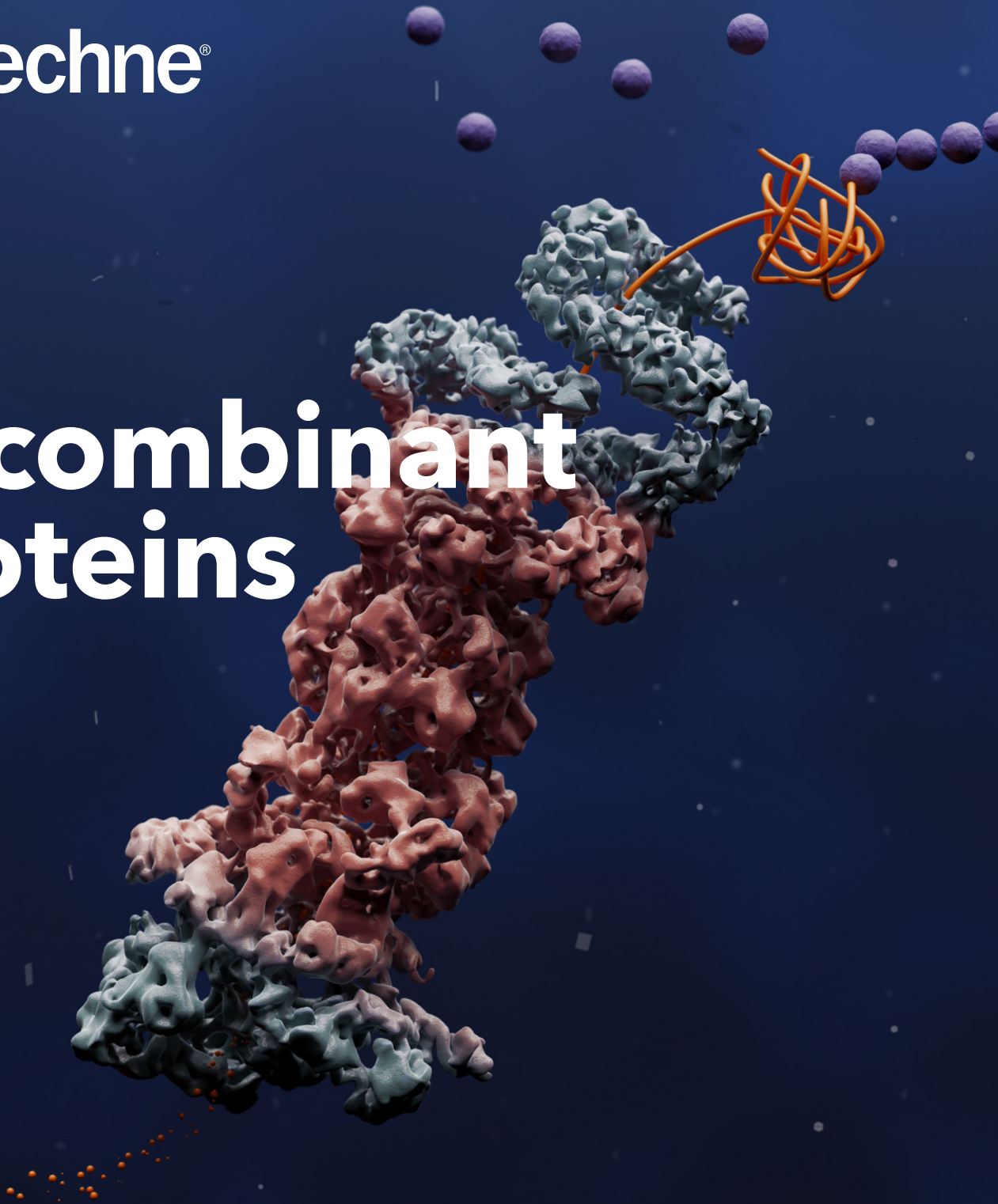


biotechne®

# Recombinant Proteins



Find it at [fishersci.com](https://www.fishersci.com)

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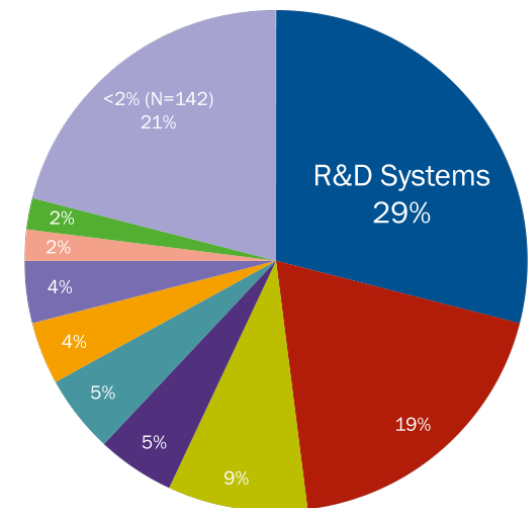
## SETTING THE STANDARD IN PROTEINS FOR OVER 30 YEARS

All of our proteins are produced by scientists - for scientists, so we understand that producing recombinant proteins is about generating the reliable tools that researchers need to thrive.

