



Sample preparation

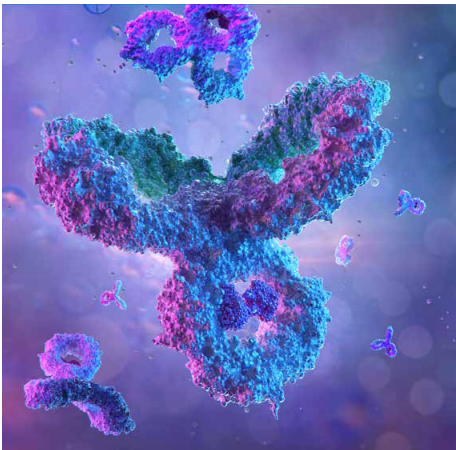
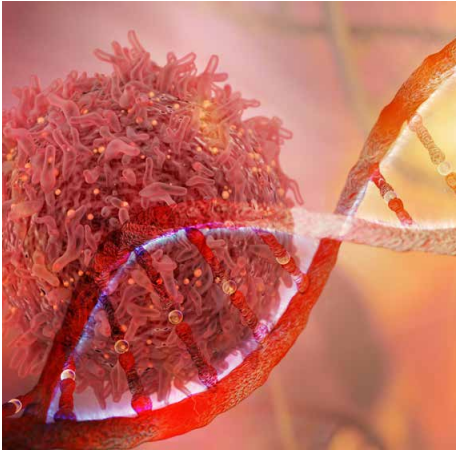
# When you have a KingFisher system, you have options

Explore all the ways your KingFisher system can empower you beyond SARS-CoV-2 research and testing

# Gratitude to laboratory professionals

Thermo Fisher Scientific expresses our deep gratitude to laboratory professionals who have been broadly impacted both personally and professionally during this challenging time. The coronavirus has dramatically shifted research priorities for scientists across the globe. It has disrupted many clinical trials, biomedical work, and central research activity. As you pursue your research, share ideas with other scientists, and access resources, Thermo Fisher will be here to support you.

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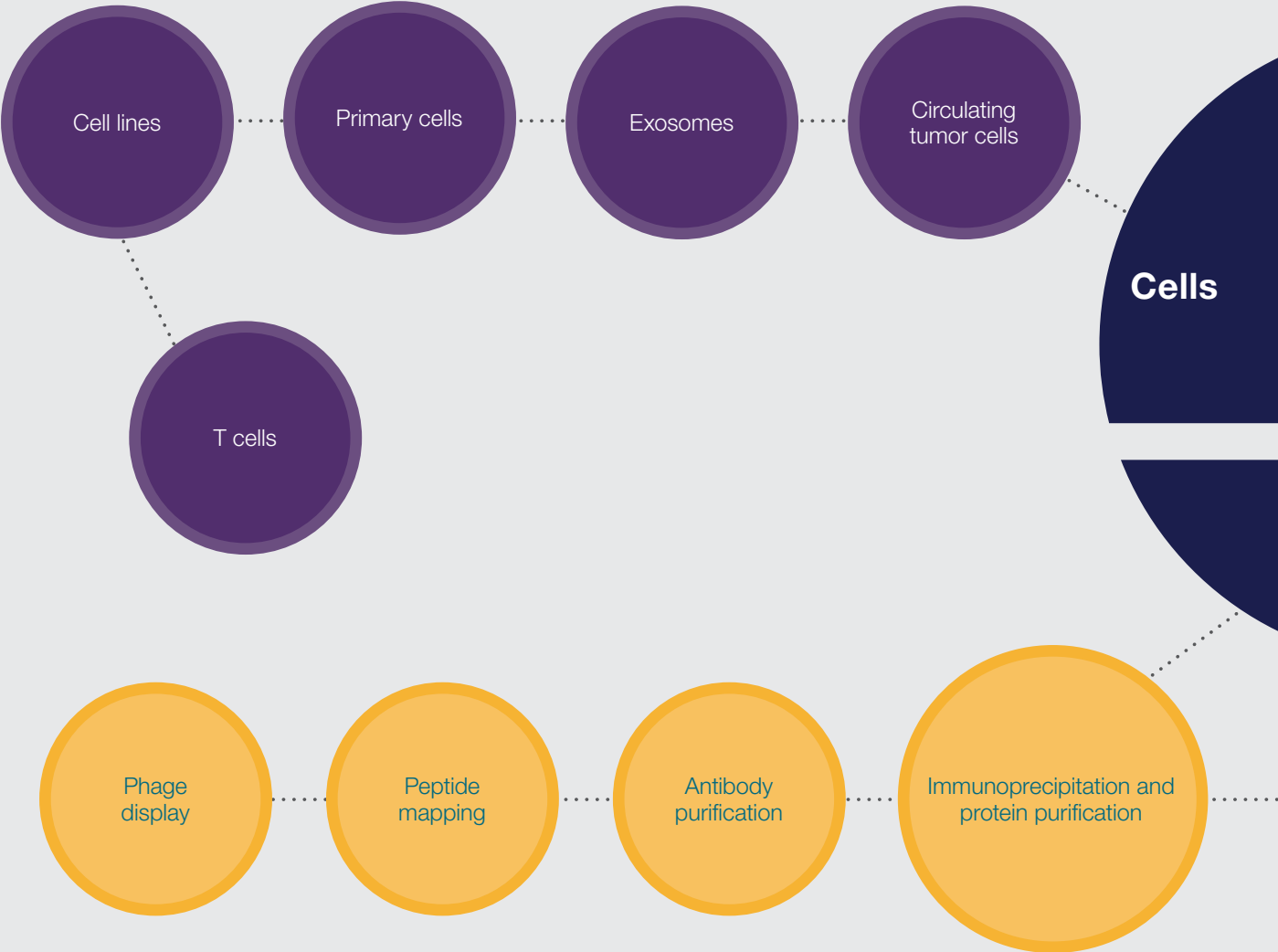


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# Explore the adaptability of your KingFisher instrument

