



# Total RNA from cells and tissue

RNA sample preparation



# Legal disclaimer





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# Intact, high-quality total RNA from cells and tissue – kit overview



Sample	Kit	Features	Processing	Sample amount	Format	Elution volume	
<b>Single-spin, silica technology</b>							
Mini spin kits for cells and tissue  	<a href="#">RNeasy Plus (50, 250)</a>	Fast gDNA removal, gDNA removal columns included	Manual/ centrifugation or <a href="#">QIAcube</a>	<10 <sup>7</sup> cells or 30 mg tissue	Mini column	30–50 µL	
	<a href="#">RNeasy (50, 250)</a>	The gold standard for RNA isolation from cells and tissue	Manual/ centrifugation or <a href="#">QIAcube</a>	10 to 1 x 10 <sup>7</sup> animal or human cells, 0.5–30 mg animal or human tissues	Mini column	30–100 µL	
	<a href="#">QIAwave Plus RNA Mini (50, 250)</a>	Eco-friendlier version of the RNeasy Plus Mini Kit	Manual/ centrifugation or <a href="#">QIAcube</a>	<10 <sup>7</sup> cells or 30 mg tissue	Mini column	30–50 µL	
	<a href="#">QIAwave RNA Mini (50, 250)</a>	Eco-friendlier version of the RNeasy Mini Kit	Manual/ centrifugation or <a href="#">QIAcube</a>	10 to 1 x 10 <sup>7</sup> animal or human cells, 0.5–30 mg animal or human tissues	Mini column	30–100 µL	
	<a href="#">RNeasy Mini QIAcube (240)</a>	Specifically designed for use with QIAcube Connect – spin columns and tubes already loaded onto the rotor	<a href="#">QIAcube Connect</a>	<1 x 10 <sup>7</sup> cells, < 30 mg tissue, 20–250 mg animal or human tissue	Mini column	30–100 µL	
	Include stabilization solution (RNAprotect)	<a href="#">RNeasy Protect (50, 250)</a>	50 mL RNAprotect Tissue Reagent included	Manual/ centrifugation or <a href="#">QIAcube</a>	0.5–30 mg animal or human tissues	Mini column	30–100 µL
		<a href="#">RNeasy Protect Cell Mini (50)</a>	50 mL RNAprotect Cell Reagent included	Manual/ centrifugation or <a href="#">QIAcube</a>	Max. 10 <sup>7</sup> cells	Mini column	30–100 µL
	For difficult-to-lyse tissues	<a href="#">RNeasy Fibrous Tissue (50)</a>	Optimized protocols for fibrous tissues, with Proteinase K to remove structural proteins	Manual/ centrifugation or <a href="#">QIAcube</a>	0.5–30 mg of fiber-rich tissue samples	Mini column	30–100 µL
		<a href="#">RNeasy Plus Universal Mini (50)</a>	QIAzol lysis and RNeasy purification, includes gDNA Eliminator Solution	Manual/ centrifugation	25–50 mg tissue samples, including difficult-to-lyse and demanding tissues	Mini column	30 µL
	Micro kits for small samples and elution volumes  	<a href="#">RNeasy Plus Micro (50)</a>	Optimized for small samples and elution volumes, fast gDNA removal, gDNA removal columns included	Manual/ centrifugation or <a href="#">QIAcube</a>	<5 x 10 <sup>5</sup> cells, <5 mg tissue	Micro column	14 µL
<a href="#">RNeasy Micro (50)</a>		Optimized for small samples and elution volumes	Manual/ centrifugation or <a href="#">QIAcube</a>	<5 x 10 <sup>5</sup> cells, <5 mg tissue	Micro column	10–14 µL	
<a href="#">RNeasy UCP Micro (50)</a>		Ultra-clean production (UCP) of spin columns and buffers for RNA-seq of low abundance targets	Manual/ centrifugation or <a href="#">QIAcube</a>	<5 mg tissue or 5 x 10 <sup>5</sup> cells	Micro column	10–20 µL	

# Intact, high-quality total RNA from cells and tissue – kit overview



Sample	Kit	Features	Processing	Sample amount	Format	Elution volume
Midi and maxi kits for larger samples 	<a href="#">RNeasy Midi (50)</a>	Midi format RNeasy kit	Manual/ centrifugation	5 x 10 <sup>6</sup> to 1 x 10 <sup>8</sup> animal or human cells, 20–250 mg tissue	Midi columns	300–500 µL
	<a href="#">RNeasy Maxi (20)</a>	Maxi format RNeasy kit	Manual/ centrifugation	Up to 5 x 10 <sup>8</sup> animal or human cells, 150 mg to 1 g tissue	Maxi columns	800–2400 µL
<b>96-well, silica technology</b>						
	<a href="#">RNeasy Plus 96 (12 x 96)</a>	96-well version of RNeasy Plus kit	Manual or 3 <sup>rd</sup> party, Centrifugation, QIAvac/ Centrifugation	Fast gDNA removal, gDNA removal plates included	96-well plate	45–140 µL
	<a href="#">RNeasy 96 (4 x 96 / 12 x 96)</a>	96-well version of RNeasy Mini kit	Manual or 3 <sup>rd</sup> party, Centrifugation, QIAvac/ Centrifugation	10–5 x 10 <sup>5</sup> cells	96-well plate	45–140 µL
	<a href="#">RNeasy 96 Universal Tissue (4 x 96)</a>	QIAzol lysis and RNeasy 96 purification	Manual or 3 <sup>rd</sup> party, Centrifugation, QIAvac/ Centrifugation	25–50 mg Tissue samples including difficult-to-lyse and demanding tissues	96-well plate	45–70 µL
<b>Kits for automation platforms</b>						
Silica plate/ column based	<a href="#">RNeasy Mini QIAcube (240)</a>	Specifically designed for use with QIAcube Connect - spin columns and tubes already loaded onto the rotor	<a href="#">QIAcube Connect</a>	<1 x 10 <sup>7</sup> cells, < 30 mg tissue	Mini columns	30–100 µL
	<a href="#">QIAcube HT RNA (5x 96), QIAzol Lysis Reagent (200 mL)</a>	Automated purification of total RNA or total RNA, including miRNA, from animal and human cells and tissue samples on the QIAcube HT system	<a href="#">QIAcube HT</a>	Up to 5 x 10 <sup>5</sup> cells, homogenized in 140 µL Buffer RLT	96-well plate	110 µL
Magnetic bead based	<a href="#">EZ2 RNA/miRNA Tissue/Cells (48)</a>	Automated purification of RNA and miRNA from human and animal cells and tissues on the EZ2	<a href="#">EZ2 Connect</a>	Up to 30 mg (frozen) or 15 mg (stabilized) tissue or 10 mg frozen spleen or lung tissue, or up to 5 x 10 <sup>6</sup> cells	Cartridge/ mag beads	50 or 100 µL
	<a href="#">EZ1&amp;2 RNA Tissue Mini (48)</a>	For automated purification of high-quality total RNA	<a href="#">EZ2/ EZ1</a>	5–10 µg tissue	Cartridge/ mag beads	50–200 µL
	<a href="#">QIASymphony RNA (192)</a>	Automated purification of total RNA, or total RNA including miRNA and other small RNAs, from 1–96 samples on the QIASymphony SP	<a href="#">QIASymphony</a>	For 2 x 96 samples: ≤3 x 10 <sup>6</sup> cultured cells, ≤ 20 mg easy-to-lyse tissue, ≤20 mg fibrous tissue, For 2 x 48 samples: 3 x 10 <sup>6</sup> –1 x 10 <sup>7</sup> cultured cells ≤50 mg easy-to-lyse tissue	Cartridge/ mag beads	50 or 100 or 200 µL

