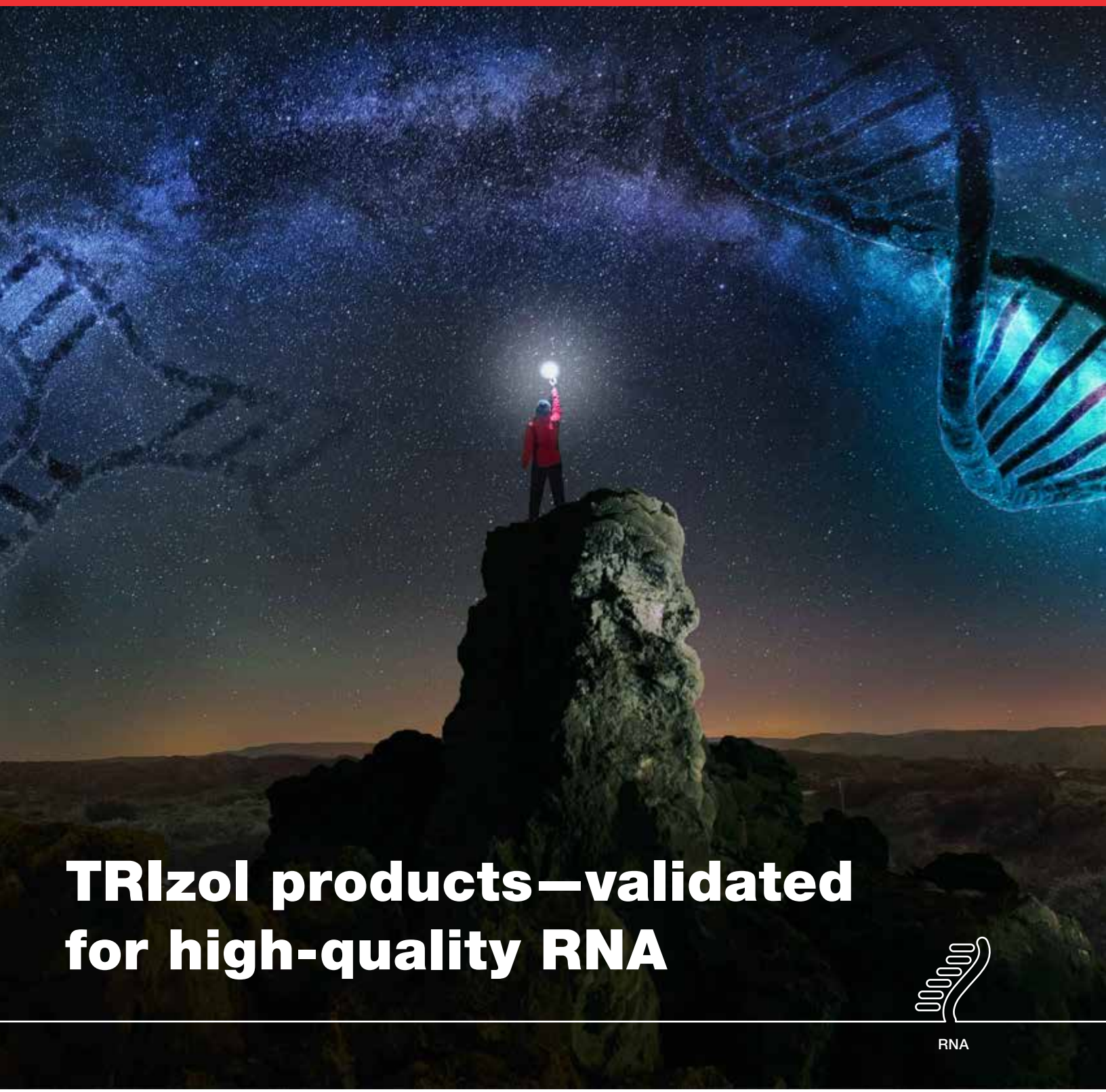