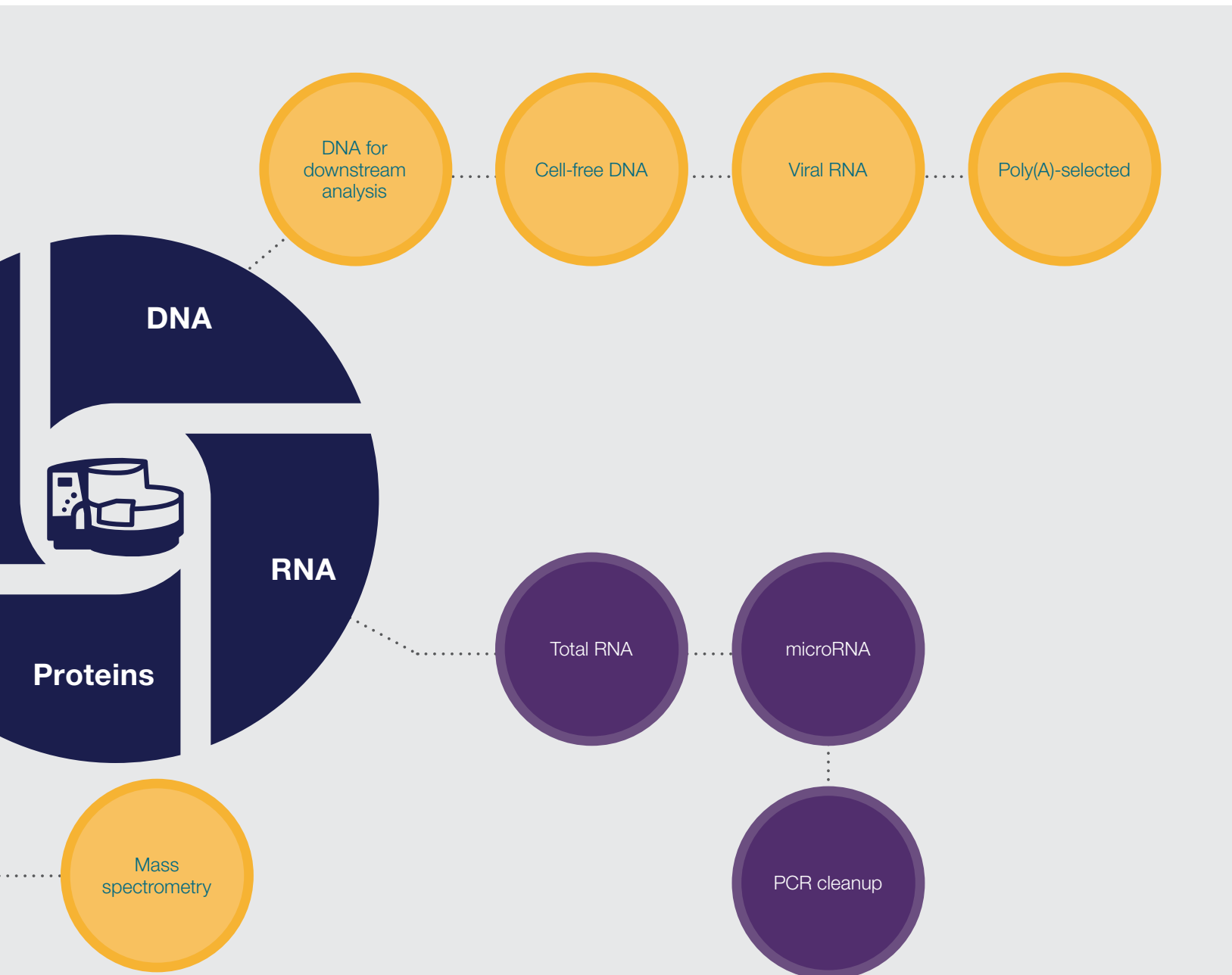
Discover all the ways your Thermo Scientific™ KingFisher™ system can empower you beyond SARS-CoV-2 research and testing. Wherever your research takes you after the pandemic, your KingFisher instrument can help advance your changing goals. Explore the wide range of applications it supports and how you can make the most of your investment now and in the future.

Versatile benchtop automation for all sample preparation applications



## Explore KingFisher instrument applications

- Noninvasive cancer surveillance research
- Formalin-fixed, paraffin-embedded (FFPE) samples
- Infectious pathogen testing and wastewater monitoring
- DNA isolation for downstream analysis
- DNA isolation for genetic testing
- Plant DNA or RNA extraction
- RNA isolation for gene expression
- Messenger RNA (mRNA) extraction
- Protein purification
- Immunoprecipitation (IP)
- Peptide mapping and quantitation



# Explore noninvasive cancer surveillance research

Researchers can potentially detect and monitor targets associated with certain disease states such as cancer via circulating cell-free DNA (cfDNA) from peripheral blood. It is often difficult to perform a second biopsy of tumor tissue; thus, genetic testing using cfDNA is of interest to many researchers studying practical methods to replace a tissue biopsy.

The Applied Biosystems™ MagMAX™ Cell-Free DNA Isolation Kit and MagMAX™ Cell-Free Total Nucleic Acid Kit are optimized specifically for the enrichment of cell-free DNA (cfDNA) and cell-free total nucleic acid (cfTNA) rather than genomic DNA. With MagMAX kits, you can recover more nucleic acid with smaller starting volumes.

Gibco™ Dynabeads™ Human T-Activator CD3/CD28 offer a simple solution for mimicking the *in vivo* interaction of T cells with antigen-presenting cells (APCs)—without feeder cells (antigen-presenting cells) or antigen. The 4.5 μm diameter, inert, superparamagnetic beads are similar in size to APCs, and are covalently coupled to anti-CD3 and anti-CD28 antibodies. These two antibodies provide primary and co-stimulatory signals, optimized for efficient T cell activation and expansion.