# RNeasy – the most trusted kit for total RNA extraction from cells and tissue

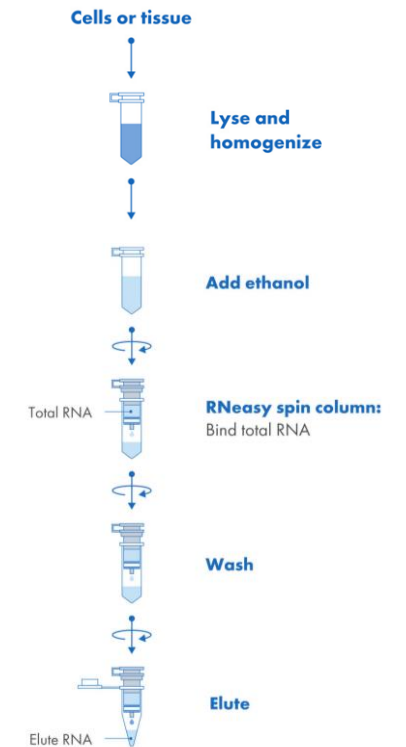


## Ready-to-use RNA for high performance in any downstream application

- Consistent RNA yields from small to large amounts of starting material
- No phenol/chloroform extraction, CsCl gradients, or LiCl/ethanol precipitation
- Simple “lyse-bind-wash-elute” protocol
- High-throughput processing in 96-well format and automatable protocols



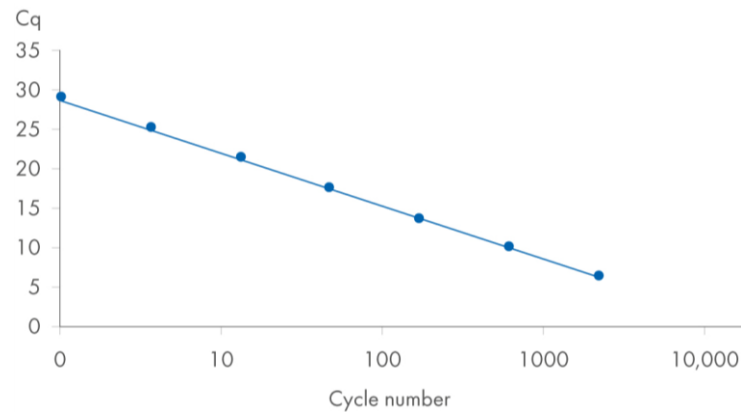
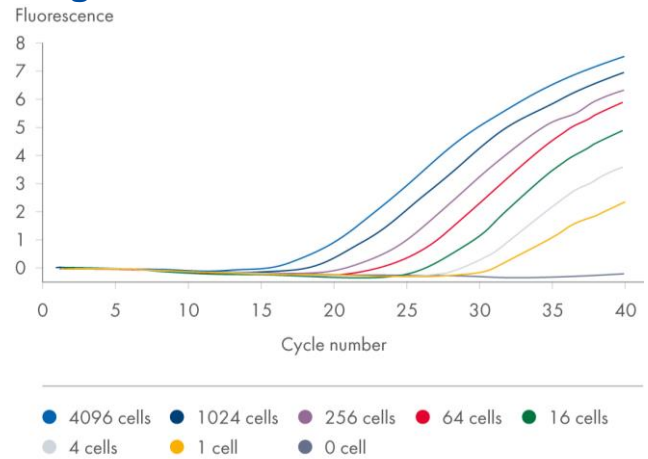
	RNeasy Micro	RNeasy Mini	QIAwave RNA Mini	RNeasy Mini QIAcube	RNeasy 96	RNeasy Midi	RNeasy Maxi
<b>Format</b>	Micro column	Mini column	Mini column	Mini column	96-well plate	Midi columns	Maxi columns
<b>Target</b>	RNA <200 nt						
<b>Sample</b>	<5 x 10 <sup>5</sup> cells, <5 mg tissue	10 to 1 x 10 <sup>7</sup> cells, 0.5–30 mg tissues	10 to 1 x 10 <sup>7</sup> cells, 0.5–30 mg tissues	<1 x 10 <sup>7</sup> cells, <30 mg tissue	10–5 x 10 <sup>5</sup> cells	5 x 10 <sup>6</sup> to 1 x 10 <sup>8</sup> animal or human cells	Up to 5 x 10 <sup>8</sup> cells, 150 mg to 1 g tissue
<b>Elution volume</b>	10–14 µL	30–100 µL	30–100 µL	30–100 µL	45–140 µL	300–500 µL	800–2400 µL
<b>Processing</b>	Manual (centrifugation), automated			Automated	Manual (centrifugation or centrifugation /vacuum)	5 x 10 <sup>6</sup> to 1 x 10 <sup>8</sup> cells, 20–250 mg tissue	Up to 5 x 10 <sup>8</sup> cells, 150 mg to 1 g tissue
<b>Automation</b>	QIAcube Connect			QIAcube Connect	3rd party	-	-
<b>gDNA removal</b>	Optional on-column DNase digest						



Did you know that there are more than 300,000 peer-reviewed citations for RNeasy? Most of them for RNeasy Mini?