We manufacture more than 95% of our proteins. It gives us complete control over all aspects of production, so nothing becomes an R&D Systems protein that does not meet our industry-leading specifications.

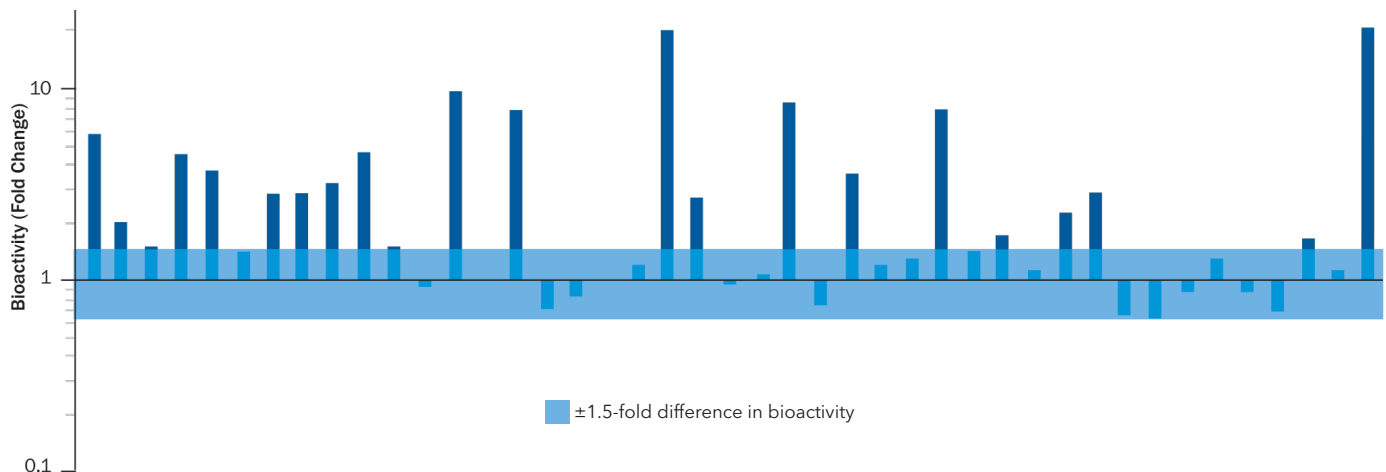
### TRUSTED BY RESEARCH

In a survey of 1,125 manuscripts published in 2013 covering cancer, immunology, neuroscience, and stem cell research, 29% cited the use of R&D Systems proteins, greater than any other single protein manufacturer.



### LEADING THE WAY IN BIOSCIENCE

R&D Systems recombinant proteins were compared with those from other manufacturers in side-by-side bioassays. Over half of the 43 tested R&D Systems proteins exhibited 1.5-fold or higher bioactivity, compared to competitor proteins.



## FIRST CLASS PRODUCTS & SERVICES

We understand that experimental outcomes can be limited by the performance of your protein. That is why the focus on quality starts at the birth of each R&D Systems protein.

During product development our optimization process involves analysis of protein sequence, expression system, and formulation to ensure we provide proteins with the best possible bioactivity and performance.

We are proud that R&D Systems experience and dedication to protein development and manufacturing is unmatched in the life science industry.

Our quality commitment does not stop with our products.

Wherever you are in the world, you can access our highly trained technical service staff and the scientists responsible for protein development, so we can answer any questions you might have.

Let us be your trusted partner in research.



## THE FOUR PILLARS OF R&D SYSTEMS QUALITY

To guarantee you the best possible proteins, we focus on the following quality pillars.



### BIOACTIVITY

Biological activity assays, based on the available scientific literature, are developed for each protein we produce. Each new lot has to pass our strict QC activity parameters before it is released to the market.