# Sample workflow

## Sample collection



Cell-free samples



## Sample purification



MagMAX cfDNA or cfTNA kit and a KingFisher instrument



## Library prep



Ion Torrent™ Oncomine™ cfDNA or cfTNA assay\*



## Sequencing



Ion GeneStudio™ S5 system or other NGS platform



## Analysis



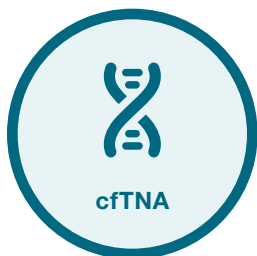
Torrent Suite™, Ion Reporter™, or Ion Torrent™ Oncomine™ Reporter Software

\* Compatible with Ion Torrent™ Oncomine™ assays.

## Recommended kits



|  |                              |  |
|--|------------------------------|--|
|  | <b>Sample types</b>          | Serum, plasma, urine   |
|  | <b>Sample input volume</b>   | 0.5–10 mL plasma, 0.1–10 mL serum, 10 mL of urine            |
|  | <b>Yield</b>                 | 40–50 ng from 4 mL plasma                                    |
|  | <b>Elution volume</b>        | 15–50 µL   |
|  | <b>Total processing time</b> | 45–55 min total (10–15 min hands-on time)                    |
|  | <b>Reactions (rxn)</b>       | 50 rxn for 2 mL plasma input<br>25 rxn for 4 mL plasma input |
|  | <b>Cat. No.</b>              | A29319   |



|  |                              |  |
|--|------------------------------|--|
|  | <b>Sample types</b>          | Serum and plasma   |
|  | <b>Sample input volume</b>   | 1–6 mL (plasma)  |
|  | <b>Yield</b>                 | Up to 50 ng DNA from 4 mL sample; 5–100 pg DNA from 10 mL sample |
|  | <b>Elution volume</b>        | 15–60 µL   |
|  | <b>Total processing time</b> | 45–55 min total (10–15 min hands-on time)                        |
|  | <b>Reactions (rxn)</b>       | 50 rxn for 2 mL plasma input<br>25 rxn for 4 mL plasma input     |
|  | <b>Cat. No.</b>              | A36716   |

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

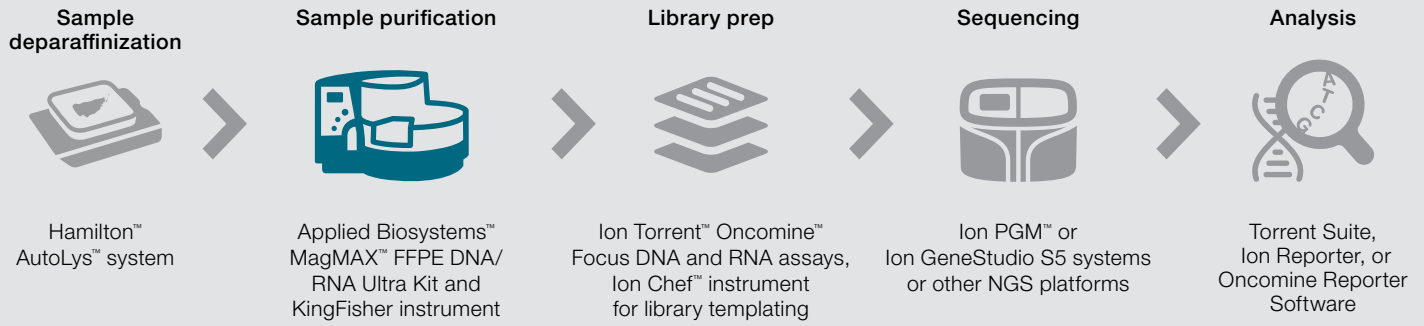
# Explore FFPE sample processing

Sequentially isolate DNA and RNA from FFPE samples and get high-quality gDNA yields that are comparable to yields from fresh-frozen blood.





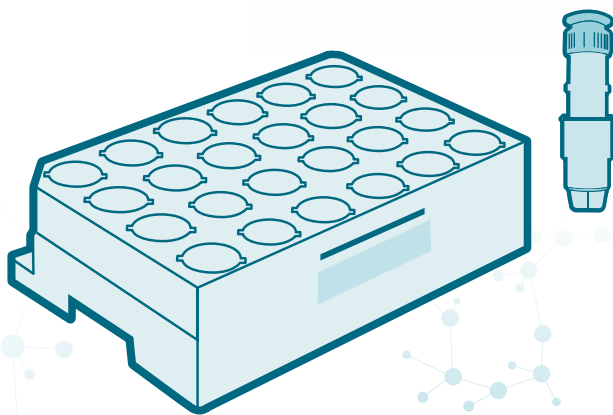
# Sample workflow



## Recommended kits



|  |                              |   |
|--|------------------------------|---|
|  | <b>Sample types</b>          | FFPE tissue samples (resections, biopsies, aspirates) |
|  | <b>Sample input volume</b>   | 5–40 µm standard input of slide or curls              |
|  | <b>Elution volume</b>        | 20–50 µL  |
|  | <b>Total processing time</b> | 20 min for DNA, 48 min for RNA                        |
|  | <b>Reactions (rxn)</b>       | 96 isolations (48 RNA and 48 DNA, 96 DNA, or 96 RNA)  |
|  | <b>Cat. No.</b>              | A31881  |



### AutoLys system

Speed up your deparaffinization process with the AutoLys system. Comprised of pretreated tubes and a rack system to reduce pipetting steps, the system eliminates the need for hazardous chemicals and minimizes loss of tissue sample.

**Note:** Not included with the MagMAX FFPE DNA/RNA Ultra Kit.

Find out more at [thermofisher.com/ffpeisolation](http://thermofisher.com/ffpeisolation)

# Explore infectious pathogen testing and wastewater monitoring

There is an urgent need to have a better means for rapid detection and elimination of infectious agents. Quantitative PCR (qPCR) is the most sensitive, specific, and reliable method for detection of pathogens. The innovative Applied Biosystems™ MagMAX™ Viral/Pathogen kits have been specifically designed for viral nucleic acid extraction from nasopharyngeal swabs, and can capture enough pathogenic nucleic acid to support downstream qPCR analysis.