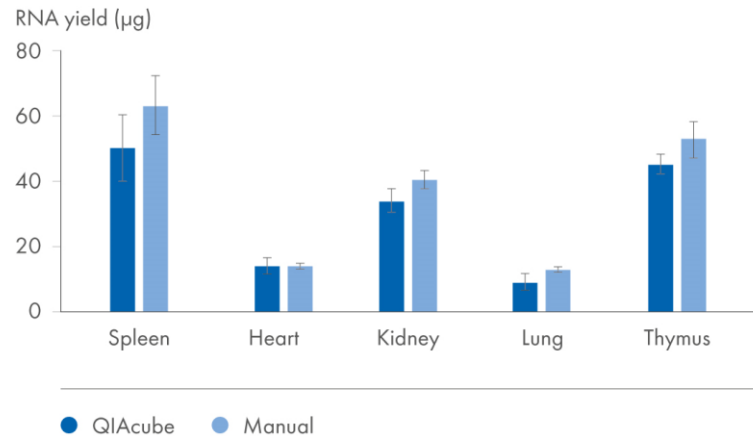
# RNeasy – the most trusted kit for total RNA extraction from cells and tissue

## Linear and very sensitive down to a single cell



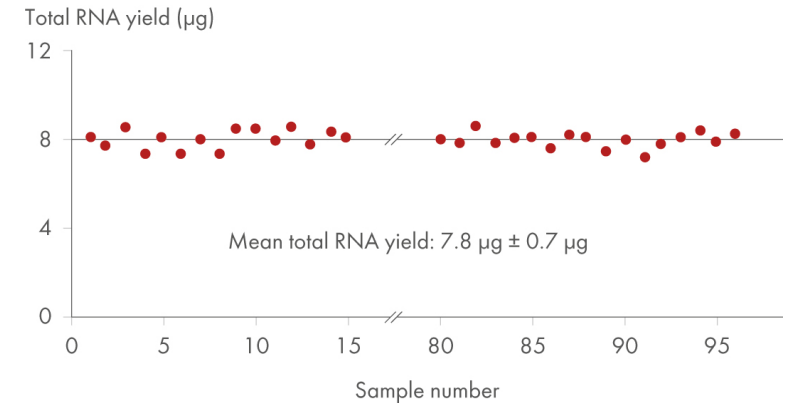
- Total RNA was isolated from the indicated number of HeLa cells using the RNeasy Micro Kit

## High RNA yield from various tissues – manual and automated



- Rat tissue (15 mg) was stabilized in RNAprotect Tissue Stabilization Solution and disrupted using the TissueLyser III
- RNA was purified using the RNeasy Mini kit, either manually or on the QIAcube Connect

## Reproducible purification of high-quality RNA







- HeLa cells ( $5 \times 10^5$ ) from a homogeneous cell culture were pelleted in a 96-well cell-culture plate and the total RNA purified using the RNeasy 96 Kit
- Each square represents the yield from a preparation originating from 1 well of the 96-well cell culture plate

# RNeasy Plus – the fastest way to remove gDNA



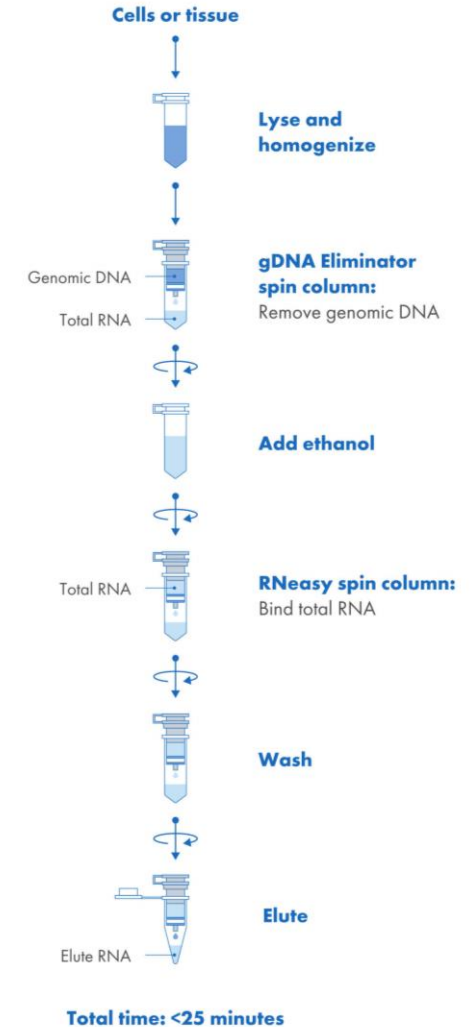
## Efficient gDNA removal with unique gDNA Eliminator columns or plates (no need for DNase)

- High-quality total RNA in minutes using fast and simple extraction protocols
- Phenol-free RNA isolation
- High-throughput processing in 96-well format
- Ideal for sensitive applications such as real-time RT-PCR and RNA-seq

				
	RNeasy Plus Micro	RNeasy Plus Mini	QIAwave RNA Plus Mini	RNeasy Plus 96
<b>Format</b>	Micro column	Mini column	Mini column	96-well plate
<b>Target</b>	RNA <200 nt	RNA <200 nt	RNA <200 nt	RNA <200 nt
<b>Sample material</b>	<5 x 10 <sup>5</sup> cells or 5 mg tissue	<10 <sup>7</sup> cells or 30 mg tissue	<10 <sup>7</sup> cells or 30 mg tissue	10 to 5 x 10 <sup>5</sup> cells
<b>Elution volume</b>	10–14 µL	30–100 µL	30–100 µL	30–50 µL
<b>Processing</b>	Manual (centrifugation), automated			Manual (centrifugation or centrifugation/vacuum)
<b>Automation</b>	QIAcube Connect			-
<b>gDNA removal</b>	gDNA Eliminator Columns			gDNA Eliminator Plate
<b>Processing time</b>	25 min			-

