

Know you've picked the ideal match

Explore our complete offering of
gene expression solutions

Explore the most complete offering of gene expression solutions to pick what's best for your project

We offer a wide range of high-quality solutions for gene expression profiling, verification, and screening.

Choosing a gene expression technology is no time for experimentation. Whether you're running digital or real-time PCR, microarrays, or next-generation sequencing (NGS), we can guide you through our full range of solutions so you don't end up with a solution that's too expensive or too complex for what you need.

Pick your ideal match.

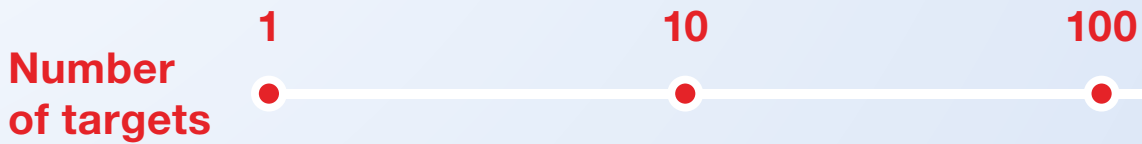


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Overview of gene expression solutions



Digital and real-time PCR

Branched DNA



Format	Single-tube TaqMan Assays	TaqMan array plates (96- and 384-well)	QuantiGene Plex assays (96- and 384-well)	TaqMan array cards	OpenArray plates (3,072-well)
Targets per run	Few	8–95	3–80	12–384	18–896
Samples per day	Up to 384	Up to 384/768 fast	Up to 480	Up to 32	Up to 800

1K

10K

25K

540K

Microarray

Next-generation sequencing



Ion AmpliSeq panels

Ion AmpliSeq transcriptome kit

Clariom S gene-level assays

Ion Total RNA-Seq whole-transcriptome kit

Clariom D transcriptome-level assays

12-1,200+

>20,000

>20,000

>90,000

>540,000

Up to 192

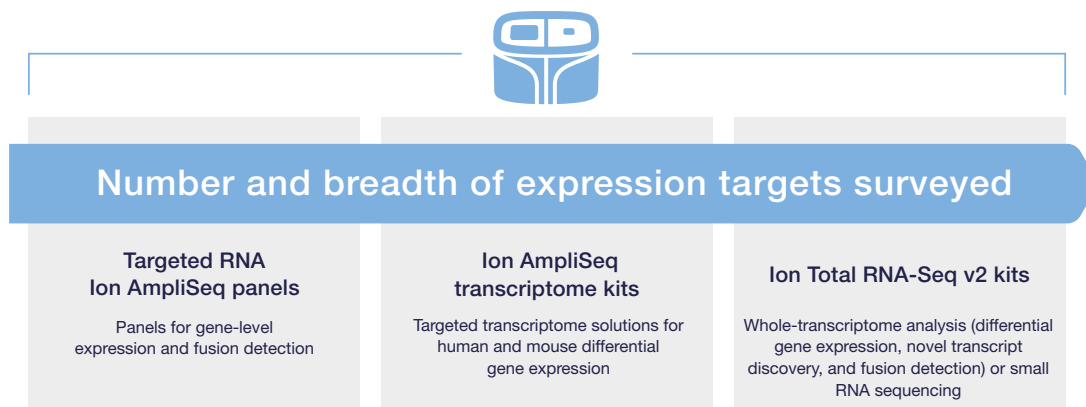
Up to 32

Up to 192

Up to 32 (3-4 for human, mouse)

Up to 48

RNA sequencing using NGS



Ion AmpliSeq RNA panels

Ion AmpliSeq™ RNA panels empower high-throughput gene expression analysis with a fast and FFPE-compatible workflow. They can be customized by selecting from over 20,000 well-annotated RefSeq genes.

Ion AmpliSeq transcriptome kits

Ion AmpliSeq™ transcriptome gene expression kits (human or mouse) enable fast and affordable gene expression analysis from limited samples. Achieve simultaneous amplification of more than 20,000 RefSeq genes in a single tube, starting from as little as 1 ng of total RNA.

Whole-transcriptome sequencing (RNA-Seq)

The Ion GeneStudio™ S5 series instruments enable you to perform hypothesis-free screening when discovering isoforms and comparing gene expression.