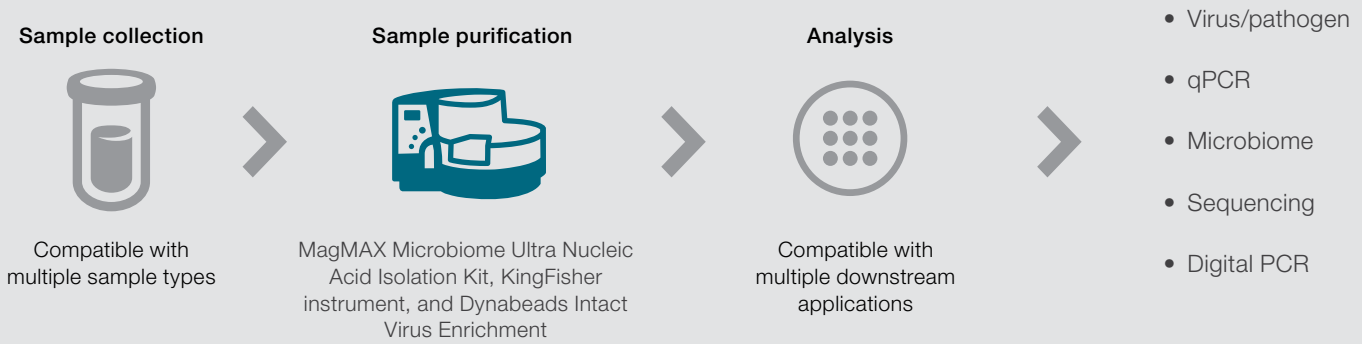
Surveillance from wastewater and fecal samples has been recently adopted as a method for monitoring emergence and reemergence of infectious diseases. This method allows public health agencies, universities, hospitals, cruise lines, and more to detect a pathogen and respond before there is a community outbreak. Our R&D scientists have created new protocols using the Thermo Scientific™ KingFisher™ Flex Purification System and the Applied Biosystems™ MagMAX™ Microbiome Ultra Nucleic Acid Isolation Kit for viral nucleic acid extraction from wastewater.

Wastewater itself is a very diluted starting sample. When processing wastewater samples, it is important to use optimal volumes to account for low abundance of viral particles. This often requires a concentration step prior to extraction of viral nucleic acids. Magnetic bead technology is the recommended technique for wastewater concentration.

The Invitrogen™ Dynabeads™ Intact Virus Enrichment kit contains highly positively charged, monosized, superparamagnetic beads that strongly bind negatively charged vesicles or molecules in the sample. The enriched virus can be used for functional studies, immunological studies, protein analysis (e.g., western blot), or nucleic acid (NA) extraction (e.g., for RT-qPCR).



# Sample workflow



## Recommended kits



|  |                              |  |
|--|------------------------------|--|
|  | <b>Sample types</b>          | Plasma, whole blood, urine, BAL, VTM, serum, CSF, saliva |
|  | <b>Sample input volume</b>   | 200 µL– 2 mL   |
|  | <b>Detection limit</b>       | ≥50 copies   |
|  | <b>Elution volume</b>        | 50–100 µL  |
|  | <b>Total processing time</b> | 40 min   |
|  | <b>Reactions (rxn)</b>       | 100 rxn  |
|  | <b>Cat. No.</b>              | A42352, A48383R  |



|  |                              |   |
|--|------------------------------|---|
|  | <b>Sample types</b>          | Stool, soil, swabs, urine, saliva                   |
|  | <b>Sample input volume</b>   | 100 mg of stool, 250 mg of soil, 400 µL of biofluid |
|  | <b>Yield</b>                 | 40–60 µg of stool, 5–10 µg of soil                  |
|  | <b>Elution volume</b>        | 50–200 µL   |
|  | <b>Total processing time</b> | 50 min for stool, 70 min for soil and biofluid      |
|  | <b>Reactions (rxn)</b>       | 100 rxn   |
|  | <b>Cat. No.</b>              | A42357 (with plate), A42358 (with tubes)            |

Find out more at [thermofisher.com/magmaxmicrobiome](https://thermofisher.com/magmaxmicrobiome) and [thermofisher.com/magmaxviralpathogen](https://thermofisher.com/magmaxviralpathogen)

# Explore DNA isolation for genetic testing

Quickly process saliva samples for genetic testing. Recover DNA that is compatible with NGS and array platforms, from 96 samples, in 25 minutes.

Reagents were tested with the 10 most common saliva collection devices to confirm consistent results.



# Sample workflow

## Sample collection



Compatible with multiple saliva collection devices



## Sample purification



Invitrogen™ Dynabeads™ FlowComp™, Untouched™, and Intact Virus Enrichment kits and KingFisher instruments



## Target prep



Applied Biosystems™ Axiom™ reagents and consumables



## Array



Applied Biosystems™ GeneTitan™ MC Instrument or other array platform










## Analysis



Applied Biosystems™ Axiom™ Analysis Suite



## Recommended kits

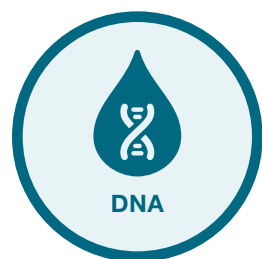
|   |                              |   |
|---|------------------------------|---|
|    | <b>Sample type</b>           | Fresh and preserved saliva                                    |
|    | <b>Sample input volume</b>   | 200 µL–2 mL   |
|    | <b>Yield</b>                 | 100 ng/µL saliva on average depending on the individual donor |
|    | <b>Elution volume</b>        | 50 µL   |
|   | <b>Total processing time</b> | 25 min (5 min hands-on time)                                  |
|  | <b>Reactions (rxn)</b>       | 100 rxn<br>500 rxn  |
|  | <b>Cat. No.</b>              | A39059, A39060  |

Find out more at [thermofisher.com/saliva](http://thermofisher.com/saliva)







# Explore plant DNA or RNA extraction

Use the Applied Biosystems™ MagMAX™ Plant DNA and RNA kits for automation-ready purification of DNA and RNA from a wide variety of plant species.