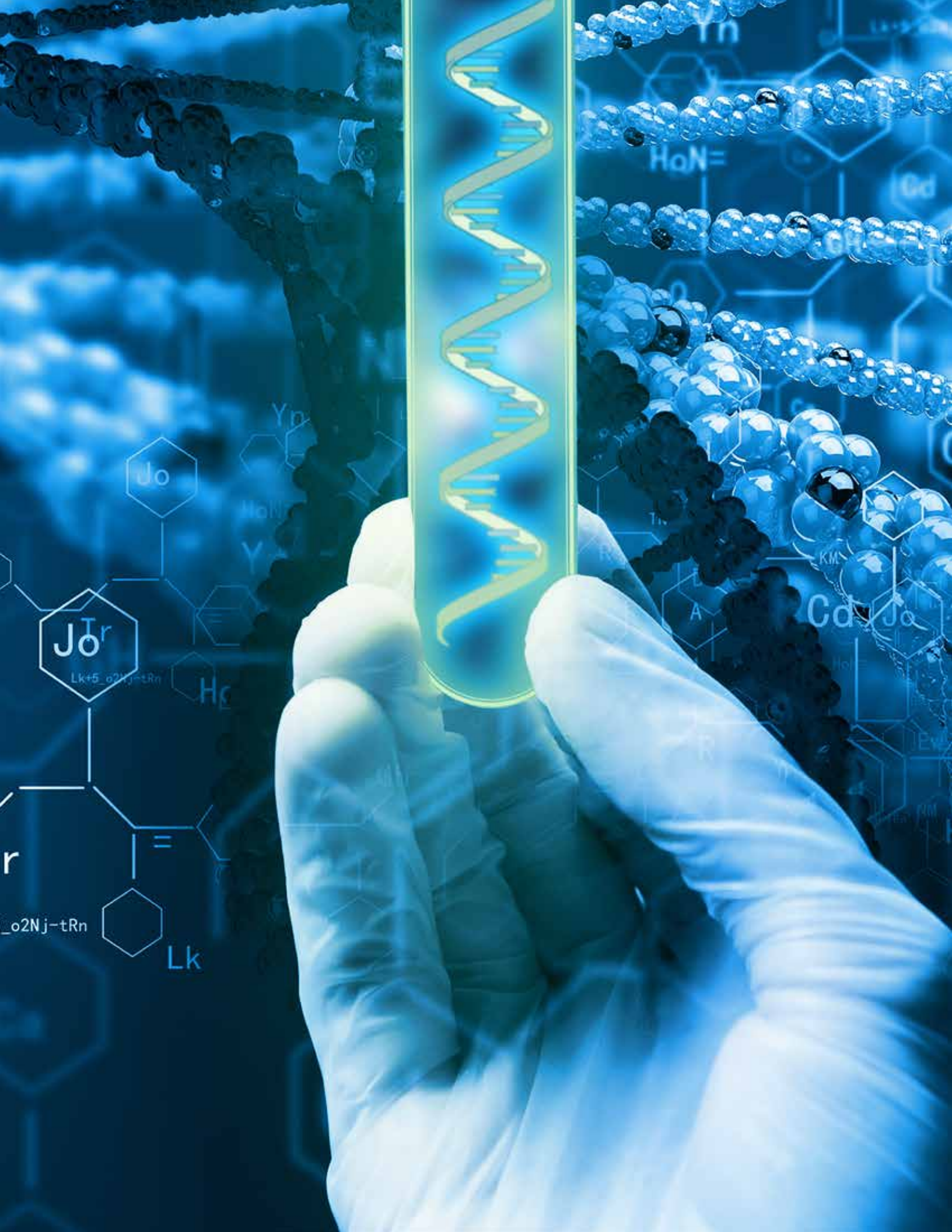
invitrogen