Small RNA sequencing

Ion Torrent™ NGS systems provide analysis of all known and novel small-RNA transcripts in a strand-specific, hypothesis-free fashion.

Ion GeneStudio S5 series systems



Prepare

- Automated Ion AmpliSeq™ library prep, template prep, and chip loading using Ion Chef™ System

Sequence

- Ion GeneStudio S5 series

Analyze

- Torrent Suite™ Software
- Torrent Suite Software Plug-ins
- Transcriptome Analysis Console (TAC) Software

Figure 1. Simple, rapid NGS workflow with less than 45 minutes of hands-on time.

Find out more at thermofisher.com/genestudio

Ion GeneStudio S5 series systems—a fast and automated workflow

Ion GeneStudio S5 series systems are designed to enable a broad range of targeted NGS applications with industry-leading speed and an automated workflow (Figure 1). The Ion 5 series chips offer a flexible format to help accelerate your research across both small and large projects without the need to change instruments.

Key features of Ion GeneStudio systems include:

- **Small sample input**—use as little as 1 ng of input RNA with Ion AmpliSeq™ technology
- **Scalability**—select from five different sequencing chips to sequence a throughput range from 2M to 260M reads per day
- **Speed**—go from RNA to data in less than two days
- **Simplified data analysis**—get an end-to-end bioinformatics solution



Ion GeneStudio S5 System

Single sequencer. Multiple RNA sequencing applications.

+ Ion 510™ Chip 2–3M reads*	+ Ion 520™ Chip 4–6M reads/chip*	+ Ion 530™ Chip 15–20M reads/chip*	+ Ion 540™ Chip 60–80M reads/chip*	+ Ion 550™ Chip 100–130M reads/chip*
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* Read counts shown are per chip. Depending on the chip size and Ion GeneStudio S5 system used, up to two chips can be run per day.

Find out more about targeted transcriptome sequencing at thermofisher.com/ampliseqtranscriptome

Whole-transcriptome profiling with gene expression microarrays

Discover the power of Clariom assays

Accelerate your expression biomarker discovery research with Applied Biosystems™ Clariom™ assays, the next generation of transcriptome profiling tools offering a fast path to results. We offer a complete range of arrays to suit your application and sample needs.

Key features of Clariom assays include:

- Generate expression profiles from as little as 100 pg of total RNA with as few as 10 cells
- Analyze RNA from a wide variety of sample types, including cells, whole blood, and fresh/fresh-frozen or formalin-fixed, paraffin-embedded (FFPE) tissues
- Preserve sample integrity and reduce variability with no need for globin or ribosomal RNA removal

Go deep into the transcriptome with Clariom D assays that enable you to:

- Perform comprehensive, detailed analysis of coding and long noncoding genes, exons, and splice variants
- Get coverage of all known transcripts, regardless of abundance
- Rapidly discover complex signatures and help ensure biomarkers are not missed

Figure 2. Applied Biosystems™ Transcriptome Analysis Console (TAC) Software hierarchical clustering view. Quickly arrange samples and genes into groups based on their expression levels and analyze transcriptomic data from all of our Clariom assays.

Keep biomarker discovery simple and swift with Clariom S assays, which enable you to:

- Rapidly generate robust expression profiles from all well- annotated genes
- Identify important gene signatures and pathways quickly and easily
- Discover gene-level signatures and quickly screen large numbers of samples with high-throughput, automated formats

Clariom assays are available for human, mouse, and rat analyses. Custom designs are available for other species.

Quick, easy, and cost-effective expression assay services are also available—let us run the assays for you.



Find out more at thermofisher.com/expressionmicroarrays

At a glance: portfolio of Applied Biosystems™ RNA expression microarrays for Clariom™ and GeneChip™ assays

