Enabling discovery

A comprehensive spectrum of tools for target and therapeutic discovery
Whether you choose a cell line, a purified protein, a validated assay, or an outsourced service, you can be confident that we understand what you need on your pathway to discovery.
Expertise

Shared experience supports your research goals and enables you to effectively utilize our assays and reagents
Our R&D scientists, technical specialists, and project managers have extensive experience developing a broad spectrum of integrated tools, services, and processes to support you and your research. More importantly, we develop a keen understanding of your research goals by listening to your needs and communicating with you at every step of your discovery, through research partnerships, technology workshops, and training programs.

Collaboration

Collaborating as partners to drive discovery and engage in interactions as an extended part of your team
Our dedicated staff of R&D scientists and technical or field support specialists can partner with you and your research colleagues to provide cells, assays, reagents, and other solutions to help meet your requirements. The scientists who develop the tools that you use in your discovery and development experiments can also help you advance your research through a variety of collaboration opportunities.

Customization

Discovery demands custom research and custom solutions that reach beyond off-the-shelf products to harmonize with your objectives
Our scientists work to understand your goals and tailor a solution to fit your project guidelines. Our biochemical and cell-based assay development service has dedicated scientific professionals with access to, and expertise in, assay solutions across multiple target classes and detection platforms. We strive to deliver short cycle times and high-quality results on time, every time, with proactive communication throughout the project.

Support

Supporting you at every stage of discovery—from instrument setup to screening, profiling, and custom services through data analysis
As a discovery and development researcher, you’re constantly challenged to do more with less—and still rapidly produce relevant leads. A problem with an assay is the last thing you or your lab wants to experience. Our team of technical and project support specialists comprises experienced scientists and professionals who appreciate your challenges and can help you find answers efficiently and accurately.
Discover how our off-the-shelf product portfolio and outsourced services meet a spectrum of your needs.
Contents

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Target-based proteins and assays

Kinase biology

The broadest array of purified recombinant human protein kinases, biochemical and cellular assays, and screening services to meet your research needs

- A large selection of high-quality, ready-to-use purified human kinases available
- A choice of seven preconfigured and fully validated assay technologies (Table 1)
- Superior customer support for kinase profiling and screening services

Table 1. Available kinase assay technologies and number of assays available.

<table>
<thead>
<tr>
<th>Biochemical assays</th>
<th>Z'-LYTE</th>
<th>Adapta</th>
<th>Cellular assays</th>
<th>Profiling services</th>
</tr>
</thead>
<tbody>
<tr>
<td>LanthaScreen</td>
<td>TR-FRET Eu Kinase Binding Assay</td>
<td>TR-FRET Eu Activity Assay</td>
<td>TR-FRET Tb Activity Assay</td>
<td>TR-FRET Activity Assay</td>
</tr>
<tr>
<td>&gt;320</td>
<td>&gt;70</td>
<td>&gt;200</td>
<td>&gt;230</td>
<td>&gt;20</td>
</tr>
<tr>
<td>TR-FRET Activity Assay</td>
<td>&gt;60</td>
<td>&gt;20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FRET Activity Assay</td>
<td>&gt;410</td>
<td>&gt;50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Proteins
The largest portfolio of ready-to-use purified recombinant human kinases
Quality and validation are the primary characteristics of our purified recombinant human kinases. Our focus is to deliver a consistent and physiologically relevant product (Table 2). Combine our proteins and assays to meet your research needs and enable confidence in your results (Figure 1).

Each enzyme is:
- Sequence validated
- Expressed according to controlled processes
- Evaluated by SDS-PAGE for purity
- Assessed for activity in a radiometric phosphorylation assay or functional assay (for active kinases)
- Available for convenient online ordering in 10 µg, 100 µg, or 1 mg* packs

View our current listing of available kinase proteins at thermofisher.com/kinases

* Some targets are available in 5 µg and 20 µg pack sizes; see our web listing for details about our full selection.

Table 2. Representative IC_{50} values (nM) for JAK3 kinase obtained in binding and activity assay formats, compared to literature values.

<table>
<thead>
<tr>
<th>Compound</th>
<th>LanthaScreen Eu Kinase Binding Assay</th>
<th>SelectScreen Kinase Profiling Service (Z'-LYTE activity assay)</th>
<th>Literature Kd values**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staurosporine</td>
<td>1.1</td>
<td>1.1</td>
<td>10</td>
</tr>
<tr>
<td>Dasatinib</td>
<td>3,900</td>
<td>1,100</td>
<td>&gt;10,000</td>
</tr>
<tr>
<td>PP2</td>
<td>&gt;10,000</td>
<td>&gt;5,000</td>
<td>ND†</td>
</tr>
<tr>
<td>Imatinib</td>
<td>&gt;10,000</td>
<td>&gt;5,000</td>
<td>&gt;10,000</td>
</tr>
<tr>
<td>VX680</td>
<td>4,900</td>
<td>2,800</td>
<td>630</td>
</tr>
<tr>
<td>Sunitinib</td>
<td>1,700</td>
<td>1,800</td>
<td>1,200</td>
</tr>
<tr>
<td>Gefitinib</td>
<td>&gt;10,000</td>
<td>ND†</td>
<td>&gt;10,000</td>
</tr>
<tr>
<td>Sorafenib</td>
<td>&gt;10,000</td>
<td>&gt;5,000</td>
<td>&gt;10,000</td>
</tr>
</tbody>
</table>

† Not determined.

Eight compounds were analyzed with the Invitrogen™ LanthaScreen™ Eu Kinase Binding Assay and the Invitrogen™ Z'-LYTE™ activity assay for JAK3. Data were compared to literature values to assess correlation between the various formats.

Note: These data are provided for reference purposes. It is important to consider that the source of enzymes and method of detection (activity assay vs. binding assay) will affect whether measurements of IC_{50} values are due to active kinase, non-activated kinase, or a combination of both.