TRIzol products—validated for high-quality RNA

RNA

ThermoFisher SCIENTIFIC



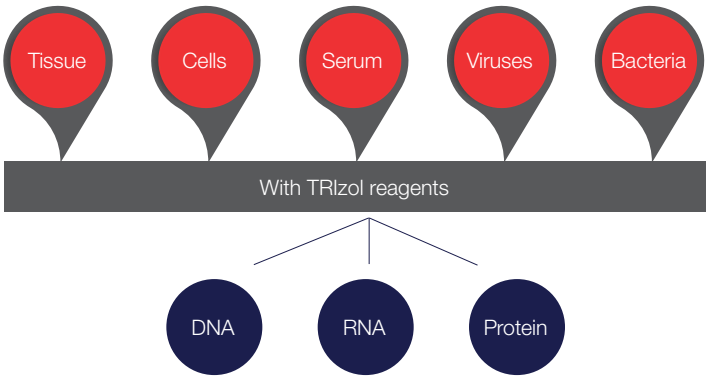
Contents

It's your turn to succeed with TRIzol products

Invitrogen™ TRIzol™ products are referenced in over 70,000 journal publications, reflecting the trust that molecular biologists have placed in them. TRIzol reagents are tailored to isolate total RNA or to simultaneously isolate RNA, DNA, and protein from diverse biological sources.

Key features include:

- Trusted by scientists for preparing high-quality and intact RNA
- Single-step monophasic solution (phenol + guanidium isothiocynate)
- Available in several ready-to-use formats
- Superior lysis capability, even with difficult sample types
- Optimized formulations and protocols for tissue, cells, sera, viruses, and bacteria



Downstream applications for RNA isolated using TRIzol

Applications		
RNA	**DNA**	**Protein**
Real-time quantitative PCR (qPCR)	PCR	Western blots
Northern blot analysis	Restriction enzyme digestion	Recovery of enzymatic activity
Dot blot hybridization	Southern blots	Immunoprecipitation
Poly-(A)+ selection		
In vitro translation		
RNase protection assays		
Molecular cloning		

Did you know?

The "TRI" in TRIzol stands for total RNA isolation reagent. It also signifies that this reagent can be used in the purification of RNA, DNA, and proteins from a single source.

Solutions for every scenario

We have developed a variety of products based on the TRIzol formulation to help with isolating RNA from virtually any sample without compromising the yield or quality.

Take a look at the range of our solutions.

Product	Sample type	Features	Throughput Low = 1–12 Medium= 12–48 High = 48 and above	Duration
TRIzol Reagent	Tissues and cells	Monophasic solution of phenol and guanidine isothiocyanate is designed to isolate separate fractions of RNA, DNA, and proteins from cell and tissue samples	Low	All within a 1 hour protocol
TRIzol LS Reagent	Liquid samples such as serum and virus preparations	Concentrated formula to accommodate processing of more liquid sample per unit of reagent	Low	
TRIzol MAX Reagent	Bacterial samples	Kit-based system designed to isolate total RNA from bacterial cells	Low	All within a 1 hour protocol
TRIzol Plus Kit	All sample types, especially difficult samples (fibrous, fatty or plant samples)	Offers rapid isolation of total RNA by combining the lysis capability of TRIzol Reagent with the convenient RNA extraction technology of the Invitrogen™ PureLink™ RNA Mini Kit silica spin column	Medium	45 min
A great companion for all the above products				
Invitrogen™ Phasemaker™ Tubes	All sample types processed using any of the above TRIzol Reagents	Create a tight, durable seal between the aqueous and organic phase of your TRIzol mix, allowing the RNA to be easily removed while maintaining the performance of TRIzol reagents	Medium	