Assay kit name	Clariom D Assay	Clariom D Pico Assay	Clariom S Assay	Clariom S Pico Assay	GeneChip Human Genome U133 Plus 2.0 Assay	GeneChip Human Genome U133 Plus 2.0 Pico Assay	GeneChip miRNA 4.0 Assay
Application(s)	Deep and broad transcriptome analysis and biomarker discovery		Gene-level expression profiling of well-annotated genes		3'-biased basic gene-level expression analysis in the context of extensive published studies		Comprehensive miRNA profiling to identify miRNA biomarkers
Level of analysis	Coding and noncoding genes, exons, and alternative splicing, including both well-annotated and speculative transcripts		Well-annotated genes		Annotated genes		Pre- and mature miRNA, snoRNA, scaRNA
FFPE tissue-compatible	No	Yes	No	Yes	No	Yes	Yes
RNA input minimum	50 ng	0.1 ng (0.5 ng for FFPE)	50 ng	0.1 ng (0.5 ng for FFPE)	50 ng	0.1 ng (0.5 ng for FFPE)	130 ng
Part of gene measured	Whole transcript				3' end		Whole transcript
Available format(s)	Cartridge (single sample)		Cartridge (single sample) Array plates (24 or 96 samples)				
Available species	Human, mouse, rat				Human (equivalent arrays for mouse, rat, and other species are available)		Includes 203 species on a single array
Assay kit includes	<ul style="list-style-type: none"> Clariom D Array GeneChip WT PLUS Reagent Kit 	<ul style="list-style-type: none"> Clariom D Array GeneChip WT Pico Kit 	<ul style="list-style-type: none"> Clariom S Array GeneChip WT PLUS Reagent Kit 	<ul style="list-style-type: none"> Clariom S Array GeneChip Pico Kit 	<ul style="list-style-type: none"> GeneChip U133 Plus 2.0 Array GeneChip IVT PLUS Reagent Kit 	<ul style="list-style-type: none"> GeneChip U133 Plus 2.0 Array GeneChip Pico Kit 	<ul style="list-style-type: none"> GeneChip miRNA 4.0 Array Applied Biosystems™ FlashTag™ Biotin HSR RNA Labeling Kit
Instrument (array format)	Applied Biosystems™ GeneChip™ Scanner 3000 7G System (cartridge)		GeneChip Scanner 3000 7G System (cartridge) Applied Biosystems™ GeneTitan™ Multi-Channel (MC) Instrument (plates)				

Find out more at thermofisher.com/expressionmicroarrays

Real-time PCR and digital PCR for gene expression

TaqMan gene expression assays: spend time on results, not on assay design and optimization

Applied Biosystems™ TaqMan® Assay technology is the gold standard in performance, quality, and content for gene expression analysis. We offer an end-to-end solution, so you can spend your time generating results, with the largest selection of predesigned assays.

- Detection of virtually any gene product with more than 1.8 million predesigned assays, and custom design available for everything else
- Assays for nearly every human, mouse, and rat gene in the RefSeq database
- Assays for multiple locations per transcript and across nearly every exon junction for human

TaqMan Fast Advanced Master Mix

The perfect complement for TaqMan gene expression assays, TaqMan Fast Advanced Master Mix delivers shorter run times (<40 minutes) while delivering superior sensitivity, accuracy, and linear dynamic range. To learn more about this and other real-time PCR master mixes, go to thermofisher.com/qpcrmm.

The TaqMan Assays qPCR guarantee

We guarantee the performance of all our predesigned TaqMan Assays for real-time PCR and digital PCR experiments. Our assays for gene expression, protein, noncoding RNA, SNP genotyping, copy number, drug metabolism enzyme, and mutation detection enable you to obtain the highest quality and performance available. If a TaqMan Assay does not perform according to specifications, we'll replace it at no cost or credit your account.*

* Restrictions and terms and conditions apply. For complete details, go to thermofisher.com/taqmanguarantee.



Formats of TaqMan gene expression assays

Single tubes

- Low entry price
- Flexible
- Suited to run on any real-time PCR instrument

96- or 384-well plates

- Optimal for small to medium projects
- Flexible with streamlined reaction setup
- Suited to run on any 96- or 384-well real-time PCR instrument

Check plate compatibility at thermofisher.com/pcrplastics

384-well microfluidic cards

- Low cost per reaction
- TaqMan Array Cards are optimal for medium to large projects
- Suited to run on Applied Biosystems™ QuantStudio™ 7 and 12K Flex, ViiA™ 7, and 7900HT Real-Time PCR Systems

OpenArray™ plates

- Lowest cost for large projects
- Ultimate throughput
- Suited to run on QuantStudio 12K Flex Real-Time PCR System