Figure 1. Correlation between activity and binding assays. These data compare the results of IC_{50} inhibitor potency values for seven inhibitors tested against the first 165 kinases validated by kinase binding assay in both the Invitrogen™ LanthaScreen™ TR-FRET Eu Kinase Binding Assays and Invitrogen™ Z'-LYTE FRET-based assays.
Biochemical assays

Robust and reliable assays to advance your kinase research

We’ve developed a variety of preconfigured fluorescence assay solutions to meet your target validation, assay development, and screening needs. All our kinase assay technologies are nonradioactive, addition-only, miniaturizable, robust (Z’-factors >0.5), and optimized for high-throughput screening. They’re available as kits or individual components, in bulk, or can be ordered to your specifications as a custom product. Our portfolio includes the following Invitrogen™ technologies:

- LanthaScreen Eu Kinase Binding Assays
- LanthaScreen™ Kinase Activity Assays (terbium and europium versions)
- Adapta™ Universal Kinase Assay
- Z’-LYTE FRET-based assays
- Phosphate Sensor assays

Select the right tool for your research goals (Table 3).

Table 3. Biochemical kinase assay comparison guide.

<table>
<thead>
<tr>
<th></th>
<th>LanthaScreen Eu Kinase Binding Assay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total assay volume</td>
<td>15 μL</td>
</tr>
<tr>
<td>(kinase and detection)</td>
<td></td>
</tr>
<tr>
<td>Ratiometric readout</td>
<td>√</td>
</tr>
<tr>
<td>Detection technology</td>
<td>TR-FRET (europium-labeled antibody to an Invitrogen™ Alexa Fluor™ 647 dye tracer fusion)</td>
</tr>
<tr>
<td>Increase-in-signal assay</td>
<td>√</td>
</tr>
<tr>
<td>Kinetic vs. endpoint readout</td>
<td>Endpoint or kinetic</td>
</tr>
<tr>
<td>Detection step required</td>
<td>(antibody)</td>
</tr>
<tr>
<td>Improved signal</td>
<td>Time-resolved readout allows read after interfering signals have decayed; use of epitope tag ensures no contaminating kinase is detected</td>
</tr>
<tr>
<td>ATP concentration flexibility</td>
<td>ATP not needed for binding analysis</td>
</tr>
<tr>
<td>Substrate concentration flexibility</td>
<td>No substrate needed</td>
</tr>
<tr>
<td>Compatibility with protein substrates</td>
<td>NA</td>
</tr>
<tr>
<td>Available in Invitrogen™ SelectScreen™ Kinase Profiling Service</td>
<td>√</td>
</tr>
<tr>
<td>To learn more, go to:</td>
<td>thermofisher.com/bindingassay</td>
</tr>
</tbody>
</table>

Setup instructions for instruments can be found at thermofisher.com/instrumentsetup
<table>
<thead>
<tr>
<th>Lanthascreen Kinase Activity Assays</th>
<th>Adapta Universal Kinase Assay</th>
<th>Z-LYTE FRET-based assay</th>
<th>Phosphate Sensor assay</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ideal for primary screening, often requiring only small amounts of kinase</strong></td>
<td>Detects ADP accumulation and is ideal for lipid kinases; use with any substrate or substrate with no phosphospecific antibody</td>
<td>Quantitative assay validated for profiling across many kinases; the primary technology platform used in our SelectScreen Kinase Profiling Service</td>
<td>Enables real-time or endpoint assays for any enzyme that directly or indirectly generates phosphate</td>
</tr>
<tr>
<td>20 µL</td>
<td>15 µL</td>
<td>20 µL</td>
<td>20 µL</td>
</tr>
<tr>
<td>√</td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>TR-FRET (terbium- or europium-labeled antibody to fluorescein or substrate fusion)</td>
<td>TR-FRET (europium-labeled antibody to an Alexa Fluor 647 tracer displaced by ADP)</td>
<td>FRET</td>
<td>Fluorescence intensity</td>
</tr>
<tr>
<td>√</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Endpoint</td>
<td>Endpoint</td>
<td>Endpoint</td>
<td>Endpoint or kinetic</td>
</tr>
<tr>
<td>√ (antibody)</td>
<td>√ (antibody)</td>
<td>√ (protease)</td>
<td>√ (phosphate-binding protein*)</td>
</tr>
<tr>
<td>Time-resolved readout allows read after interfering signals have decayed</td>
<td>Time-resolved readout allows read after interfering signals have decayed; use of red Alexa Fluor™ acceptor enhances ability to overcome interference</td>
<td>Preread at 445/520 nm</td>
<td>Kinetic, real-time measurement</td>
</tr>
<tr>
<td>Complete flexibility; tested up to 1 mM</td>
<td>Tested from 1 to 100 µM</td>
<td>Complete flexibility; tested up to 1 mM</td>
<td>Complete flexibility</td>
</tr>
<tr>
<td>100 nM–1 µM</td>
<td>Complete flexibility; must be greater than ATP concentration</td>
<td>2 µM only</td>
<td>Complete flexibility</td>
</tr>
<tr>
<td>√</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Inquire</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

thermoscientific.com/lanthascreen thermofisher.com/adapta thermofisher.com/zlyte thermofisher.com/phosphatesensor

* No additional detection step is required in this mix-and-read assay after addition of the fluorescent Phosphate Sensor reagent.

For inquiries regarding validation of instruments, contact us at drugdiscoverytech@thermoscientific.com
Analyse complex signal transduction pathways in a live-cell format with our cell-based assays
In discovery, there is a need for tools to analyze compound efficacy in a pathway-specific physiological context. To address this need, we offer three technology platforms for endpoint or proximity-oriented pathway analysis for use in high-throughput screening and profiling (Table 4).

Table 4. Invitrogen™ cellular pathway analysis assay comparison guide.