- Purification of total RNA from a variety of plant species and tissue types, including plant fungus
- Optimized for the isolation of DNA from 10–100 mg plant samples
- Purified RNA is free of proteins, nucleases, and other contaminants or inhibitors



## Recommended kits

|  |  |
|--|--|
|  <b>Sample type</b>           | Plant tissue                                       |
|  <b>Sample input volume</b>   | Up to 100 mg                                       |
|  <b>Yield</b>                 | Varies based on the starting material              |
|  <b>Total processing time</b> | <40 min                      Up to 75 min          |
|  <b>Reactions (rxn)</b>       | 96 or 384  |
|  <b>Cat. No.</b>              | A32549, A32580                      A33784, A33899 |

# Explore mRNA extraction








Target and capture the mRNA transcriptome from an extremely wide variety of crude starting samples using Invitrogen™ Dynabeads™ mRNA DIRECT™ kits.

These kits are designed for simple and rapid isolation of pure, intact poly(A) RNA directly from the crude lysate of animal and plant cells and tissues. The isolated mRNA is suitable for use in all downstream applications.

- **Fast**—15 min procedure yields pure, intact mRNA
- **Highly pure mRNA isolation**—upstream of cDNA synthesis
- **Sensitive mRNA isolation**—enables cDNA synthesis and cDNA library construction from ultrasmall starting samples



## Recommended kits

|  |   |
|--|---|
|  <b>Sample types</b>          | Blood, cells, FFPE and fixed samples, liquid samples (e.g., serum), plant samples, RNA, tissues, viral samples, yeast |
|  <b>Sample input volume</b>   | Up to $20 \times 10^6$ cells, 2–200 mg animal tissue, and 4–400 mg plant tissue                                       |
|  <b>Yield</b>                 | 2 $\mu$ g of mRNA per 1 mg of Dynabeads oligo(dT)   |
|  <b>Elution volume</b>        | 10–100 $\mu$ L  |
|  <b>Total processing time</b> | 15 min  |
|  <b>Reactions (rxn)</b>       | 20 or 40  |
|  <b>Cat. No.</b>              | 61006   |

# Explore RNA isolation for gene expression

Isolate total RNA, as well as small RNAs such as miRNA and mRNA, from a wide variety of sample types using phenol-free extraction (no organic extraction).





# Sample workflow

## Sample collection



Compatible with multiple sample types

## Sample purification



Applied Biosystems™ MagMAX™ *mirVana*™ Total RNA Isolation Kit and KingFisher instrument

## Analysis










Compatible with multiple downstream applications

- qPCR
- Sequencing (NGS or CE platform)
- Array
- Digital PCR



## Recommended kits

|   |                              |  |
|---|------------------------------|--|
|    | <b>Sample types</b>          | Multiple (plasma/serum, whole blood, tissue, cell culture, urine)  |
|    | <b>Sample input volume</b>   | 50 µL of blood, up to 50 mg of tissue, 1 x 10 <sup>6</sup> cells, 100 µL of plasma or serum, 250 µL of urine |
|    | <b>Yield</b>                 | 100 ng RNA from whole blood (50 µL)<br>600 ng from 5 mg mouse brain<br>2.5 µg from 5 mg mouse liver          |
|  | <b>Elution volume</b>        | 50 µL  |
|  | <b>Total processing time</b> | 1.5–2 hr total time<br>(20 min hands-on time)  |
|  | <b>Reactions (rxn)</b>       | 96 rxn   |
|  | <b>Cat. No.</b>              | A27828   |

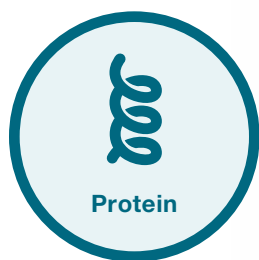
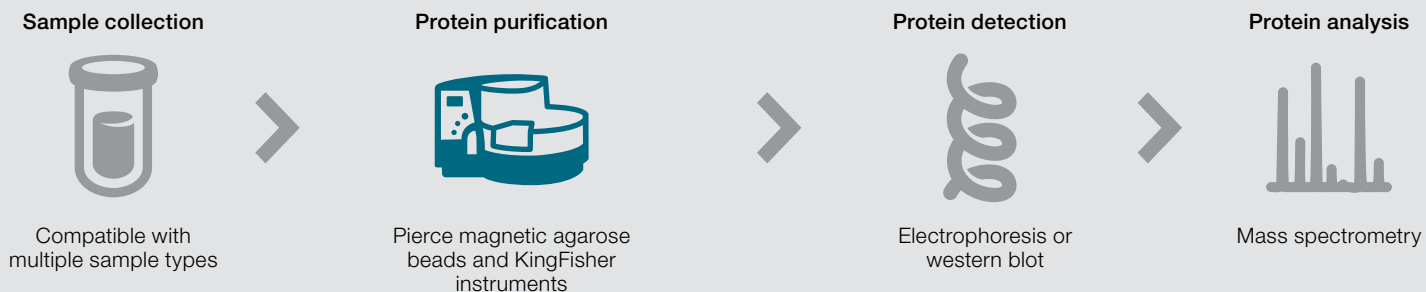
Find out more at [thermofisher.com/magmaxmirvana](https://www.thermofisher.com/magmaxmirvana)

# Explore protein purification

Thermo Scientific™ Pierce™ magnetic agarose beads are available with a variety of immobilized ligands for immunoprecipitation, pull-down, and other high-throughput affinity purification applications.