Find out more at thermofisher.com/taqman

Real-time PCR gene expression workflow

					
<p>Isolate RNA</p> <p>Isolate RNA using methods that preserve RNA integrity and expression profiles.</p> <p>We provide multiple solutions whether you are looking at isolating only RNA, isolating miRNA without RNA purification, or isolating RNA and DNA simultaneously.</p> <p>Assess RNA quality and quantity using Invitrogen™ Qubit™ fluorometric assays.</p>	<p>Design and optimize primers</p> <p>TaqMan real-time PCR assays are designed using our extensively validated bioinformatics pipeline, eliminating the need for primer design or PCR optimization. Assays are available in different formats: single tubes, 96- and 384-well plates, 384-well microfluidic cards, and OpenArray plates.</p> <p>-or-</p> <p>Design your own primers for Applied Biosystems™ PowerUp™ SYBR™ Green detection.</p>	<p>Perform reverse transcription</p> <p>Convert your RNA into cDNA over a wide range of RNA concentrations.</p> <p>With over 50,000 citations, reviews, and publications, Invitrogen™ SuperScript™ Reverse Transcriptases (RTs) are proven to be the superior choice for many research applications.</p>	<p>Amplify cDNA</p> <p>TaqMan real-time PCR assays are pre-designed and deliver superior sensitivity, accuracy, and linear dynamic range with shorter run times (<40 mins) when paired with TaqMan Fast Advanced Master Mix.</p> <p>-or-</p> <p>Amplify your cDNA using Applied Biosystems™ SYBR™ Green master mixes and custom primers that you design.</p>	<p>Run qPCR</p> <p>Take advantage of our Applied Biosystems™ QuantStudio™ family of instruments for real-time PCR and digital PCR for all of your research needs.</p>	<p>Analyze data</p> <p>Analyze and interpret qPCR data with intuitive software tools including free Applied Biosystems™ qPCR analysis modules on Thermo Fisher Connect and in the ExpressionSuite™ Software.</p>

TaqMan Advanced miRNA Assays

Applied Biosystems™ TaqMan® Advanced miRNA Assays enable highly sensitive and specific quantification of mature miRNAs that are ideal for analysis of multiple miRNA targets from a single sample, or low-level RNA samples such as serum and plasma.

Key features include:

- **Simplicity**—the TaqMan Advanced miRNA cDNA Synthesis Kit has a universal RT step to simplify the upfront workflow with one reverse transcription step for all TaqMan Advanced miRNA Assays
- **Sensitivity**—detect as few as 60 copies of target input into cDNA synthesis

- **Specificity**—detect only the mature miRNA and distinguish between highly homologous targets
- **Small sample input**—detect and quantify mature miRNA from as little as 1 pg of total RNA or 2 µL of plasma
- **Compatibility**—with biofluids including human serum, plasma, and tissue
- **Flexible formats**—single tubes, 96-well plates, TaqMan Array Cards, OpenArray plates

Find out more at thermofisher.com/advancedmirna

QuantStudio family of real-time and digital PCR systems

With superior flexibility, connectivity, speed, and precision, the QuantStudio family of real-time PCR systems provides you the platform to meet your specific research needs.

Contact a sales representative to personalize a solution or use our online product configuration tool to easily configure a QuantStudio system that's best for you.

For when you need:	Ultimate simplicity	Total control	Room to grow	More versatility	Maximum productivity	Absolute answers
	QuantStudio 3 System	QuantStudio 5 System	QuantStudio 6 Flex System	QuantStudio 7 Flex System	QuantStudio 12K Flex System	QuantStudio 3D System
	Real-time PCR				Digital PCR	



Colors	4 colors	5 or 6 colors (21 filter combinations)	5 colors	6 colors (21 filter combinations)	6 colors (21 filter combinations)	2 colors (endpoint detection)
Available formats*	96-well (0.2 mL block) 96-well Fast (0.1 mL block)	96-well (0.2 mL block) 96-well Fast (0.1 mL block) 384-well	96-well 96-well Fast 384-well	96-well 96-well Fast 384-well TaqMan Array card (384-well microfluidic card)	96-well 96-well Fast 384-well TaqMan Array card (384-well microfluidic card) OpenArray plates (3,072 through-holes)	20,000 partitions per chip
Dimensions	27 x 50 x 40 cm	27 x 50 x 40 cm	90.7 x 74.7 x 12.5 cm	90.7 x 74.7 x 12.5 cm	50.5 x 67.2 x 73.8 cm	21 x 13.5 x 23.25 cm
Block change	Fixed	Fixed	Block change from front in less than 1 min; no tools required			N/A
VeriFlex™ Blocks temperature control	3 zones	6 zones (96-well blocks only)	N/A	N/A	N/A	N/A
Automation-compatible	No	No	No	Yes	Yes	No
Throughput	Medium	Medium	Medium	High	Very high	Low
21 CFR Part 11–enablement	Security	Security, auditing, e-signature package	Optional security, auditing, e-signature packages available			No
Touch screen	Yes, interactive	Yes, interactive	Yes	Yes	Yes	Yes