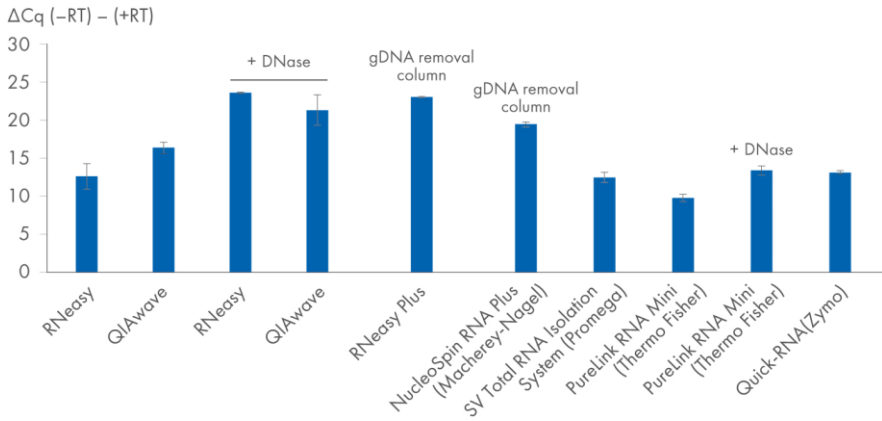


Did you know? QIAGEN invented the spin-column technology more than 30 years ago and revolutionized how nucleic acids are purified from any biological sample.



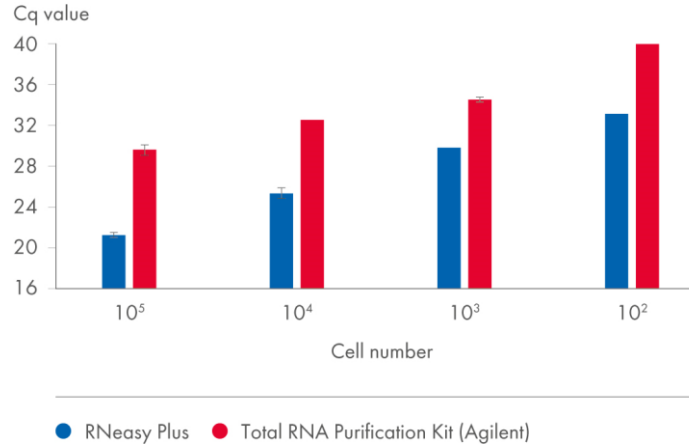
# RNeasy Plus – the fastest way to remove gDNA

## Effective removal of genomic DNA



- Total RNA was purified in duplicate from mouse liver (10 mg per sample) using QIAGEN Kits or kits from other suppliers
- Real-time PCR assays were performed to determine the amount of DNA contamination in the purified RNA

## High, reproducible RNA yields



- Total RNA was purified in duplicate from different amounts of Jurkat cells using the RNeasy Plus Mini Kit or a similar kit from another supplier
- Real-time RT-PCR assays for β-actin were performed (40 cycles)
- The lower Cq values with the RNeasy Kit demonstrate greater RNA yields. With the Total RNA Purification Kit, no transcript was detectable in RNA purified from 10<sup>2</sup> cells

## High-quality RNA



- Total RNA was purified from the indicated cell lines using the RNeasy Plus 96 Kit and analyzed on the Agilent 2100 Bioanalyzer
- The RIN values were close to 10, indicating the high integrity of the purified RNA



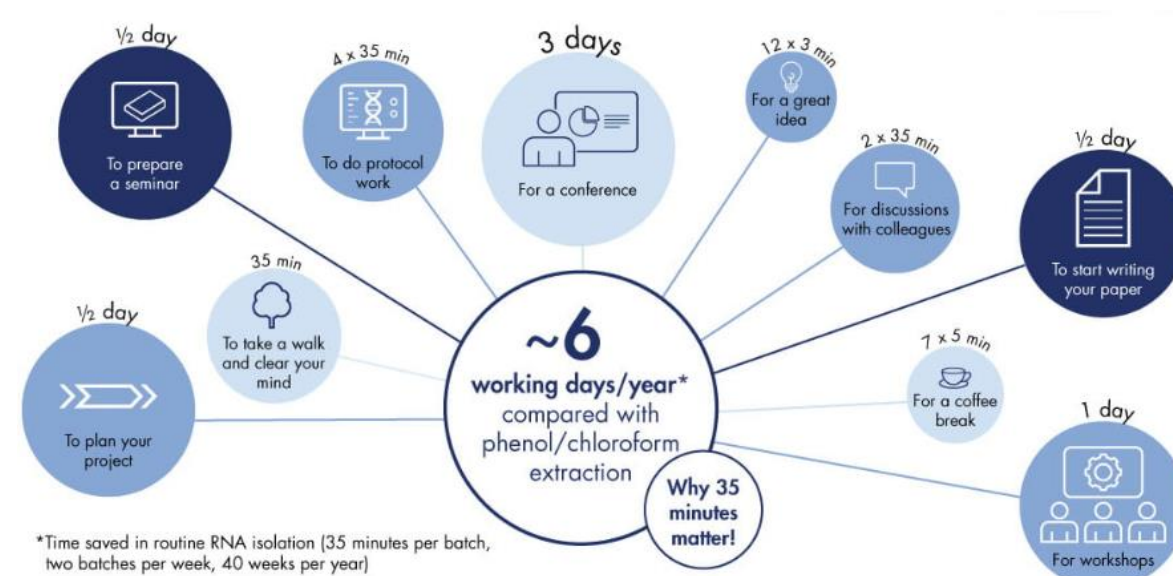
# Save time and enjoy greater convenience with RNeasy Plus Kits