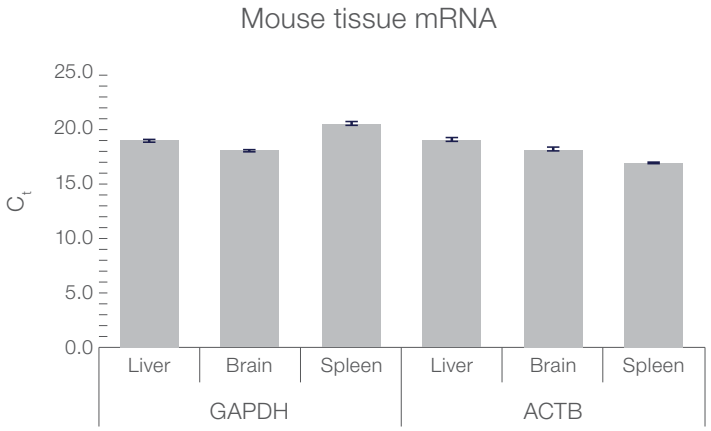
Find out more at **thermofisher.com/trizol**

TRIzol Reagent

Features include:

Complete, ready-to-use reagent for the isolation of high-quality total RNA

- Simultaneous isolation of RNA, DNA, and protein from a variety of biological samples
- Maintains integrity of RNA during sample homogenization or lysis while disrupting cells and solubilizing cell components
- Addition of chloroform, followed by centrifugation, separates the solution into an aqueous phase and an organic phase.
- RNA from aqueous phase is recovered by precipitation with isopropanol
- DNA from organic phase can be recovered by sequential precipitation
- Protein can be recovered from organic phase by isopropanol precipitation



RT-PCR analysis for 2 house-keeping target genes. RNA was isolated from three different samples (liver, brain, and spleen) and cDNA generated prior to RT-qPCR analysis.

Yield, purity, and duration for TRIzol Reagent

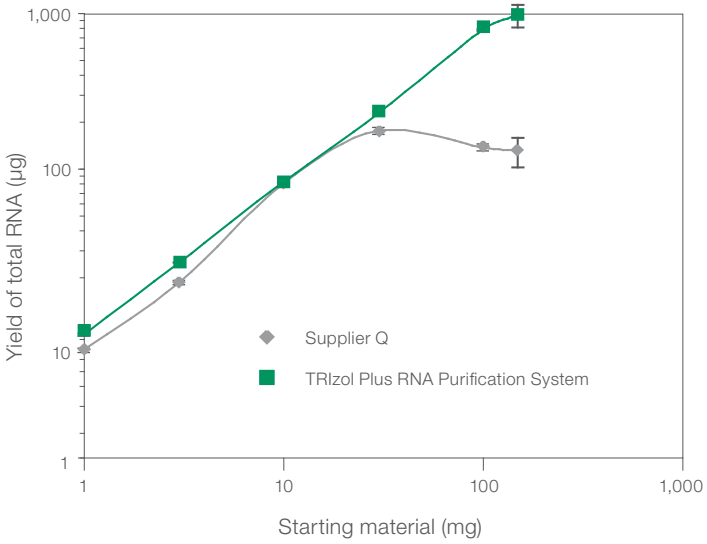
	Liver	Spleen	Kidney	Skeletal muscles	Brain	Placenta	1 x 10e^6 epithelial cells	Fibroblasts
Yield	1 mg	6–10 µg	3-4 µg	1–1.5 µg	1–1.5 µg	1–4 µg	8-15 µg	5–7 µg
Purity	$A_{260/230}$ 2.0–2.1							
Duration	1 hour							