* Some instruments are also available in a diagnostic format. Find out more at thermofisher.com/qsdx.

 = cloud-enabled instrument

Find out more at thermofisher.com/qs-family

RNA analysis using branched DNA detection

QuantiGene RNA assays—no RNA purification required

Invitrogen™ QuantiGene™ RNA assays are hybridization-based assays that utilize a branched DNA technology for signal amplification for the direct quantitation of gene expression transcripts.

QuantiGene Singleplex Assays and QuantiGene Singleplex HT Assays

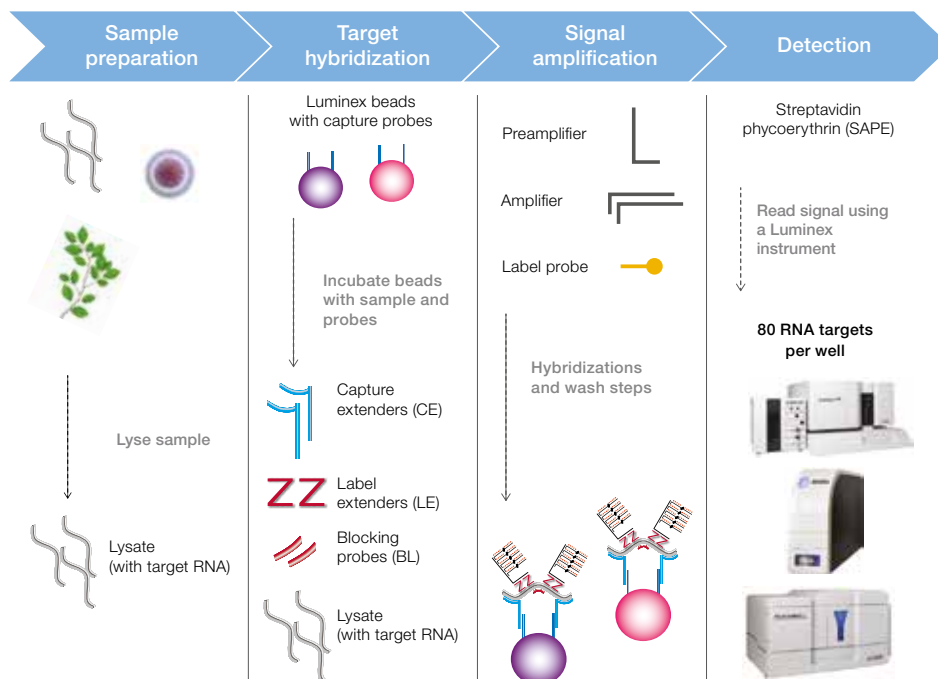
Invitrogen™ QuantiGene™ Singleplex Assays utilize a sandwich nucleic acid hybridization method followed by branched DNA–based signal amplification. The QuantiGene Singleplex Assay is performed in a 96-well plate and signal is detected using a standard luminometer. The QuantiGene Singleplex HT Assay is performed in a higher-throughput 384-well plate.

QuantiGene Plex assays

QuantiGene™ Plex assays provide an accurate and precise method for multiplexed gene expression quantitation using Luminex® xMAP® technology.