## RNeasy vs. RNeasy Plus

	RNeasy		RNeasy Plus	
<b>gDNA removal</b>	Optional on-column or post-isolation DNase treatment	-	gDNA Eliminator columns	+
<b>Preparation time</b>	Longer procedure when combined with on-column digest	-	Fast procedure due to gDNA eliminator column/plate (no need for DNase)	+
<b>Popularity</b>	More than 300,000 citations, most popular RNA isolation kit on the market	+	More than 27,400 citations	+
<b>Formats</b>	Highest flexibility in yield and throughput: Micro, Mini, Midi, Maxi scale and 96-well format	+	Micro, Mini and 96-well	+
<b>QIAwave</b>	Yes, 50 and 250 preps		Yes, 50 and 250 preps	
<b>Applications</b>	Ideal for applications that do not require removal of residual gDNA		Ideal for DNA sensitive applications such as RNA-seq	

## Save ~6 working days per year by switching to RNeasy Plus



### Did you know?

Additional genomic DNA removal is unnecessary for many analytical methods. qPCR primers spanning exon-intron boundaries and cDNA synthesis kits with integrated genomic DNA removal, like QuantiNova Reverse Transcription Kit, do not require additional gDNA removal.

Make sure to select the RNA sample prep kit that best meets your needs.

### Want less lab waste and more space?

Did you know that using QIAwave RNA and QIAwave RNA Plus—the eco-friendlier versions of RNeasy and RNeasy Plus—can save up to 62% plastic and 58% cardboard?

[View website](#)

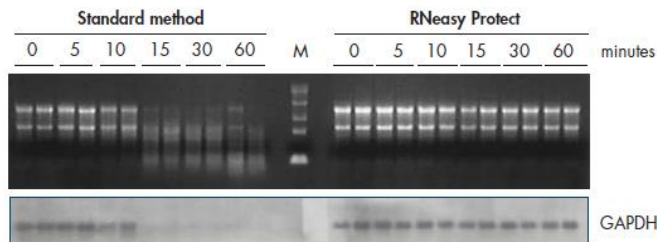
# Avoiding RNA degradation – RNeasy Protect Kits

## For stabilization and purification of total RNA from tissues, cells, human saliva and bacteria

- Specialized stabilization solution for cells and tissue combined with proven RNeasy RNA purification
- Immediate stabilization of RNA and RNA protection
- Reliable gene expression and gene-profiling data

## RNeasy Protect Kits – sample stabilization plus purification

	Cultured cells	Tissue	Bacteria	Animal blood	Saliva
<b>Kit name</b>	<a href="#">RNeasy Protect Cell Mini Kit</a>	<a href="#">RNeasy Protect Mini Kit</a>	<a href="#">RNeasy Protect Bacteria Mini Kit</a>	<a href="#">RNeasy Protect Animal Blood System</a>	<a href="#">RNeasy Protect Saliva Mini</a>
<b>Sample type</b>	Cultured cells	Animal or human tissue	Gram-positive and gram-negative bacteria	Animal blood	Saliva
<b>Stabilization</b>	RNAprotect Cell Reagent	RNAprotect Tissue Reagent	RNAprotect Bacteria reagent (2 x 100 mL)	Contains Animal Blood Tubes	RNAprotect Saliva Reagent
<b>RNA extraction kit</b>	RNeasy Mini	RNeasy Mini	RNeasy Mini	RNeasy Animal Blood	RNeasy Micro
<b>Input</b>	Max. 10 <sup>7</sup> cells	0.5-30 mg tissue	Up to 7.5 x 10 <sup>8</sup>	100-500 µL blood	200 µL saliva
<b>Special features</b>	RNAprotect Cell Reagent also available separately	RNAprotect Tissue Reagent also available separately	RNAprotect Bacteria Reagent also available separately	RNAprotect Animal Blood tubes also available separately, protocol for purification of small RNA available	-
<b>Automation</b>	QIAcube Connect	QIAcube Connect	QIAcube Connect	QIAcube Connect	QIAcube Connect



## Prevention of RNA degradation

RNA was isolated from fresh rat kidney samples after 0, 5, 10, 15, 30, and 60 minutes, using either unstabilized samples or RNeasy Protect Kits. M: markers.

[Visit website](#)

## Did you know?

RNA degradation is a significant risk that arises from endogenous RNases present in tissues and cells. To prevent RNA degradation, it is crucial to inactivate these RNases immediately upon harvesting tissues. RNAprotect reagents are designed to quickly permeate tissues or cells and stabilize and protect RNA. This means that you don't have to process your samples right away.

# Kits for difficult-to-lyse tissues

## Dedicated RNeasy kits for special sample types and difficult to lyse tissues

- Developed for difficult-to-lyse samples (e.g., fiber- or lipid-rich tissue)
- Deliver high-quality nucleic acids, ready for downstream use
- Optimized protocols enable purification of high-quality RNA from any type of tissue, even difficult-to-lyse tissues.



	RNeasy Plus Universal Mini	RNeasy Fibrous Tissue	RNeasy Lipid Tissue	RNeasy 96 Universal Tissue
<b>Format</b>	Micro column	Mini column	Mini column	96-well
<b>Sample material</b>	25–50 mg tissue samples including difficult-to-lyse and demanding tissues	0.5–30 mg of Fiber-rich tissue samples	10–100 mg of fatty tissue	25–50 mg tissue samples including difficult-to-lyse and demanding tissues
<b>Elution volume</b>	30–100 µL	30–100 µL	30–100 µL	45–70 µL
<b>Features</b>	QIAzol lysis and RNeasy purification, includes gDNA Eliminator Solution	With Proteinase K to remove structural proteins	QIAzol Lysis Reagent	QIAzol lysis and RNeasy 96 purification
<b>Citations</b>	More than 1000	More than 3500	More than 6700	More than 80



Check out our [RNA Benchguide](#) for recommendations on disruption and homogenization

## Trying to isolate RNA from difficult-to-lyse tissues?

Tissues high in fat (e.g., brain, breast, and adipose tissue), fiber (e.g., skin, heart, and skeletal muscle), or RNases (e.g., pancreas) can pose significant challenges for RNA isolation. QIAGEN offers a variety of optimized kits for such samples, helping you get high-quality RNA—even from the most challenging samples.