### PURITY

Be confident that the results obtained in your experiments are not due to contaminants. The majority of our proteins have >95% purity and have a guaranteed industry-leading endotoxin level of  $\leq 0.1$  EU/ $\mu$ g (established by LAL assay).



### STABILITY

We constantly monitor the condition of our proteins to check for long term performance. Our proteins are shipped lyophilized or in specially optimized formulations, so each recombinant protein reaches you in perfect condition.



### CONSISTENCY

You can be sure of the reliability of our proteins because of our rigorous QC and production standards. Each new lot is compared to the previous for bioactivity, purity and endotoxin level.

# YOUR PARTNER IN RESEARCH . . . AT EVERY STEP

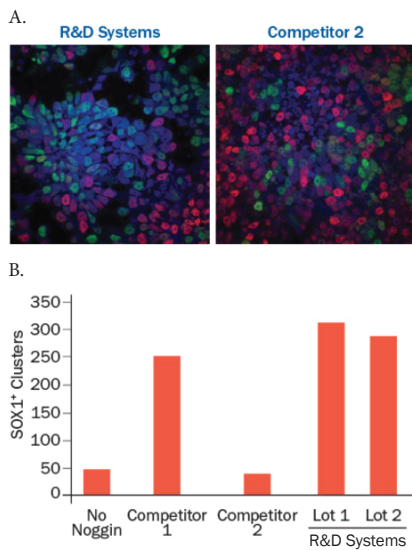
What is important to you in a recombinant protein? Is it the species, the activity, available size, expression system or documentation?

Every research question is unique and so requires a unique solution. That is why the range of R&D Systems recombinant proteins give you the choices to tailor the right protein solution to your research.

By listening to the scientists we serve, R&D Systems produces the protein tools that are the most useful to you.

From immunology to apoptosis, neuroscience to cancer research - our protein catalogue spans the widest range of research areas. This ensures that R&D Systems is your partner for all recombinant protein needs - whatever your research goals.

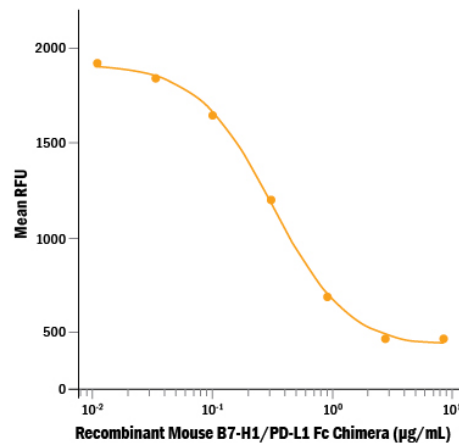
## STEM CELLS



### Recombinant Human Noggin CATALOG #6057-NG

Noggin is a highly conserved vertebrate signaling molecule important in embryonic nerve, muscle and bone tissue development. A. Epithelial stem cells treated with Recombinant Human Noggin (catalog #6057-NG) show greater ectoderm differentiation compared to competitor recombinant human Noggin. B. The average number of SOX1-positive clusters revealed that 2 lots of R&D Systems' Noggin consistently showed greater ectoderm differentiation than recombinant human Noggin obtained from two different competitors.

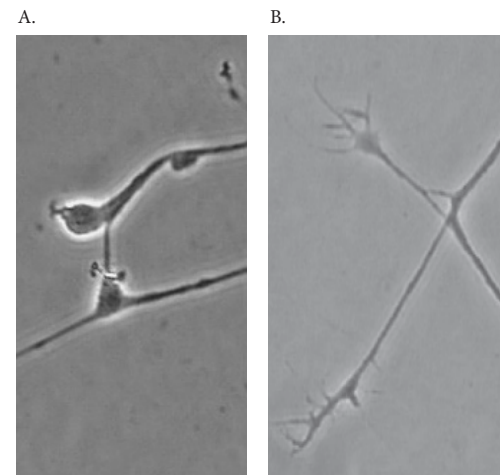
## IMMUNOLOGY



### Recombinant Mouse B7 H1/PD-L1 CATALOG # 1019-B7

B7 H1/PD-L1 plays a role in the development of immune tolerance by promoting T cell anergy and enhancing regulatory T cell development. Recombinant Mouse B7-H1/PD-L1 Fc Chimera (catalog #1019-B7) inhibits anti-CD3-induced cell proliferation of stimulated mouse T cells. The ED<sup>50</sup> for this effect is typically 0.15-0.75 µg/mL.