TRIzol PLUS RNA Purification Kit

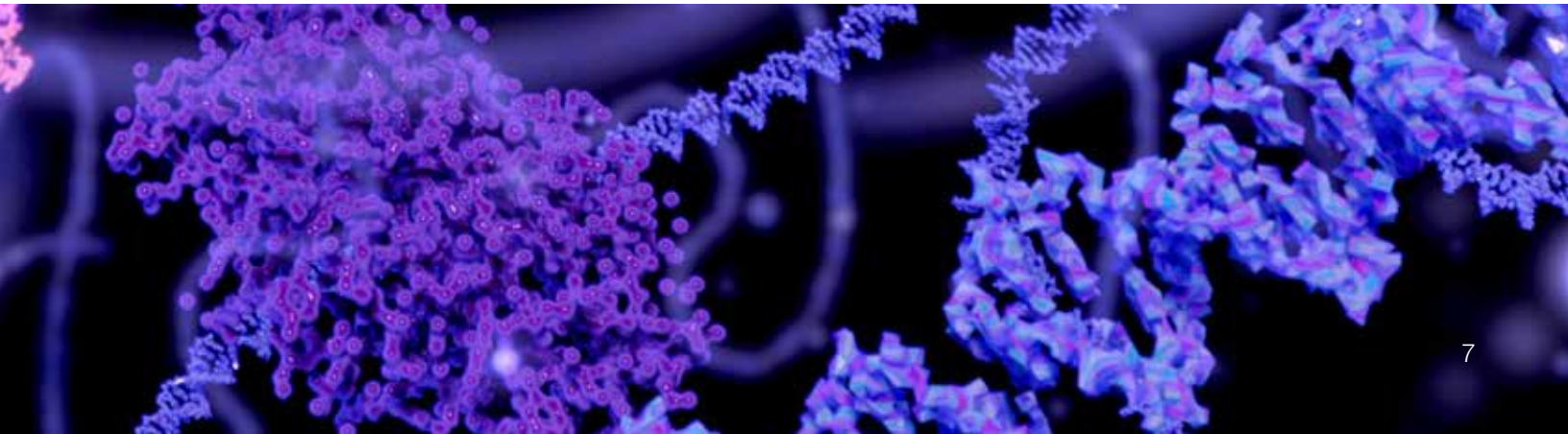
This combined kit provides ultrapure total RNA typically within an hour, even from difficult samples such as fibrous or fatty tissues

Features:

- Combines strong lysis capability of TRIzol Reagent and PureLink spin column technology and convenience of PureLink silica catridge technology
- RNA obtained within 45 mins—purification time only 20 min
- Recommended for difficult samples such as fibrous and fatty tissue



Comparison of RNA yields. The yield of total RNA from increasing amounts of rat liver was determined for supplier Q and the TRIzol Plus RNA Purification System. The TRIzol® Plus system produced up to 1,000 µg of total RNA, nearly 10 times more than the alternative kit.



TRIzol LS Reagent

Key features:

- Optimized for the isolation of high-quality total RNA liquid samples such as serum and virus preparations
- Integrity of resulting RNA is maintained by effective inhibition of RNase activity during sample homogenization
- Facilitates recovery of RNA, DNA, and protein
- Offers excellent lysis capability, even with difficult biological fluids
- Simple protocol, allowing larger sample processing
- RNA can be used in variety of downstream applications

Yield, purity, and duration for TRIzol LS Reagent

Yield	up to 20 µg from 1 ml of blood sample
Purity	$A_{260/230}$
Duration	1 hour

TRIzol Max Bacterial RNA Isolation Kit

Key features:

- Formulated for the isolation of RNA from both gram-positive and gram-negative bacteria
- Uses Invitrogen™ Max Bacterial Enhancement Reagent and TRIzol Reagent for maximum RNA yield and purity
- Minimizes time required for RNA isolation by eliminating enzymatic and mechanical lytic steps