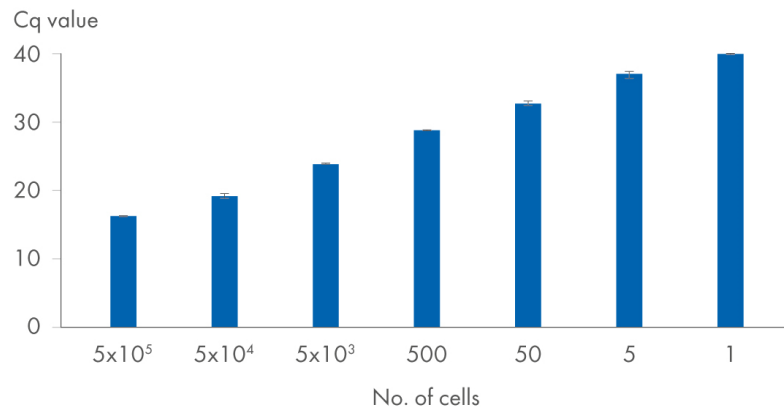
# Achieve high yields, even from small sample quantities



## Focus Product: RNeasy UCP Micro

- Ultra-Clean Production (UCP) of spin columns and buffers
- RNA isolation without exogenous nucleic acids for RNA-Seq of low abundance targets
- Consistent RNA yields from very small amounts of starting material

	RNeasy UCP Micro	RNeasy Plus Micro	RNeasy Micro
<b>Sample</b>	For limited sample quantities like LCM issues, fine-needle aspirates, and FACS-sorted cells		
<b>Sample amount</b>	<5 mg tissue, <5 x 10 <sup>5</sup> cells	<5 mg tissue, <5 x 10 <sup>5</sup> cells	<5 mg tissue, <5 x 10 <sup>5</sup> cells
<b>Elution volume</b>	10–20 µL	14 µL	10–14 µL
<b>gDNA removal</b>	On column digest, RNase-free DNase, included in kit	gDNA eliminator column, non enzymatic	On column digest, RNase-free DNase, included in kit
<b>Features</b>	Ultra-Clean Production (UCP) of spin columns and buffers	Fast gDNA removal	RNeasy optimized for small samples
<b>Applications</b>	Low biomass samples, RNA-Seq of low abundance targets	Suited for downstream applications that are sensitive to low amounts of DNA contamination	Quantitative, real-time RT-PCR and other standard applications



### Linearity over a broad dilution range

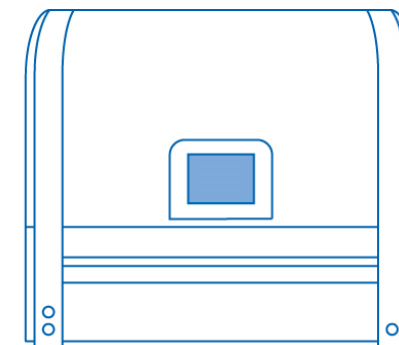
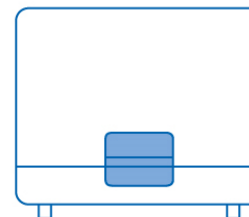
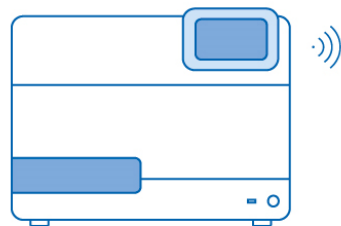
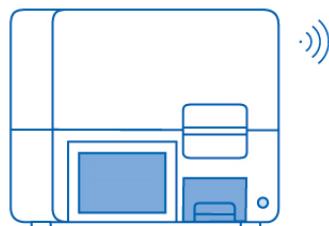
Total RNA was purified from 10-fold serial dilutions of Jurkat cells using the RNeasy UCP Micro Kit. The  $\beta$ -actin transcript was detected even down to one cell by real-time RT-PCR, and reproducible CT values were observed at each dilution, indicating the absence of inhibition

### Did you know?

Sorting small cell populations directly into the lysis buffer of the RNA isolation kit can enhance RNA integrity\*

\*Loontjens S, et al. Purification of high-quality RNA from a small number of fluorescence-activated cell-sorted zebrafish cells for RNA sequencing purposes. *BMC Genomics*. 2019;20(1):228.

# Automated RNA purification from cells and tissue



Instrument	QIAcube Connect	EZ2 Connect	QIAcube HT	QIASymphony
Throughput	Up to 12 samples	Up to 24 samples	Up to 96 samples	Up to 96 samples
Kits	<a href="#">RNeasy Mini QIAcube</a> (240)	<a href="#">EZ2 RNA/miRNA Tissue/Cells</a> (48)	<a href="#">QIAcube HT RNA</a> (5x 96)	<a href="#">QIASymphony RNA</a>
	Most RNeasy kits*	<a href="#">EZ1&amp;2 RNA Tissue Mini</a> (48)**		
Sample amount	<1 x 10 <sup>7</sup> cells, <30 mg tissue	Up to 30 mg (frozen) or 15 mg (stabilized) tissue or 10 mg frozen spleen or lung tissue, or up to 5 x 10 <sup>6</sup> cells	Up to 5 x 10 <sup>5</sup> cells, homogenized in 140 µL Buffer RLT	For 2 x 96 samples: ≤3 x 10 <sup>6</sup> cultured cells, ≤20 mg easy-to-lyse tissue, ≤20 mg fibrous tissue, For 2 x 48 samples: 3 x 10 <sup>6</sup> –1 x 10 <sup>7</sup> cultured cells
Format	Single-spin columns	Cartridge/magnetic beads	96-well plate	Cartridge/magnetic beads
Elution volume	30–100 µL	50 or 100 µL	110 µL	50, 100 or 200 µL

\* Most RNA Single-Spin kits can be processed on the QIAcube Connect. For available protocols please check here: [QIAcube Connect standard protocols - QIAGEN](#)