- **Works with difficult sample types**—works with degraded and crosslinked RNA in FFPE tissues and directly with blood, with no RNA purification required
- **True multiplexing**—measure up to 80 genes of interest and housekeeping genes in the same well with no cross-reactivity, reducing the number of sample wells needed
- **Standardized platform**—96-well plate format compatible with Luminex® 100/200™, MAGPIX®, and FLEXMAP 3D® systems
- **Simple workflow**—ELISA-like workflow for direct hybridization of transcripts to beads and transcript labeling, and no reverse transcription needed
- **Large inventory of verified genes**—over 15,000 genes can be mixed to create pathway- and disease-themed panels
- **Faster customization**—if we don't have your gene(s), we can create and QC your custom panel within 2 weeks

Overview of the QuantiGene Plex assay workflow.



Find out more at [thermofisher.com/quantigene](https://www.thermofisher.com/quantigene)

Gene expression data analysis and software

Smart informatics

The simplicity of using Ion Torrent™ sequencing instruments is enhanced by the easy-to-use, preinstalled Torrent Suite Software that runs on the Torrent Server. This software suite provides automated data analysis workflows that take you from raw data to high-quality sequencing reads and alignments. Plug-ins provided in Torrent Suite Software offer a powerful means to manage a full range of additional applications and analyses and to extend biological insights through compatibility with Transcriptome Analysis Console (TAC) Software.

Find out more at thermofisher.com/torrentsuite

Transcriptome Analysis Console (TAC) Software

Our whole-transcriptome data analysis software is easy and convenient. With TAC Software, you can:

- Perform array QC and data normalization
- Conduct statistical tests for differential gene expression analysis and generate lists of differentially expressed genes

- Explore interactions between coding RNA and noncoding RNA (ncRNA)
- Simplify the interpretation of complex alternative splicing events
- Understand which biological pathways have been impacted

Find out more at thermofisher.com/tac

Real-time PCR analysis

Applied Biosystems™ analysis modules are innovative cloud-based secondary data analysis solutions that bring together multiple data sets in one convenient place. This online solution makes it easier to view, store, and analyze qPCR and Sanger sequencing data. Applied Biosystems analysis modules take advantage of cloud computing to provide highly versatile analysis tools that are flexible, fast, and easy to use.

Find out more at thermofisher.com/abmodules

Comprehensive service and support

Comprehensive instrument warranty

Our factory-trained and certified field service engineers (FSEs) deliver high-quality workmanship for all warranty issues. Your warranty covers all repair costs, including engineer time and travel.

Service and support plans

We provide complete post-warranty support with our professional consulting services to help you maintain productivity, maximize the value of your investment, and optimize performance. With a service and support plan you will have lower, predictable operating costs and more running time on reliable instruments.

- Flexible and configurable support solutions
- Prioritized response based on your business demands

- Optimum reliability and workstation performance via scheduled system maintenance
- Discounted optional services and support products (varies by region)

Find out more at thermofisher.com/instrumentservices

How to reach us

To find your local support or technical support team, go to thermofisher.com/contactus

For product FAQs, protocols, training courses, and webinars, go to thermofisher.com/technicalresources

Sample preparation for optimized gene expression workflows

RNA extraction kits

Performance in downstream applications is often influenced by the quality of the starting nucleic acid being analyzed. We offer a broad range of kits for purifying high-quality RNA from a variety of sample types.

	Invitrogen™ TRIzol™ reagents	Invitrogen™ PureLink™ kits	Applied Biosystems™ MagMAX™ kits	Invitrogen™ Cells-to-C _T ™ kits
	Process a large amount of tissue	Fast isolation of RNA from a variety of samples	High-throughput purification of RNA and DNA	Process cells for gene expression
Prep time	60 min	<20 min	45 min	10 min
Sample types	Most samples, particularly those more difficult to lyse	Bacteria, liquid, blood, cells, yeast, plants, tissue	Cells, blood, plants	Cultured cells
Starting material	100 mg of tissue or 10 ⁷ cells	10 ⁸ cells, 200 mg of tissue, 250 mg of plant tissue, 0.2 mL of blood, 5 x 10 ⁸ yeast cells, 10 ⁹ bacterial cells	100 mg of tissue or 5 x 10 ⁶ cells	1–100,000 cells
Yield	1 x 10 ⁶ epithelial cells: 8–15 µg, tobacco leaf: 73 µg	Up to 350 µg	Variable depending on sample	N/A
High-throughput compatible	No	Yes	Yes	Yes
Technology	Organic extraction	Silica membrane spin column/filter plate	Magnetic beads	Crude lysate

Find out more at thermofisher.com/rnapreps

Reverse transcriptases (RTs)

With over 50,000 citations, reviews, and publications, SuperScript RTs are proven to be the superior choice for many research applications. Our latest innovation, Invitrogen™ SuperScript™ IV RTs were developed for improved thermostability, processivity, and cDNA yields to enable superior performance with even the most challenging RNA samples. If you seek the best cDNA synthesis performance, trust SuperScript RTs.