Yield, purity, and duration for TRIzol Max Bacterial RNA Isolation Kit

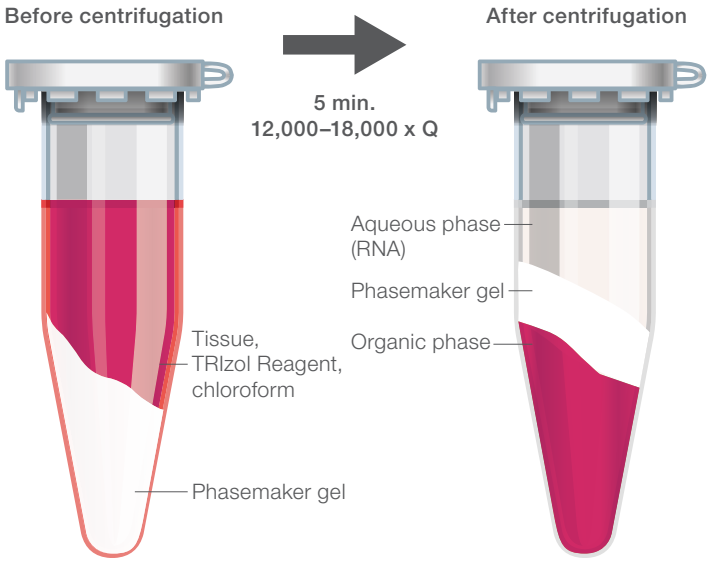
Yield	(~1x 10^8 cells) is >20 µg for E. *coli*
Purity	$A_{260/230}$: 1.85 and 2.15
Duration	1 hour

Phasemaker Tubes

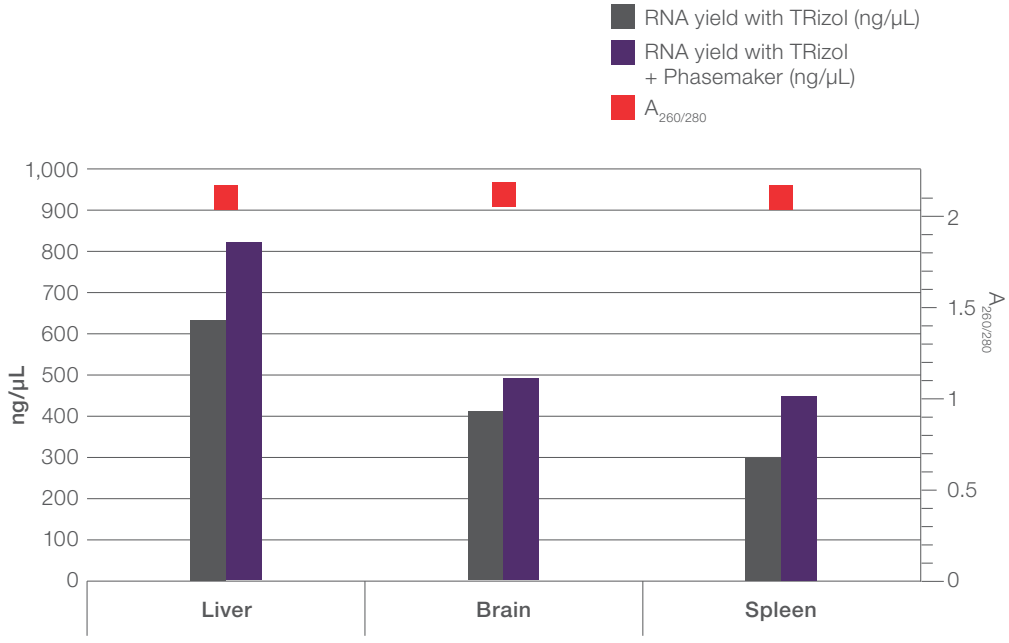
Phasemaker Tubes contain a thick liquid polymer that separates and completely isolates the upper aqueous phase of the TRIzol reagent mix from the organic phase underneath, greatly simplifying the recovery of the upper phase containing the RNA—even if the tubes are shaken, dropped, or bumped, you can still recover the aqueous phase without additional centrifugation.

Benefits include:

- Higher yield—increase recovery by as much as 30% compared to procedure without PhaseMaker Tubes
- Ease of use—simply add your TRIzol reagent and sample mix to the Phasemaker tube, centrifuge, centrifuge, and then easily pipette off the aqueous phase
- Ready-to-use convenience—comes predispensed in 2 mL tubes
- Increased throughput—stable gel seal allows you to maximize the number of samples per run without losing phase separation



Phasemaker Tubes create a tight, durable seal between the aqueous and organic phases of the TRIzol mix, allowing researchers to easily pipette off the RNA phase.