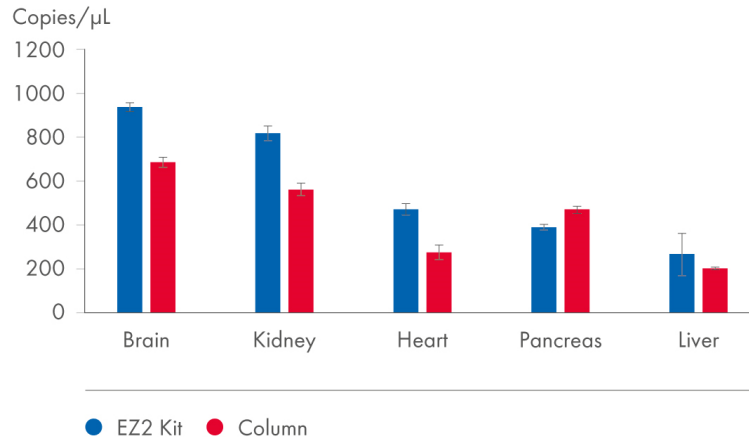
\*\* Will be replaced by EZ2 RNA/miRNA Tissue/Cells (48)

# High degree of automation with the EZ2 RNA/miRNA Tissue/Cells

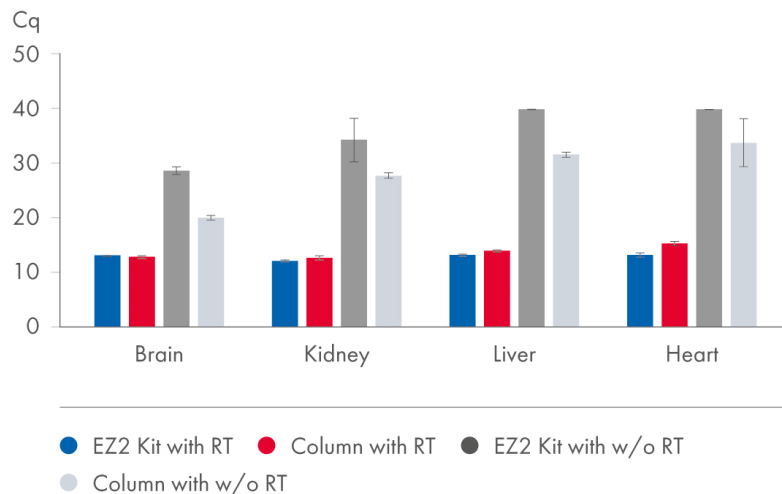
## Purification of microRNA and total RNA from formalin-fixed, paraffin-embedded tissue sections

- Proven QIAGEN chemistry allows efficient recovery of RNA
- Efficient removal of gDNA guarantees unimpaired downstream analysis
- Prefilled and sealed cartridges ensure processing without risk for contamination
- Parallel processing of up to 24 samples minimizes intra-run variability between samples of one batch