<table>
<thead>
<tr>
<th></th>
<th>CellSensor™ cellular pathway assays</th>
<th>Lanthascreen cellular pathway assays—stable assays</th>
<th>Lanthascreen cellular pathway assays—BacMam-enabled assays</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable vs. transient</td>
<td>Stable</td>
<td>Stable</td>
<td>Transient</td>
</tr>
<tr>
<td>Cellular engineering</td>
<td>Pathway-specific response element upstream of BLA reporter</td>
<td>GFP–substrate fusion, readout of endogenous kinases</td>
<td>GFP–substrate fusion, readout of endogenous kinases</td>
</tr>
<tr>
<td>Detection technology</td>
<td>FRET (coumarin to fluorescein)</td>
<td>TR-FRET (terbium-labeled antibody to GFP–substrate fusion)</td>
<td>TR-FRET (terbium-labeled antibody to GFP–substrate fusion)</td>
</tr>
<tr>
<td>Cell type</td>
<td>Engineered/immortalized</td>
<td>Engineered/immortalized</td>
<td>Immortalized, primary, and stem</td>
</tr>
<tr>
<td>Improved signal</td>
<td>Ratiometric readout with a background suppression dye in the substrate mixture</td>
<td>Time-resolved readout allows read after interfering signals have decayed</td>
<td>Time-resolved readout allows read after interfering signals have decayed</td>
</tr>
<tr>
<td>Plate reader method</td>
<td>Bottom-read</td>
<td>Top-read</td>
<td>Top-read</td>
</tr>
<tr>
<td>Use in Invitrogen™ SelectScreen™ Cellular Profiling Services</td>
<td>√</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>To learn more, go to</td>
<td>thermofisher.com/cellsensor</td>
<td>thermofisher.com/lanthascreencellular</td>
<td>thermofisher.com/bacmamassay</td>
</tr>
</tbody>
</table>

The BacMam system—unique gene-delivery method
The BacMam system uses a modified insect cell virus (baculovirus) as a vehicle to efficiently and safely transduce and express non-replicating genes in mammalian cells with minimum effort and toxicity. See what cells have been tested at thermofisher.com/bacmam

Advantages of the BacMam system include:
- **Scalable**—frozen storage of pre-transduced cells generates assay-ready cells, enabling you to choose your throughput—thaw 1 or 1,000 vials
- **Choice of cell line**—enables assays in pharmacologically relevant cell types
- **Time savings**—transduces and measures cells in less than 48 hours

Don’t see your target of interest? Ask us to make a BacMam reagent for you (see page 28).
Target-based proteins and assays
GPCR and ion channel biology

Optimized, high-throughput intracellular signaling tools
We offer a highly validated and novel family of G protein–coupled receptor (GPCR) cell lines and services to enable your discovery programs (Table 5). Our collection of antibodies, immunoassays, and cell-based assays to monitor potassium, chloride, calcium, and membrane potentials enable you to screen compounds that modulate ligand- and voltage-gated ion channels. Our tool set enables functional studies for ion channels with cell-based assays, and monitors membrane potential changes with voltage sensor probes.

Cell-based GPCR assays

Table 5. Invitrogen™ cell-based GPCR assays.

<table>
<thead>
<tr>
<th>GeneBLAzer™ Reporter Assays</th>
<th>Tango™ GPCR Assay System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cell lines: &gt;80</td>
<td>Number of cell lines: &gt;80</td>
</tr>
<tr>
<td>Detection technology:</td>
<td>Detection technology:</td>
</tr>
<tr>
<td>FRET (coumarin to fluorescein)</td>
<td>FRET (coumarin to fluorescein)</td>
</tr>
</tbody>
</table>

Advantages
- Flexible readout options—monitor pathway activation via beta-lactamase activation, calcium flux, or cAMP production
- Accurate efficacy assessment—gain a truer perspective on ligand-mediated physiological response
- Detect weak activators—ratiometric readout produces tighter data for heightened sensitivity

Advantages
- Specific to the target receptor—ensuring a selective readout
- Proximal to the actual site of receptor activation—minimizing false positives
- Independent of the G protein through which the receptor signals—enabling study of any GPCR (including orphans)

thermofisher.com/geneblazer

In the Tango GPCR system, beta-arrestin recruitment to a GPCR modified with a protease site and transcription factor (TF) allows study of receptors independent of GPCR specificity. After protease cleavage, the TF translocates to the nucleus and activates expression of the beta-lactamase gene.

Cell Provisioning Services—validated cell lines in just weeks
Obtain validated, assay-ready cells more efficiently with our scale-up and cryopreservation service.

Our standardized, high-quality process yields validated cell lines typically within two to four weeks.

Simplify the tasks associated with growing cells:
1. Provide your cell line or purchase one of our cell lines.
2. Allow our scientists to scale-up and produce cryopreserved cells.
3. Receive cell lines that are quality control–tested and validated.

Find out more about our Custom Biology Services capabilities on page 28.
### Table 6. Choosing the right Invitrogen™ calcium indicator to suit your research needs.

<table>
<thead>
<tr>
<th>Nonquencher calcium flux assay</th>
<th>Fluorescent, UV-excitable calcium indicator</th>
<th>Cost-effective, quencher-based calcium flux assay</th>
<th>Luminescent calcium biosensor</th>
<th>Fluorescent dye loading and retention agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluo-4 AM, Fluo-4 NW*</td>
<td>Fura-2 AM</td>
<td>Fluo-4 Direct™ Calcium Assay</td>
<td>BacMam Aequorin Kit</td>
<td>PowerLoad™ Concentrate, water-soluble Probencid</td>
</tr>
<tr>
<td><strong>Applications</strong>—high-throughput screening (HTS), fluorescence detection by microplate reader, high-content analysis, fluorescence microscopy, fluorescence imaging, confocal microscopy, flow cytometry, microplate screening</td>
<td><strong>Applications</strong>—fluorescence microscopy</td>
<td><strong>Applications</strong>—HTS, fluorescence detection by microplate reader, fluorescence imaging, confocal microscopy, high-content analysis, and fluorescence microscopy</td>
<td><strong>Applications</strong>—detection by luminescence microplate reader and HTS</td>
<td><strong>Applications</strong>—cell labeling</td>
</tr>
</tbody>
</table>

- Rigorously tested, highly cited dyes with proven pharmacology
- Robust assay with fewer wash steps and consistent Z-factors
- Optimized for use with Tango or GeneBLAzer GPCR cell lines

**How it works**—displays a >100-fold increase in fluorescence (494/506 nm) upon binding calcium. For optimal results, media removal is required before use.