## Sample workflow



## Recommended kits

### Pierce magnetic agarose beads:

- **High affinity**—up to 100-fold more binding capacity than traditional magnetic beads
- **More choices**—multiple ligands are available for different purification strategies, including Thermo Scientific™ Pierce™ NHS-Activated Magnetic Beads, Pierce™ Protein A/G Magnetic Beads, Pierce™ Ni-NTA Magnetic Agarose Beads, Pierce™ Glutathione Magnetic Agarose Beads, and Pierce™ Anti-DYKDDDDK Magnetic Agarose with immobilized anti-FLAG Ab
- **Automation-compatible**—can be used with magnetic particle processors for higher-throughput applications
- **Flexible**—can scale up or down as needed using adaptable protocols

Find out more at [thermofisher.com/mag-agarose](https://thermofisher.com/mag-agarose)

# Explore cell isolation and virus enrichment

Cell isolation and depletion can be time-consuming and labor-intensive, and manual errors can lead to inconsistent results. By automating the procedure using Invitrogen™ Dynabeads™ cell isolation products on a KingFisher instrument, the hands-on time is reduced, enabling the hands-on time and

number of manual errors to be drastically reduced. With the push of a button, cells are isolated from samples from mouse, human, or other species using a variety of positive or negative isolation or depletion kits. In less than 45 minutes, the workflow achieves high yields of pure, viable, and functional cells that may be used in downstream applications.

Additionally, Dynabeads Intact Virus Enrichment beads can efficiently isolate intact virus from up to 96 virus-containing samples from cell culture media, viral transport media, and wastewater in less than 20 minutes.



## Sample workflow

### Sample collection



Isolate single cells from peripheral blood mononuclear cells, whole and cord blood, tissue digests, or cell lines

### Sample purification



Isolation or depletion of cells with Dynabeads magnetic beads and a KingFisher instrument

### Analysis



Compatible with multiple downstream applications

- Cell sorting
- Cellular or molecular analysis
- Cell culture
- Cell activation and expansion
- Flow cytometry
- Imaging
- Immunoassay

## Recommended kits



Automate your cell isolation and virus enrichment on the KingFisher family of instruments. KingFisher instruments have the ability to eliminate any cross contamination, have reproducible results, and reduce your hands-on time. Set up plates, press start, and walk away.



The Dynabeads Intact Virus Enrichment kit provides fast isolation of intact virus in ~20 minutes, enriching up to 96 samples per run, including samples from wastewater. The final intact virus can be released from the beads in ~10 minutes, with downstream RT-qPCR results in <1 hour.

Isolate cells

Dynabeads FlowComp kits (CD3, CD4, CD8, CD14, CD19)

Dynabeads products for cell depletion

Isolate viruses and exosomes

Dynabeads virus enrichment kit

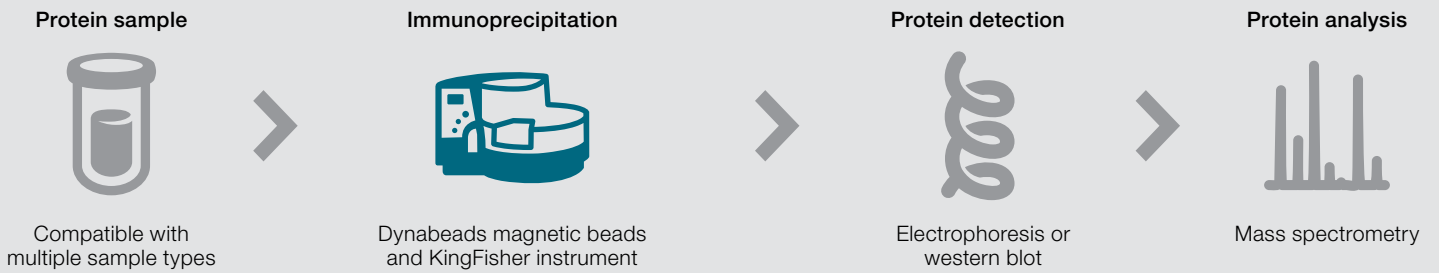
Find out more at [thermofisher.com/cellisolation](https://thermofisher.com/cellisolation), [thermofisher.com/virusenrichment](https://thermofisher.com/virusenrichment), and [thermofisher.com/streptavidinbeads](https://thermofisher.com/streptavidinbeads)

# Explore immunoprecipitation

Sample processing with a KingFisher instrument and Dynabeads magnetic beads provides the best balance between high yield and reproducibility. Dynabeads magnetic beads minimize nonspecific binding, in less than 40 minutes, with no centrifugation or preclearing steps.

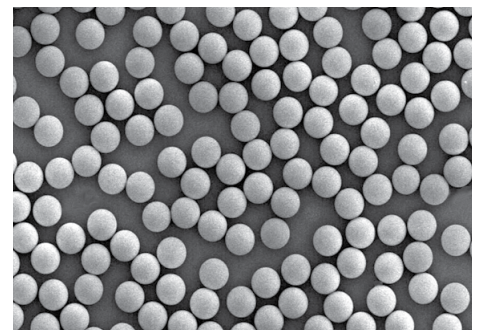


## Sample workflow



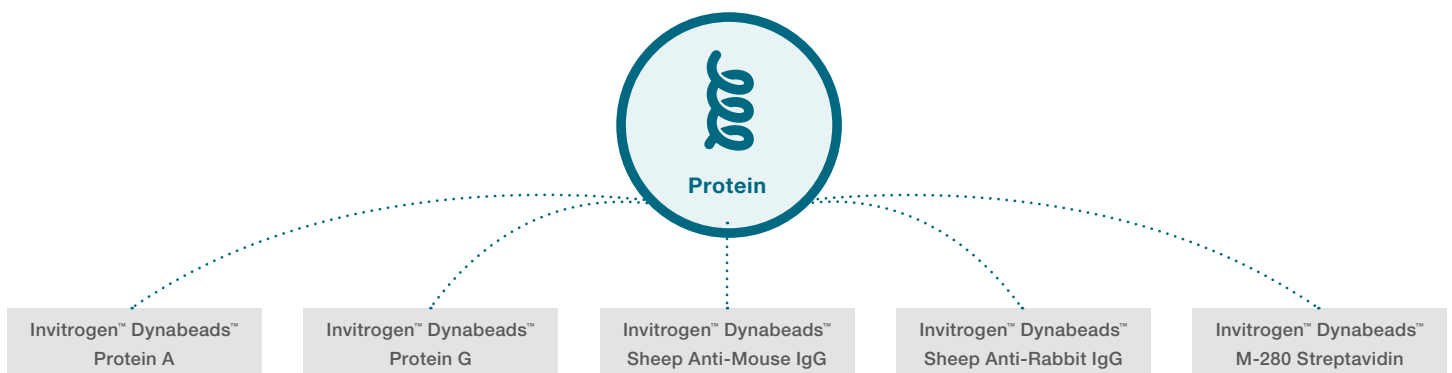
### Dynabeads magnetic beads for immunoprecipitation:

- **Fast and easy**—protocol is <40 minutes with no centrifugation or preclearing steps
- **Low background**—little to no nonspecific binding
- **Highly sensitive**—Dynabeads technology is the most cited method for sensitive applications
- **Antibody savings**—all binding occurs on the smooth outer surface of the beads, which conserves precious antibodies and supports a cost-efficient solution per sample
- **Flexible**—products for IP, Co-IP, pull-down, and ChIP assays; ideal for both manual and automated protocols



Dynabeads magnetic beads are the most uniformly dispersed superparamagnetic beads on the market. Our highly controlled manufacturing process helps ensure the highest degree of reproducibility.

## Recommended kits



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

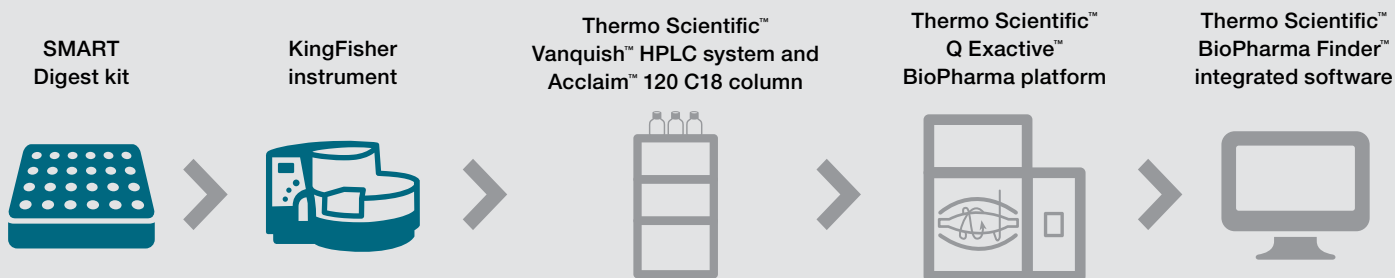
# Explore peptide mapping and quantification

Amazingly fast, simple, reproducible, and sensitive protein digestion with immunoaffinity capture will make you more confident in your chromatography and liquid chromatography-mass spectrometry (LC-MS) results.

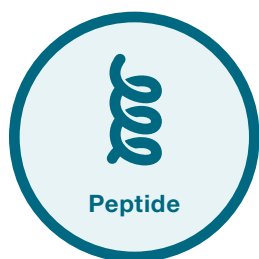







## Peptide mapping workflow

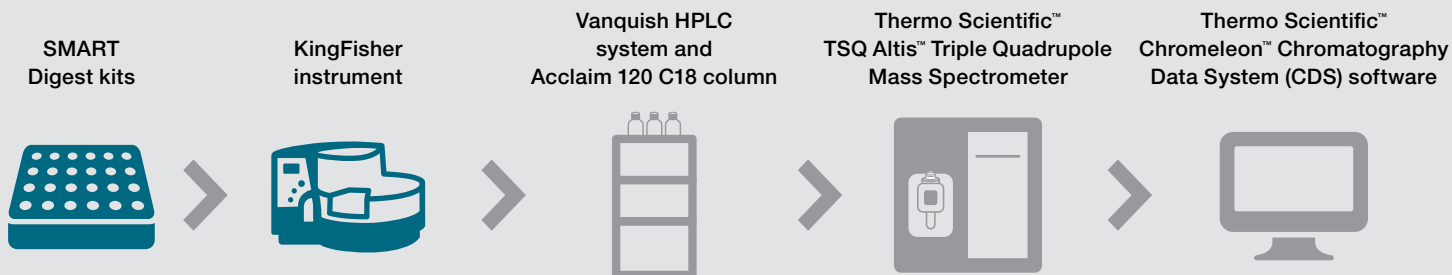


## Recommended kits

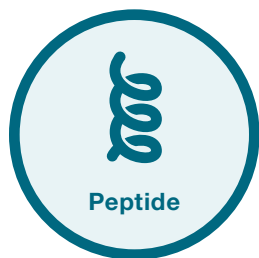





|   |                              |  |
|---|------------------------------|--|
|  | <b>Sample types</b>          | Cell broth, plasma, serum  |
|  | <b>Sample input volume</b>   | Up to 50 $\mu\text{L}$ (200 pg to 3.5 mg total protein)          |
|  | <b>Total processing time</b> | ~45 min for typical mAb depending on size and protein complexity |

## Peptide quantitation workflow



## Recommended kits



|   |                              |   |
|---|------------------------------|---|
|  | <b>Sample types</b>          | Cell broth, plasma, serum                                       |
|  | <b>Sample input volume</b>   | Up to 50 $\mu\text{L}$ (200 pg–3.5 mg total protein)            |
|  | <b>Total processing time</b> | 3–4 hr for typical mAb depending on size and protein complexity |

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

# Additional applications for KingFisher instruments

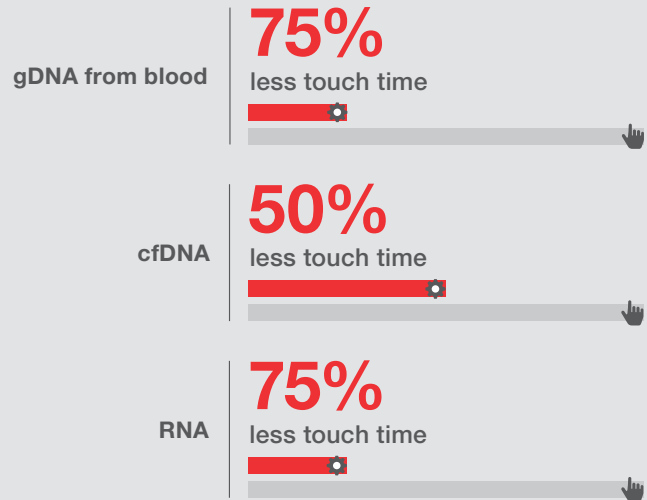
## Process your samples, faster

KingFisher instruments help save you valuable time by removing manual steps and reducing overall processing time when compared to other instruments.