## dPCR – high RNA concentration



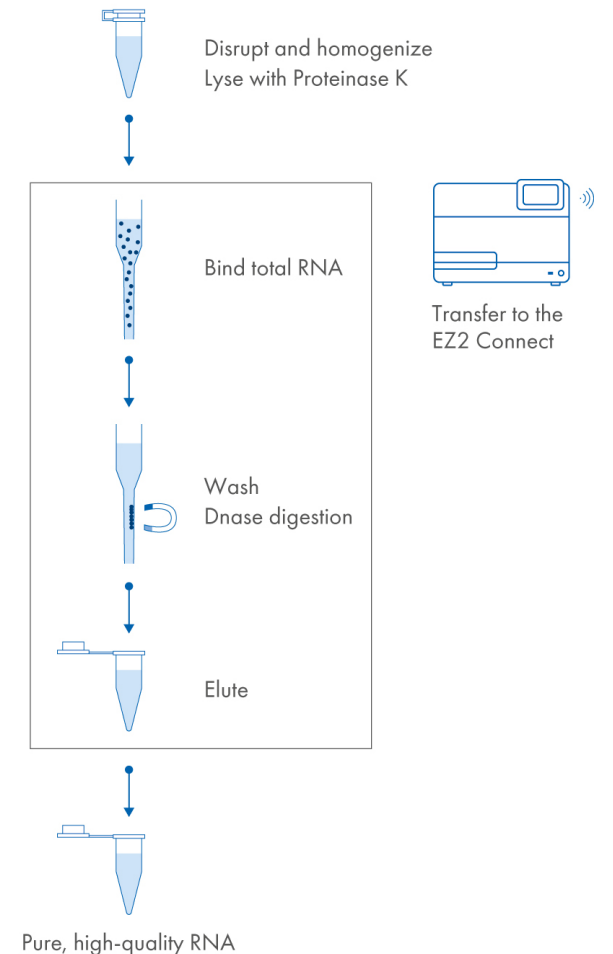
## Highly efficient gDNA removal



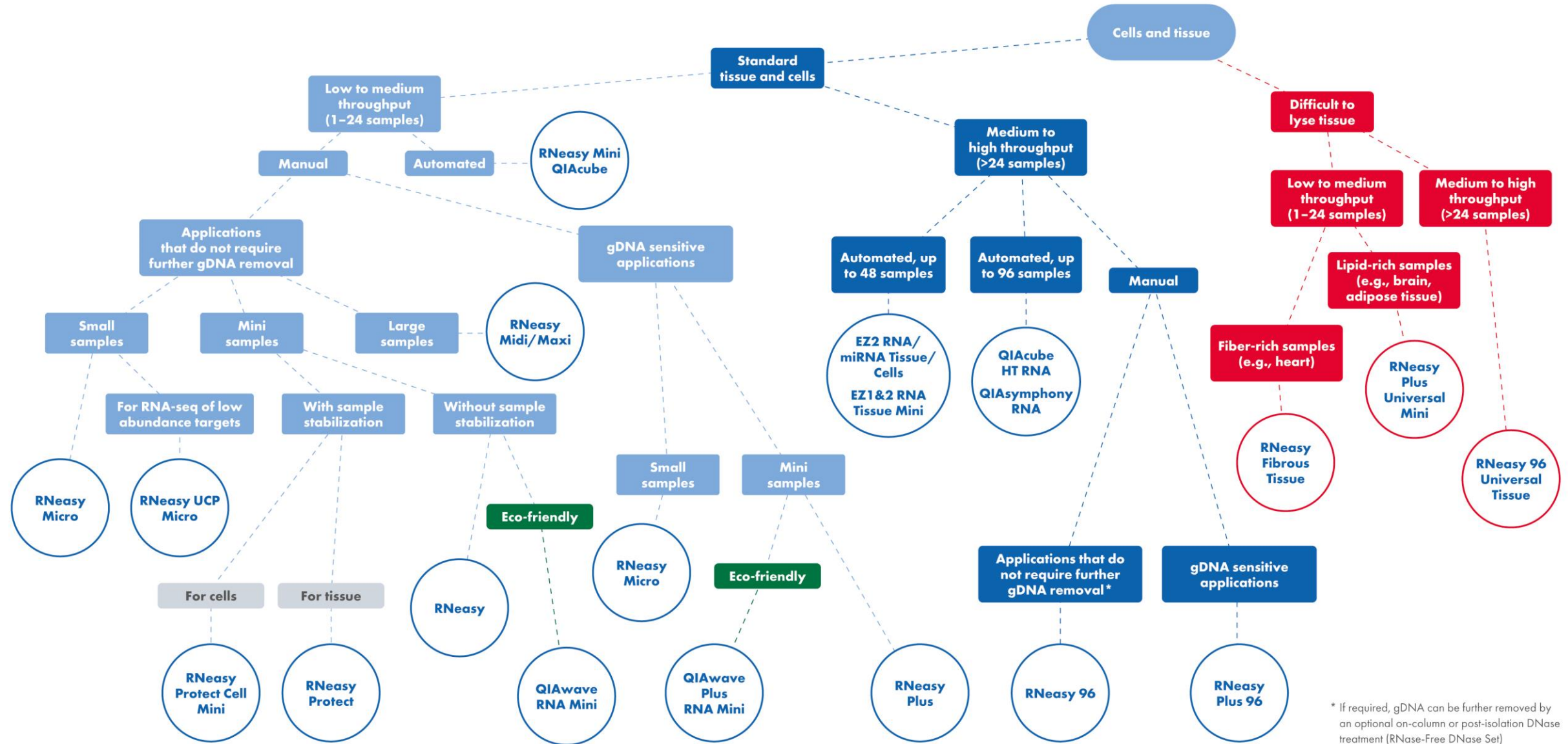
- Total RNA was purified from stabilized rat tissues using the EZ2 RNA/miRNA Tissue/Cell Kit and a manual column-based system. Digital PCR was performed
- High RNA concentration were consistently observed in samples purified with the EZ2 RNA/miRNA Tissue/Cell Kit

- Total RNA was purified from 10 mg stabilized rat tissues using the EZ2 RNA/miRNA Tissue/Cell Kit and the miRNeasy Tissue/Cells Advanced Mini Kit
- Real-time RT-PCR for pgk1 was performed with or without reverse transcriptase. Both kits show comparable mRNA recovery and good gDNA removal

## EZ2 RNA/miRNA Tissue/Cells Workflow

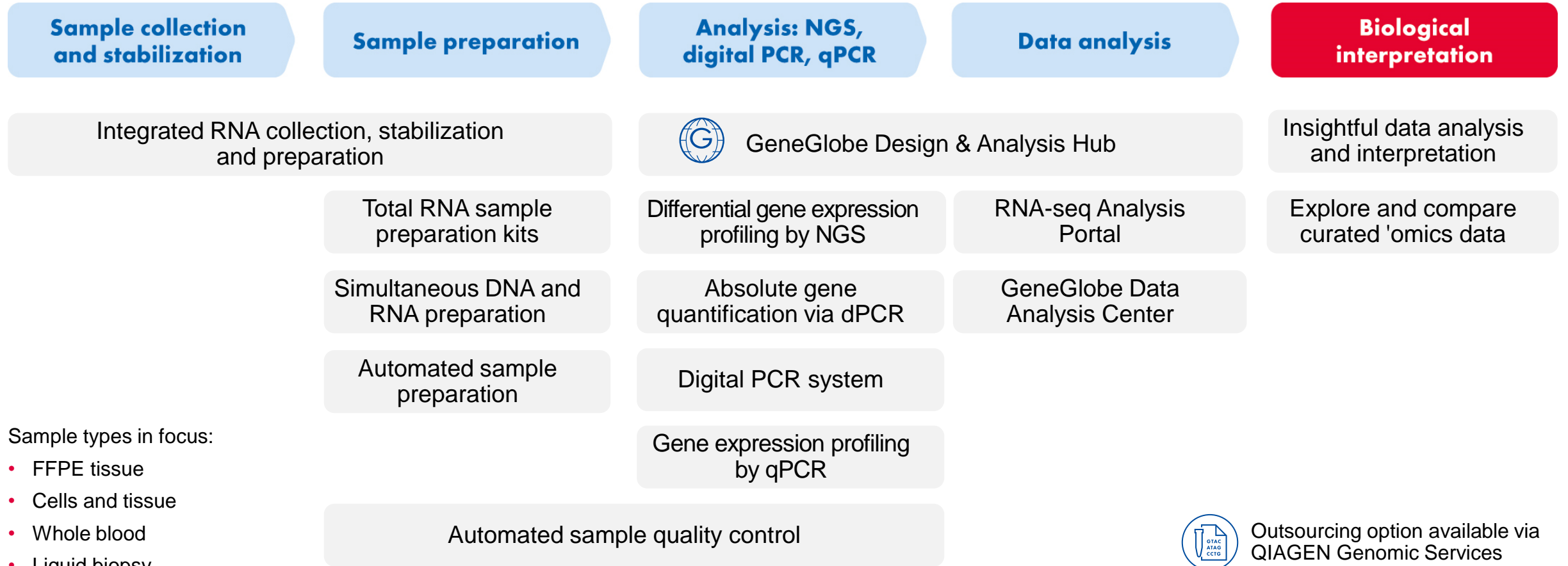


# Choose the right kit for your cells and tissue samples



\* If required, gDNA can be further removed by an optional on-column or post-isolation DNase treatment (RNase-Free DNase Set)

# Gene expression analysis beyond RNA sample prep







# Thank you for your attention. Questions?



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