**How it works**—upon binding Ca²⁺, fura-2 AM exhibits an absorption shift of the excitation spectrum between 300 and 400 nm, while monitoring the emission at ~510 nm.

**How it works**—the Fluo-4 Direct assay is the Fluo-4 AM assay with background-suppressing quencher, resulting in an intracellular calcium assay that can be used in complete media; no need for media removal.

**How it works**—upon binding calcium ions, aequorin displays a "flash"-style luminescence signal while consuming coelenterazine as a substrate.

**How it works**—nonionic Invitrogen™ Pluronic™ surfactant polyols aid in the solubilization of dyes and other materials. Probencid inhibits anion transporters, blocking efflux of dyes and indicators.

* Fluo-4 NW shares the advantages of Fluo-4 AM in a PowerLoad formulation that requires no washes after media removal.

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

Be sure to contact [discoveryservices@thermofisher.com](mailto:discoveryservices@thermofisher.com) to design any custom assay you need.
**Ion channel reagents and hERG channel assays**

**Table 7. Ion channel reagents and hERG channel assays comparison guide.**

<table>
<thead>
<tr>
<th>Fluorogenic dye coupled to thallium transport measures potassium flux</th>
<th>Study chloride flux by efficient, BacMam delivery of a halide sensor</th>
<th>FRET-based Voltage Sensor Probes (VSPs) membrane potential changes</th>
<th>Triage hERG channel blockers before investing in patch-clamp studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Invitrogen™ FluxOR™ Potassium Ion Channel Assay</td>
<td>Invitrogen™ Premo™ Halide Sensor</td>
<td>VSPs</td>
<td>Invitrogen™ Predictor™ hERG Fluorescence Polarization (FP) Assay Kit</td>
</tr>
</tbody>
</table>

- Reproducibly measures potassium ion flux in voltage- and ligand-gated channels
- Pharmacologically relevant blockers show dose-dependent inhibition
- Extensively validated with several potassium ion channel targets
- Measures chloride flux and generates highly reproducible results
- BacMam delivery enables reliable, high-expression results and an excellent signal window
- Pharmacologically relevant modulators show dose-dependent quenching
- Ratiometric readout reduces errors arising from well-to-well variations and autofluorescent compounds
- Measurement located in membrane reduces interference from intracellular structures
- Data correlate reliably to patch-clamp assays
- Performance validated against established hERG channel blockers
- Data correlate highly to those obtained from patch-clamp techniques
- Fluorescence polarization allows radio ligand–free binding studies

**How it works**—based on the permeability of potassium channels to thallium (a surrogate for potassium). When potassium channels are opened, thallium influx from the external medium is detected with a highly sensitive indicator dye.

**How it works**—iodide ions (a chloride surrogate) are added to the external media. Opening of chloride channels results in an influx of iodide ions which bind to and quench the fluorescence signal from the BacMam-delivered YFP.

**How it works**—this FRET-based VSP assay measures changes in the membrane potential of cells.

**How it works**—the FP assay displaces a red-shifted fluorescent tracer from the hERG channel by compounds binding to the channel.

thermofisher.com/fluxor  thermofisher.com/premohalide  thermofisher.com/vsp  thermofisher.com/predictor

**Need to rapidly screen compounds for interaction with cytochrome P450?**
Learn more about Invitrogen™ Vivid™ P450 Assay Reagents at [thermofisher.com/p450assays](thermofisher.com/p450assays)
Table 8. Select from among our broad array of targets, assays, and services, including cell line provisioning (see page 12) to meet your nuclear receptor biology needs. The number of assays is shown.
Support

Supporting you at every stage of discovery
Our team of technical and project support specialists comprises experienced scientists and professionals who appreciate your challenges and can help you find answers efficiently and accurately. Whether it’s validating an assay, setting up your experiment, purchasing supplies, or verifying compatibility of an instrument, our team is here to help.

Robust assay validation documentation
We provide “validation packet” documentation for each of our biochemical and cellular assays to enable optimal performance. Our biochemical assay packets are accessible online for each target in all available validated assays. To help you achieve success, a detailed protocol with step-by-step instructions and applicable data is provided for each assay. Our extensive validation packet provided for each cell-based assay includes assays for proper reference pharmacology, Z’-factors, accurate agonist/antagonist response, HTS 384-well format, and excellent reproducibility. Each document is written by our R&D scientists and supported by our dedicated technical support team.

Find more information about our validation documentation whenever you look for a biochemical or cellular assay at thermofisher.com/targetvalidation
**Instrument compatibility**
How do I verify my microplate reader compatibility?
Ask us for help or check out our online resources at [thermofisher.com/instrumentsetup](http://thermofisher.com/instrumentsetup).

Which microplate readers are compatible with the assays described in this brochure?
Go online to view the latest compatibility information by assay technology, by company, and by instrument.

How do I set up reagents and assays on a specific instrument?
Detailed setup guides describing the use of reagents on the listed instruments are available on our website.

**Invitrogen™ Drug Discovery Assay Maker™ tool**
Find the assay you need by gene symbol or signaling pathway:
1. Enter information and select assay—enter an HGNC gene symbol or signaling pathway and select an assay.
2. Review and order—choose the products needed for your assay.

