mix and RNase-Free Water	204252
QuantiTect Primer Assay (200)	10x QuantiTect Primer Assay (lyophilized)	Varies¶
miScript Reverse Transcription Kit (10)†	For 10 reactions: RT Mix, Buffer, and RNase-Free Water	218060

\* Different formats available; please inquire. † Larger kit size available; please inquire. ‡ Larger kit size and micro, midi, maxi, and 96-well formats available; please inquire. § RT-PCR kits also available for one-step RT-PCR; please inquire. ¶ Visit [www.qiagen.com/GeneGlobe](http://www.qiagen.com/GeneGlobe) to search for and order these products.

## Ordering Information

Product	Contents	Cat. no.
miScript SYBR Green PCR Kit (200)*	For 200 reactions: Master Mix and miScript Universal Primer	218073
miScript Primer Assay (100)	10x miScript Primer Assay (contains one miRNA-specific primer)	Varies <sup>†</sup>
REPLI-g UltraFast Mini Kit (25)**	For 25 x 20 µl reactions: Polymerase, Buffers, and Reagents	150033
REPLI-g FPPE Kit (25)*	For 25 x 50 µl reactions: Polymerase, Buffers, and Reagents	150243
EpiTect Bisulfite Kit (48)	48 Spin Columns, Buffers and Reagents, Carrier RNA	59104
EpiTect 96 Bisulfite Kit (2)	2 x EpiTect Bisulfite 96-well Plates, Buffers and Reagents, Carrier RNA	59110

\* Larger kit size available; please inquire. <sup>†</sup> Visit [www.qiagen.com/GeneGlobe](http://www.qiagen.com/GeneGlobe) to search for and order these products. <sup>‡</sup> Mini, Midi, Mitochondrial DNA, and Screening Kits available; please inquire.

For up-to-date licensing information and product-specific disclaimers, see the respective QIAGEN kit handbook or user manual. QIAGEN kit handbooks and user manuals are available at [www.qiagen.com](http://www.qiagen.com) or can be requested from QIAGEN Technical Services or your local distributor.

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**China** ■ Orders 0086-21-3865-3865 ■ Fax 0086-21-3865-3965 ■ Technical 800-988-0325

**Denmark** ■ Orders 80-885945 ■ Fax 80-885944 ■ Technical 80-885942

**Finland** ■ Orders 0800-914416 ■ Fax 0800-914415 ■ Technical 0800-914413

**France** ■ Orders 01-60-920-920 ■ Fax 01-60-920-925 ■ Technical 01-60-920-930

**Germany** ■ Orders 02103-29-12000 ■ Fax 02103-29-22000 ■ Technical 02103-29-12400

**Hong Kong** ■ Orders 800 933 965 ■ Fax 800 930 439 ■ Technical 800 930 425

**Ireland** ■ Orders 1800 555 049 ■ Fax 1800 555 048 ■ Technical 1800 555 061

**Italy** ■ Orders 02-33430-420 ■ Fax 02-33430-426 ■ Technical 800-787980

**Japan** ■ Telephone: 03-6890-7300 ■ Fax 03-5547-0818 ■ Technical 03-6890-7300

**Korea (South)** ■ Orders 1544 7145 ■ Fax 1544 7146 ■ Technical 1544 7145

**Luxembourg** ■ Orders 8002-2076 ■ Fax 8002-2073 ■ Technical 8002-2067

**Mexico** ■ Orders 01-800-7742-639 ■ Fax 01-800-1122-330 ■ Technical 01-800-7742-639

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