Find out more at thermofisher.com/superscript

RNA quality and quantity

Invitrogen™ Qubit™ fluorometric quantitation comprises the easy-to-use Invitrogen™ Qubit™ 4 Fluorometer and sensitive, specific Qubit quantitation assays to measure RNA quality and quantity, and to quantitate ssDNA, dsDNA, and protein. Based on the detection of target-specific fluorescence, this integrated system is more sensitive than UV absorbance-based quantification, making it ideal for precious samples and demanding applications.

To find options for high-throughput nucleic acid quantitation, go to thermofisher.com/platereaders

Find out more at thermofisher.com/qubit

Gene expression research considerations

Gene transcription is an intricate and dynamic process that generates a variety of RNA types. An important consideration for the application of NGS in human disease research is whether to interrogate the whole transcriptome, targeted genes, or regulatory elements.

Which RNA analysis solutions are right for you?

	Analysis type	Objective	Potential solutions
Discovery (novel annotations and/or novel associations to annotated content)	Transcriptome: exon-level discovery	Analyze complete set of RNA transcripts (coding, splice variants, and lncRNA) produced by the genome	<ul style="list-style-type: none"> • Ion Total RNA-Seq v2 Kit • Clariom D assays—human, mouse, rat
	Transcriptome: gene-level discovery (transcripts)	Analyze complete set of RNA transcripts (coding) produced by the genome	<ul style="list-style-type: none"> • Clariom S assays—human, mouse, rat • Ion AmpliSeq transcriptome kit—human, mouse • Ion Torrent™ OncoPrint™ Immune Response Research Assay
	Alternative splicing	Evaluate eukaryotic gene regulation at the RNA-processing level in which different mRNA molecules (isoforms/variants) are produced from the same primary transcript	<ul style="list-style-type: none"> • Clariom D assay • Ion Total RNA-Seq v2 Kit
	Long noncoding RNA (lncRNA)	Study non-protein-coding transcripts (>200 nucleotides), which are abundant in the mammalian transcriptome, have been shown to regulate transcription, and have been implicated in a wide range of developmental processes and diseases	<ul style="list-style-type: none"> • Ion Total RNA-Seq v2 Kit • Clariom D assays—human, mouse, rat • TaqMan Assays
	miRNA	Profile small noncoding RNA (~22 nucleotides) generated from a hairpin structure on a precursor RNA transcribed from a particular gene, and that function in RNA silencing and posttranscriptional regulation of gene expression	<ul style="list-style-type: none"> • Ion Total RNA-Seq v2 Kit • Applied Biosystems miRNA microarrays • TaqMan Advanced miRNA Assays
	Fusion genes and/or fusion transcripts	Interrogate hybrid genes formed from two previously separate genes that can give rise to hybrid proteins or to misregulation of transcription	<ul style="list-style-type: none"> • TaqMan Assays • Ion AmpliSeq™ RNA Lung Fusion Research Panel
Verification	All RNA types	Confirm gene expression profiles of biological samples by reliable complementary techniques	<ul style="list-style-type: none"> • Ion AmpliSeq RNA panels • Clariom S or D assays • TaqMan Assays (TaqMan Array Cards, OpenArray plates) • QuantiGene assays
Profiling	All RNA types	Evaluate the activity of many genes at once to create a global picture of expression patterns	<ul style="list-style-type: none"> • Ion AmpliSeq RNA panels • Clariom S or D assays • TaqMan Assays • QuantiGene assays
	miRNA	Profile small noncoding RNA (~22 nucleotides) generated from a hairpin structure on a precursor RNA transcribed from a particular gene, and that function in RNA silencing and posttranscriptional regulation of gene expression	<ul style="list-style-type: none"> • TaqMan Advanced miRNA assays (plates and cards) • Applied Biosystems miRNA microarrays

Find out more at thermofisher.com/idealmatch

ThermoFisher
SCIENTIFIC