To find out more about supporting validation packets and to access biochemical and cellular assay product pages, go to [thermofisher.com/targetvalidation](http://thermofisher.com/targetvalidation).
Cells and cell health

Cells

**Human primary cells**

*Achieve more predictive results with primary cell systems*

Because human primary cells closely mimic the *in vivo* state, they have the potential to generate more physiologically relevant data. Our portfolio of Gibco™ primary cells, combined with high-quality primary cell culture media and matrices, reduces culture variability, and enhances cell performance so that you can achieve more predictive results. Choose from among a broad range of primary cell culture systems:

- Corneal epithelial cells
- Fibroblasts
- Hepatocytes
- Keratinocytes
- Mammary epithelial cells
- Microvascular endothelial cells
- Keratinocytes
- Large vessel endothelial cells
- Neuronal, glial, and neural stem cells
- Skeletal myoblasts
- Smooth muscle cells

For a complete review of our primary cell technologies and services, go to [thermofisher.com/primarycells](http://thermofisher.com/primarycells)

**Stem and progenitor cells**

*Extensive range of cells, media, and supplements*

Whether the final goal of your experiment is to understand the basic biology of cells or to reprogram the cells to eventually differentiate into a terminal lineage, having the best starting material is critical to downstream applications. We offer a range of Gibco™ cell and expansion media, enabling you to advance your cells to your next research step. See Custom Biology Services (page 28) for more information about services for reprogramming, gene editing, and cell engineering.

<table>
<thead>
<tr>
<th>Cells available</th>
<th>Induced pluripotent stem cells (iPSCs)</th>
<th>Adipose-derived stem cells (ADSCs)</th>
<th>Neural stem cells (NSCs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human fibroblasts</td>
<td></td>
<td>Mesenchymal stem cells (MSCs)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gibco™ culture media and supplements</th>
<th>Essential 8™ Medium—create a defined media for fibroblast expansion and reprogramming</th>
<th>CTS™ StemPro™ MSC Serum-Free Media*—supports superior growth compared to classical MSC media</th>
<th>Neurobasal™ Medium—allows for long- and short-term maintenance of neuronal cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>KnockOut™ Serum Replacement—grow human PSCs with this xeno-free, feeder-free medium</td>
<td>StemPro™ MSC SFM Xeno-Free Media—supports growth under completely serum-free, xeno-free conditions</td>
<td>B-27™ Supplements—find the supplement to meet your needs</td>
<td></td>
</tr>
</tbody>
</table>

* CTS StemPro MSC Serum-Free Media is intended for human ex vivo tissue and cell culture processing applications.

**CAUTION:** When used as a medical device, Federal Law restricts this device to sale by or on the order of a physician.

For the complete array of technologies enabling stem cell research, go to [thermofisher.com/stemcells](http://thermofisher.com/stemcells)
Hepatocytes

High viability with *in vivo*–like enzyme expression levels

Primary hepatocytes isolated from the liver are effective tools for the *in vitro* evaluation of metabolism, drug–drug interactions, hepatotoxicity, and transporter activity (Table 9).

- Extensive selection—cryopreserved hepatocyte lots from a variety of donors
- Viabilities routinely greater than 80%
- Fully characterized
- Multiple large lots
- Comprehensive offering of cells—human, rat, mouse, dog, nonhuman primate, and other species upon request

View inventory available at [thermofisher.com/hepatocytes](https://thermofisher.com/hepatocytes)

Table 9. Comparison guide for additional liver cell products.

<table>
<thead>
<tr>
<th>Cryopreserved human and rat Kupffer cells</th>
<th>Pooled cryopreserved human hepatocytes</th>
<th>Gibco™ HepaRG™ Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powerful <em>in vitro</em> tools for modeling the liver</td>
<td>Get the convenience, affordability, and power of a pooled population of hepatocytes in a single vial</td>
<td>Convenient for metabolism, induction, and toxicity modeling</td>
</tr>
<tr>
<td>• Convenient—provides a way to produce hepatocyte and Kupffer cell co-cultures for the study of various hepatic functions</td>
<td>• Useful in a variety of applications</td>
<td>• Hepatocyte-like functions—with the convenience of a cell line</td>
</tr>
<tr>
<td>• High purity—viability is routinely &gt;90%</td>
<td>• Verified enzymatic and pathway activity</td>
<td>• Compatibility—with induction, metabolism, and toxicity analyses</td>
</tr>
<tr>
<td>• Respond to activation with lipopolysaccharide (LPS)</td>
<td>• Pure, highly viable hepatocytes</td>
<td>• Reproducibility—consistent, reproducible results from a single population of cells</td>
</tr>
<tr>
<td>• Minimum 1 million viable cells per vial</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

View co-culture protocols at [thermofisher.com/kupffer](https://thermofisher.com/kupffer)

Get more information at [thermofisher.com/hep10](https://thermofisher.com/hep10)

Get more information at [thermofisher.com/heparg](https://thermofisher.com/heparg)

Need liver microsomes, subcellular fractions, or cytosol? Learn more at [thermofisher.com/microsomes](https://thermofisher.com/microsomes)
Cell health

Microplate reader assays
Reagents for measuring cytotoxicity and proliferation are essential research tools. The choice of assay depends on what questions the researchers are asking, the platforms to be used, and an evaluation of the advantages and limitations of available assays (Table 10).

We offer many products and services to assess cell health. To find out more, go to thermofisher.com/cellularhealth

Table 10. Choosing the right microplate reader assay to evaluate cell health.