■ Average time required using our automated solutions

■ Average time for manual sample prep



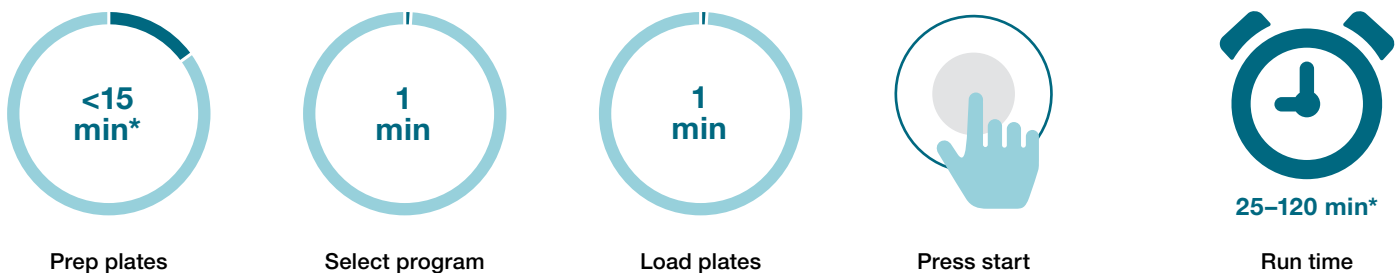
## Process your samples, consistently

KingFisher instruments enable you to reduce user-processing errors to make your results more reproducible. Our data show that samples processed with KingFisher instruments enable consistent results across runs with different users, which is important for more sensitive downstream applications such as qPCR, NGS, digital PCR, and mass spectrometry.

## Process your samples, more easily

KingFisher instruments offer optimized, easy-to-follow protocols for nearly every downstream application and sample type.

## A typical run with a KingFisher instrument



# KingFisher instrument specifications

KingFisher instruments are the most versatile sample preparation instruments in the lab, and are elegantly designed to support multiple applications.

## Test a KingFisher platform in your lab

One of our specialists can provide an on-site or virtual demonstration to show you how to process your samples using a KingFisher instrument. We select the instrument, consumables, and reagents that best suit your research needs. The specialist will show you how to set up the instrument, process samples, modify protocols, and perform other tasks specific to your needs. Find out more at [thermofisher.com/kingfisherdemo](http://thermofisher.com/kingfisherdemo)

- **Variable throughputs**—process 6–96 samples per run depending on the instrument model
- **Interchangeable formats**—choose 24- and 96-well formats so you can process a wide range of input volumes
- **Protocol customization**—easily edit, modify, or create new protocols (touchscreen enabled only on the Thermo Scientific™ KingFisher™ Apex instrument)
- **Optimized reagents**—compatible with various magnetic-bead reagents
- **Barcoded plastics**—optimize performance with specially designed plastics (for KingFisher Apex instrument only)

## Find the KingFisher model that meets your needs



| KingFisher instrument  | Duo Prime system   | Flex system   | Apex system   | Presto system   |
|------------------------|--|---|---|---|
| Instrument size        | Compact benchtop   | Benchtop  | Benchtop  | Benchtop—integrates with robotic liquid handler   |
| Throughput             | Low to medium  | High  | High  | Ultrahigh   |
| Processing volumes     | <ul style="list-style-type: none"> <li>• 50–1,000 µL: 12-pin magnet head</li> <li>• 200–5,000 µL: 6-pin magnet head</li> </ul> | <ul style="list-style-type: none"> <li>• PCR plate (20–100 µL), skirted*</li> <li>• 20–200 µL (96-well plate)</li> <li>• 50–1,000 µL (96 deep-well plate)</li> <li>• 200–5,000 µL (24 deep-well plate)</li> </ul> | <ul style="list-style-type: none"> <li>• 15–1,000 µL (96-well plate)</li> <li>• 15–200 µL (96-well KingFisher standard plate)</li> <li>• 10–80 µL (96-well plate)</li> <li>• 30–5,000 µL (24 deep-well plate)</li> <li>• 30–200 µL (96 storage tubes)</li> <li>• 200–1,000 µL (24 storage tubes)</li> </ul> | <ul style="list-style-type: none"> <li>• 50–1,000 µL (96-well plate)</li> <li>• 200–5,000 µL (24 deep-well plate)</li> <li>• KingFisher 96 plate (50–150 µL)</li> </ul> |
| Samples per run        | 6 or 12  | 24 or 96  | 24 or 96  | 24 or 96  |
| Customizable protocols | Yes  | Yes   | Yes, with touchscreen or PC software  | Yes   |
| Heating/cooling        | <ul style="list-style-type: none"> <li>• 10–75°C (plate row block A)</li> <li>• 4–75°C (elution strip block)</li> </ul>        | From 5°C above ambient temperature to 115°C   | <ul style="list-style-type: none"> <li>• From 4°C above ambient temperature to 100°C</li> <li>• Cools down to 4°C</li> </ul>  | From 5°C above ambient temperature to 115°C   |
| Ultraviolet lamp       | 8 watts for up to 16 hr  | No  | 2 UV lamps, 23 h 59 min maximum   | No  |
| Additional details     | For Research Use Only  | For Laboratory Use  | For Laboratory Use  | For Laboratory Use  |

\* Or similar skirted PCR plate.

# Instrument and application support

Whether servicing your KingFisher purification system or addressing your workflow application questions, over 1,000 trained professionals in the world's largest industrial network are ready to assist you when you need it.

Nucleic acid isolation is a crucial first step in the molecular biology workflow, whether you isolate gDNA or RNA. Our nucleic acid purification products are optimized to provide maximum yields, purity, and quality for virtually any sample type and application, which is vital for your research success.

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