Higher yield was obtained when aqueous phase was isolated with Phasemaker Tubes.

Find out more at **thermofisher.com/trizol**

FAQs

What is the difference between TRIzol and TRIzol LS reagents?
The only difference between TRIzol Reagent and TRIzol LS Reagent is the concentration of the components. TRIzol LS Reagent is slightly more concentrated and designed to isolate total RNA, DNA, and proteins from liquid samples. TRIzol LS Reagent is slightly darker than TRIzol Reagent.

What is a good stopping point during the TRIzol protocol?
There are multiple possible stopping points.

- Sample homogenization step: after homogenization (before addition of chloroform), samples can be stored at –70°C for at least 1 year.
- Sample homogenization step: the homogenized samples can also sit at room temperature for several hours before chloroform is added.
- RNA precipitation step: you can store RNA in isopropanol overnight at 4°C.
- RNA wash step: you can store RNA in 75% ethanol for 1 week at 4°C or 1 year at –20°C.

I accidentally added too much chloroform to my TRIzol Reagent reaction. What should I do?
If a large amount of chloroform was inadvertently added, you can add more TRIzol Reagent so that the ratio of 0.2 mL chloroform: 1 mL TRIzol Reagent is maintained. If too much chloroform is added, this can drive the DNA, and eventually the protein, into the aqueous phase.

Can I use TRIzol Reagent to isolate RNA from tissue that was stored in RNA*later* Reagent?
Yes, tissue stored in Invitrogen™ RNA*later*™ Reagent can be used in the TRIzol Reagent. Remove the tissue from RNA*later* Reagent, and immediately submerge in TRIzol solution.

Can Phasemaker Tubes be used with organic reagents other than TRIzol Reagent?
Phasemaker Tubes work exclusively with TRIzol Reagent (and TRIzol LS Reagent). As other similar reagents may have different densities, Phasemaker Tubes may not work properly.

How do the Phasemaker Tubes facilitate separation of phases?
The polymer in Phasemaker Tubes is heavier than the aqueous phase of the TRIzol reagent mix, but lighter than the organic phase, so after centrifugation it positions itself between these two layers.

Ordering information

Product	Quantity	Cat. No.
Phasemaker Tubes	10 tubes	A33249
	100 tubes	A33248
TRIzol Reagent	200 mL	15596018
	100 mL	15596026
TRIzol Reagent and Phasemaker Tubes Complete System	100 preps	A33250
	200 preps	A33251
TRIzol LS Reagent	100 mL	10296010
	100 mL	10296010
TRIzol LS Reagent and Phasemaker Tubes Complete System	100 preps	A33252
	200 preps	A33253
TRIzol Plus RNA Purification Kit	50 preps	12183555
TRIzol Plus RNA Purification Kit and Phasemaker Tubes Complete System	50 preps	A33254
TRIzol Max Bacterial RNA Isolation Kit	100 preps	16096020
	200 prep	16096040
Max Bacterial Enhancement Reagent	20 mL	16122012
RNA essentials products		
RNA*later* Stabilization Solution	500 mL	AM7021
RNase*Zap* RNase Decontamination Solution	250 mL	AM9780
Nuclease Free Water	1,000 mL	AM9922
RNase-free Tips	200 µL size 10 racks	AM12650

Find out more at **thermofisher.com/trizol**

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RNA support and services

Consider us to be your essential resource for all your RNA purification and analysis support needs. Navigate through RNA support categories below to obtain relevant technical information, view tips and tricks when starting an experiment, and find answers to everyday problems.

Support:
thermofisher.com/napsupport
thermofifhser.com/tehnicalresources

Contact us at **thermofisher.com/contactus**
Email us at **techsupport@thermofisher.com**

Web Resources
thermofisher.com/rnapreps
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Find out more at **thermofisher.com/trizol**

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