<table>
<thead>
<tr>
<th></th>
<th>Fastest live assay</th>
<th>Most widely used live assay</th>
<th>DNA-based cell proliferation assay</th>
<th>Homogeneous DNA-based cell proliferation assay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Answers the question(s)</td>
<td>Invitrogen™ PrestoBlue™ Cell Viability Reagent</td>
<td>Invitrogen™ alamarBlue™ Reagent</td>
<td>Invitrogen™ CyQUANT™ and CyQUANT™ NF assays</td>
<td>Invitrogen™ CyQUANT™ Direct assay</td>
</tr>
<tr>
<td>Applications</td>
<td>HTS applications, cell viability, cytotoxicity, indirect proliferation measurement</td>
<td>HTS applications, cell viability, cytotoxicity, indirect proliferation measurement</td>
<td>Cytotoxicity and antiproliferative effects of compounds or treatments independent of cellular metabolism</td>
<td>HTS applications, cytotoxicity and antiproliferative effects of compounds or treatments independent of cellular metabolism</td>
</tr>
<tr>
<td>How it works</td>
<td>Cell-permeable, resazurin-based assay that measures cellular reduction potential where fluorescence or absorbance is proportional to the number of live cells.</td>
<td>Resazurin-based assay that measures cellular reduction potential where fluorescence or absorbance is proportional to the number of live cells.</td>
<td>Quantitates number of cells in a population based on total DNA content, measuring intensity of dyes that fluoresce upon DNA binding.</td>
<td>Quantitates number of cells in a population based on viable cell content, measuring dye intensity as it fluoresces upon DNA binding. Background suppressor masks staining of dead or membrane-compromised cells.</td>
</tr>
<tr>
<td>Workflow</td>
<td>Single addition</td>
<td>Single addition</td>
<td>Media removal required</td>
<td>Single addition</td>
</tr>
<tr>
<td>Incubation time</td>
<td>≥10 minutes</td>
<td>1–4 hours</td>
<td>5 minutes</td>
<td>30–60 minutes</td>
</tr>
<tr>
<td>Detection method</td>
<td>Absorbance or fluorescence</td>
<td>Absorbance or fluorescence</td>
<td>Fluorescence</td>
<td>Fluorescence</td>
</tr>
<tr>
<td>Cell format</td>
<td>Live</td>
<td>Live</td>
<td>Endpoint</td>
<td>Live</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>12 cells/well</td>
<td>50 cells/well</td>
<td>20 (glucocorticoid receptor (GR)) or 100 (nuclear factor (NF)) cells/well</td>
<td>50 cells/well</td>
</tr>
<tr>
<td>To learn more, go to</td>
<td>thermofisher.com/prestoblue</td>
<td>thermofisher.com/alamarblue</td>
<td>thermofisher.com/cyquant</td>
<td>thermofisher.com/cyquantdirect</td>
</tr>
</tbody>
</table>

View the latest instrument compatibility information by assay technology, by company, and by instrument at thermofisher.com/instrumentcompatibility
Invitrogen™ EVOS™ Cell Imaging Systems

Designed to eliminate the complexities of microscopy without compromising performance, the EVOS line of cell imaging systems makes cell imaging accessible to almost every lab and budget. Find out which EVOS Cell Imaging System is right for you.

For additional information and pricing, go to thermofisher.com/evos

<table>
<thead>
<tr>
<th>Oxidative stress indicator</th>
<th>Apoptosis indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Invitrogen™ CellROX™ reagents</td>
<td>Invitrogen™ CellEvent™ Caspase-3/7 Green reagents</td>
</tr>
</tbody>
</table>

**Answers the question**

- Are reactive oxygen species (ROS) present in these cells?
- Is caspase-3 or caspase-7 activated in these cells?

**Applications**

- Detection and quantitation of reactive oxygen species (ROS) in live cells
- Detection of caspase-3/7 activity in live cells

**How it works**

- Uses fluorogenic probes that brightly fluoresce when oxidized in cells and that have multicolor compatibility and minimal overlap with fluorophores excited by other laser lines.
- Uses a fluorogenic substrate that detects caspase-3 and caspase-7.

<table>
<thead>
<tr>
<th>CellROX™ Green</th>
<th>CellROX™ Orange</th>
<th>CellROX™ Deep Red</th>
<th>CellEvent Caspase-3/7 Green reagents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex/Em max (nm)*</td>
<td>485/520</td>
<td>545/565</td>
<td>644/665</td>
</tr>
<tr>
<td>GFP compatible</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>RFP compatible</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Live cell compatible</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Labeling in complete medium</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Formaldehyde-fixable</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Detergent resistant</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Photostability</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Signal localizes in</td>
<td>Nucleus, mitochondria</td>
<td>Cytoplasm</td>
<td>Cytoplasm</td>
</tr>
</tbody>
</table>

*Excitation and emission maxima in nm for the oxidized reagent, in some cases bound to dsDNA.

To learn more, go to:

- thermofisher.com/cellrox
- thermofisher.com/apoptosis
## Outsourced services

A trusted partner in over 20,000 discovery projects with >99% on-time delivery

For the last decade, we have provided custom assay reagents, cell lines, assay development, compound profiling, and HTS services. Send an email to discoveryservices@thermofisher.com and we’ll contact you to discuss the services we can provide to enhance your pathway to discovery.

### Profiling, HTS, lead optimization, and safety services

**Invitrogen™ SelectScreen™ profiling and screening services**

See how you can get more from SelectScreen profiling and screening services (Table 11). We offer researchers unparalleled customer support and service, including:

**High-quality results**—commitment to data excellence and comprehensive reporting

**Reliable data in days**—Accelerated Data Delivery™ Services for the fastest average turnaround time available, allowing you to receive data in real time rather than wait until project completion

Dedicated project management—effortless project initiation and execution, managed by a dedicated project manager committed to proactive communication

Over 800 validated assays—choice of biochemical and cellular assays across multiple target classes

View the full list of targets and technologies available for profiling and screening at thermofisher.com/selectscreen

### Table 11. Choose the right profiling or screening service to suit your research needs.

<table>
<thead>
<tr>
<th>Technologies available</th>
<th>SelectScreen Kinase Profiling Service</th>
<th>SelectScreen Cell-Based Profiling Services</th>
<th>SelectScreen Safety Screening</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Z'-LYTE FRET-based assay (see page 9)</td>
<td>• GPCR profiling</td>
<td>P450 Profiling Service</td>
</tr>
<tr>
<td></td>
<td>• Adapta Universal Kinase Assay (see page 9)</td>
<td>• GeneBLAzer Reporter Assays (see page 12)</td>
<td>• P450 Invitrogen™ BACULOSOMES™ reagents</td>
</tr>
<tr>
<td></td>
<td>• Lanthascreen Eu Kinase Binding Assay (see page 8)</td>
<td>• Tango GPCR Assay System (see page 12)</td>
<td>• Invitrogen™ Vivid™ assay platform</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pathway profiling</td>
<td>hERG screening</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Lanthascreen cellular pathway assays (see page 10)</td>
<td>• Predictor hERG Fluorescence Polarization Assay Kit (see page 14)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• CellSensor cellular pathway assays (see page 10)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nuclear receptor profiling</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• GeneBLAzer Nuclear Receptor Reporter Assays (see page 17)</td>
<td></td>
</tr>
<tr>
<td>To find out more, go to:</td>
<td>thermofisher.com/kinaseprofiling</td>
<td>thermofisher.com/gpcrprofiling</td>
<td>thermofisher.com/p450profiling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>thermofisher.com/pathwayprofiling</td>
<td>thermofisher.com/hergscreening</td>
</tr>
<tr>
<td></td>
<td></td>
<td>thermofisher.com/nrprofiling</td>
<td></td>
</tr>
</tbody>
</table>

To find out more, go to: thermofisher.com/libraryscreening thermofisher.com/sirnascreening thermofisher.com/phenotypicscreening
We can help with any service in your workflow to move your discovery forward—from target identification through safety and toxicity testing.

<table>
<thead>
<tr>
<th>Technologies available</th>
<th>Invitrogen™ SelectScreen™ Library Screening Service</th>
<th>Invitrogen™ SelectScreen™ siRNA Screening Service</th>
<th>Invitrogen™ SelectScreen™ Phenotypic Screening Service</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Target identification and validation</strong></td>
<td>Send your in-house assay or choose from hundreds of validated assays in our portfolio for key target classes including kinases, nuclear receptors, and GPCRs. We can perform validation and screening of client-provided assays that do not utilize our technologies*, or build a custom assay to fit your specific screening needs. We can accommodate screening projects ranging from libraries of 1,000 to 1,000,000 compounds. We accept client-provided compound libraries or you can use one of our libraries.</td>
<td><strong>Invitrogen™ Silencer™ Select siRNA libraries</strong></td>
<td>Choose from a suite of technologies that includes general cell proliferation technologies (PrestoBlue reagent and CyQUANT assay) and specific cellular processes such as those for oxidative stress (CellRox reagents and Invitrogen™ MitoSOX™ indicator), autophagy, and apoptosis (CellEvent reagent). We can perform validation and screening of client-provided assays that do not utilize our technologies*, or build a custom assay to fit your specific screening needs.</td>
</tr>
<tr>
<td><strong>Assay development</strong></td>
<td><strong>Invitrogen™ Vivid™ assay platform</strong></td>
<td><strong>Custom siRNA Libraries</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Screening</strong></td>
<td><strong>Kinase profiling</strong></td>
<td><strong>P450 profiling</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Secondary profiling and lead optimization</strong></td>
<td><strong>Cell-based profiling</strong></td>
<td><strong>hERG screening</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Safety and toxicity testing</strong></td>
<td><strong>Phenotypic screening</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* If you would like to request a technology outside of the Thermo Fisher Scientific portfolio, please inquire about this process at discoverieservices@thermofisher.com.

To find out more, go to: thermofisher.com/libraryscreening thermofisher.com/sirnascreening thermofisher.com/phenotypicscreening
Custom Biology Services

A dedicated team providing high-quality assay development services to enable predictive answers for discovery

When your research demands a custom-developed assay, an engineered cell line, or another outside-the-catalog solution, our Custom Biology Services team can deliver. If we don’t have a pre-validated assay to interrogate your target or pathway of interest, we can build one for you. By dedicating resources to your custom projects, we have the capacity to develop exactly what you need, when you need it (Table 12).

Learn more at [thermofisher.com/custombiology](http://thermofisher.com/custombiology)

**Table 12. A sampling of the broad range of the capabilities of our custom services team.**

<table>
<thead>
<tr>
<th>Service type</th>
<th>Target/functional area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellular assay development</td>
<td>Kinases, nuclear receptors, GPCRs, ion channels, epigenetics, pathways</td>
</tr>
<tr>
<td>Biochemical assay development</td>
<td>Kinases, nuclear receptors, proteases</td>
</tr>
<tr>
<td>Applied Biosystems™ TaqMan® Assay development</td>
<td>mRNA or proteins</td>
</tr>
<tr>
<td>Invitrogen™ Jump-In™ cell line generation</td>
<td>Targets and reporters</td>
</tr>
<tr>
<td>BacMam generation</td>
<td>Targets and reporters</td>
</tr>
<tr>
<td>Tb/Eu antibody labeling</td>
<td>Kinases, posttranslational modifications</td>
</tr>
<tr>
<td>siRNA screening</td>
<td>RNA and functional readouts</td>
</tr>
<tr>
<td>Cell provisioning</td>
<td>Most cell types</td>
</tr>
<tr>
<td>Stem cell services</td>
<td>CellModel™ Services for reprogramming to iPSCs, genome editing, differentiation, characterization, and assay development</td>
</tr>
</tbody>
</table>

Each services project connects you to a dedicated project manager, who is fully engaged with your project by managing:

- Expectations and customer satisfaction
- Order placement and material receipt
- Technical meetings
- Timelines and milestones
- Timely release of deliverables

Your dedicated project manager acts as the single point of contact, facilitating all communication, including freedom-to-operate discussions with vendor or license-holder, if needed.

Contact [discoveryservices@thermofisher.com](mailto:discoveryservices@thermofisher.com) to design whatever custom assay you need in your pathway to discovery.
### The custom assay development process

Using the tools that our scientists created, coupled with our expertise in applying that technology, we provide custom solutions to meet your unique assay requirements.

<table>
<thead>
<tr>
<th>Step 1: Identify the problem</th>
<th>Step 2: Develop the solution</th>
<th>Step 3: Manage tasks and report results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Customer identifies needs</strong></td>
<td><strong>Customer team evaluates the best technology and approach</strong></td>
<td><strong>Custom team manages project milestones and reporting</strong></td>
</tr>
<tr>
<td><strong>Customer provides information about:</strong></td>
<td><strong>Customer-driven biology team:</strong></td>
<td><strong>Custom biology team provides Milestone Reports that include:</strong></td>
</tr>
<tr>
<td>• Target protein or pathway</td>
<td>• Suggests a delivery or expression system for target protein based on cell background and downstream use</td>
<td>• Experimental goals</td>
</tr>
<tr>
<td>• A biological problem</td>
<td>• Proposes methods to clone or synthesize a target</td>
<td>• Materials</td>
</tr>
<tr>
<td>• Target modification or biological function</td>
<td>• Generates a virus or cell line</td>
<td>• Methods</td>
</tr>
<tr>
<td>• Suggested antibodies, if appropriate</td>
<td>• Identifies and labels antibodies, if appropriate</td>
<td>• Results</td>
</tr>
<tr>
<td>• Cell background</td>
<td>• Tests the labeled antibodies and the cell line or the virus used to induce expression in cell line</td>
<td>Plus a Final Milestone Report and set of deliverables that include:</td>
</tr>
<tr>
<td><strong>Expectations:</strong></td>
<td>• Tests the custom reagents (virus, antibodies, or cell line) in the appropriate assay format</td>
<td>• Custom reagents</td>
</tr>
<tr>
<td>• Describe expected downstream use</td>
<td>• Elicits customer involvement as needed</td>
<td>• Protocol to enable assay runs in your own lab</td>
</tr>
<tr>
<td><strong>Freedom-to-operate:</strong></td>
<td></td>
<td>• Lists of required catalog materials</td>
</tr>
<tr>
<td>• Ask about our capabilities beyond our own portfolio*</td>
<td></td>
<td><strong>Deliverables:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Milestone and Final Milestone Reports, cell lines, antibodies, etc.</td>
</tr>
</tbody>
</table>

* If you would like to request a technology outside of the Thermo Fisher Scientific portfolio, please inquire about this process at discoveryservices@thermofisher.com.
Go online to find out more
Use these friendly URLs to quickly navigate to the web content you want:

Kinases
LanthaScreen Eu Kinase Binding Assay
LanthaScreen Kinase Activity Assays
Adapta Assay
Z'-LYTE Assay
Phosphate Sensor assay
CellSensor cellular pathway assays
LanthaScreen cellular pathway assays—stable assays
LanthaScreen cellular pathway assays—BacMam-enabled assays
BacMam System
G protein–coupled receptors (GPCR)
Cell-based GeneBLAzer reporter assays
Cell-based Tango GPCR Assay System
Calcium flux assays
FluxOR Potassium Ion Channel Assay
Premo Halide Sensor
Voltage Sensor Probes
Predictor hERG Fluorescence Polarization Assay Kit
BacMam-hERG Potassium Channel Kit
Nuclear receptors
PolarScreen Competitive Binding Assays
LanthaScreen Competitive Binding Assays
LanthaScreen Coactivator Assays
GeneBLAzer Nuclear Receptor Reporter Assays
Microplate Reader compatibility and instrument Setup
thermofisher.com/kinases
thermofisher.com/bindingassay
thermofisher.com/lanthascreen
thermofisher.com/adapta
thermofisher.com/zlyte
thermofisher.com/phosphatesensor
thermofisher.com/cellsensor
thermofisher.com/lanthascreencellular
thermofisher.com/bacmamassay
thermofisher.com/bacmam
thermofisher.com/gPCR
thermofisher.com/geneblazer
thermofisher.com/tango
thermofisher.com/calciumfluxassays
thermofisher.com/fluxor
thermofisher.com/premohalide
thermofisher.com/vsp
thermofisher.com/predictor
thermofisher.com/bacmamherg
thermofisher.com/nuclearreceptor
thermofisher.com/polarscreen
thermofisher.com/lanthascreencompetitive
thermofisher.com/lanthascreencoactivator
thermofisher.com/geneblazernr
thermofisher.com/instrumentsetup
Drug Discovery Assay Maker Tool
thermofisher.com/assaymaker
Primary cells
thermofisher.com/primarycells
Stem cells
thermofisher.com/stemcells
Hepatocytes
thermofisher.com/hepatocytes
Cryopreserved Human and Rat Kupffer Cells
thermofisher.com/kupffer
Pooled Cryopreserved Human Hepatocytes
thermofisher.com/hep10
HepaRG cells
thermofisher.com/heparg
Liver microsomes, subcellular fractions, and cytosol
Liver microsomes, subcellular fractions, and cytosol
Cell health
thermofisher.com/cellularhealth
PrestoBlue Cell Viability Reagent
thermofisher.com/prestoblue
alamarBlue Reagent
thermofisher.com/alamarblue
CyQUANT and CyQUANT NF assays
thermofisher.com/cyquant
cyQUANT Direct assay
thermofisher.com/cyquantdirect
EVOS Cell Imaging Systems
thermofisher.com/evos
CellROX reagents
thermofisher.com/cellrox
CellEvent Caspase-3/7 Green reagents
thermofisher.com/apoptosis
SelectScreen Profiling and Screening Services
thermofisher.com/selectscreen
SelectScreen Kinase Profiling Service
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SelectScreen Cell-Based Pathway Profiling Service
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SelectScreen Cell-Based Nuclear Receptor Profiling Service
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SelectScreen P450 Profiling Service
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SelectScreen hERG Screening Service
thermofisher.com/hergscreening
SelectScreen Library Screening Service
thermofisher.com/libraryscreening
SelectScreen siRNA Screening Service
thermofisher.com/sirnascreening
SelectScreen Phenotype Screening Service
thermofisher.com/phenotypescreening
Custom Biology Services
thermofisher.com/custombiology
Custom Services
discoveryservices@thermofisher.com
Technical Support
drugdiscovery@thermofisher.com