## NEUROSCIENCE



### Recombinant Human Semaphorin 3A CATALOG # 1250-S3

The semaphorins are secreted and membrane signaling molecules that have roles in axon guidance during neuronal development. Treatment with Semaphorin 3A-Induces Growth Cone Collapse. A fully extended chick dorsal root ganglion growth cone grown in the presence of Recombinant Human β-NGF (Catalog #256-GF) was untreated (A) or treated (B) with Recombinant Human Semaphorin 3A (Catalog #1250-S3).

## THE FORMAT YOU NEED – WHEN YOUR RESEARCH NEEDS IT

As research projects evolve - from basic research to pre-clinical applications, the requirements for your reagents also evolve. The availability of key reagents in the format you need can influence the pace of your discovery.

With over 30 years of experience in producing the most trusted natural and recombinant proteins, R&D Systems produces proteins in a range of formats that give you choice and flexibility whatever your requirements.

### RESEARCH GRADE

Where available, our recombinant proteins are available with and without carrier protein, giving you flexibility in format. We use a range of expression systems - from bacterial to mammalian cell lines, to ensure the highest quality biological activity.

### ANIMAL - FREE MANUFACTURING CONDITIONS

We also offer proteins manufactured and purified exclusively under animal-free conditions. The proteins generated under animal-free conditions share the same biological activities as those produced using our standard research grade, easing the process of transition between protein formats.

### ANIMAL COMPONENT - FREE PROCESS (ACFP) MANUFACTURING CONDITIONS

For proteins that require eukaryotic expression, ACFP recombinant proteins are available. Expressed in an animal-free certified *Sf9* insect cell line using dedicated animal-free laboratories, raw materials and labware, these meet standards needed for *ex vivo* research or bio-production.





## CONSTANTLY STRIVING FOR GREAT PERFORMANCE

We know that scientific progress doesn't stand still, and in developing research solutions neither do we.

From the daily challenges of the laboratory, changing reagent demands and emerging scientific trends, we are constantly challenged by our customers to solve their research demands.

To be able to provide the best reagents and solutions to the scientific community, their needs, challenges and demands are at the heart of the R&D Systems mindset.

Using our expertise and experience we develop innovative protein reagents, kits and solutions to help you solve your important scientific questions.

## PROTEIN AND PROCESS ENGINEERING

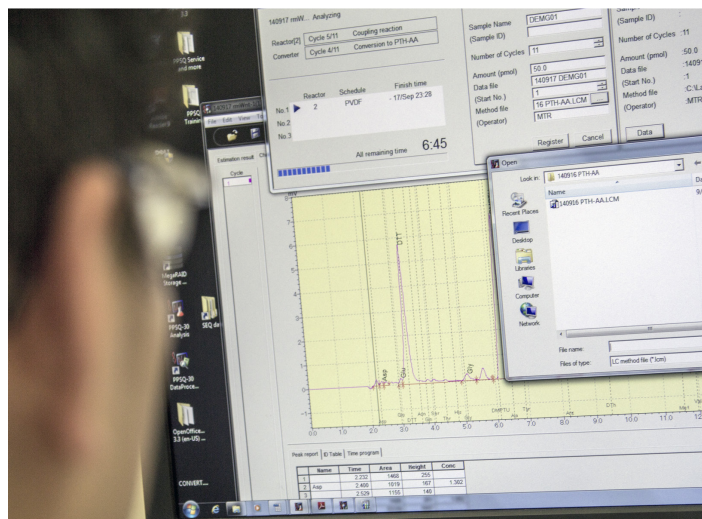
From innovative purification processes to engineering proteins to increase biological activity, we employ the best knowledge and technology to create innovative new products.

See this in practice with our Recombinant Human Shh on page 9.

## BIO-ACTIVITY - SO WHAT?

You may think that all recombinant proteins are created equally, but using poorly performing proteins in your experiments could be wasting your precious research budget.

Better performing protein means you need to use less, therefore saving you money.



## EVOLUTION OF A R&D SYSTEMS PROTEIN

Changes in scientific understanding can alter the experimental requirements of proteins.

By keeping abreast of current thinking and research trends, we strive to constantly improve our proteins to keep up with the pace of scientific discovery.

Our expert protein design and production knowledge allows modification of essential protein tools in response to customer feedback to give you the best performance.

## RECOMBINANT HUMAN SHH/SONIC HEDGEHOG

Shh is a secreted signaling protein essential for vertebrate development and critical for development of the limbs and central nervous system.

The highly processed Shh preproprotein is modified to produce 174 aa (Cys24-Gly197) active domain. N-terminal palmitate and C-terminal cholesterol modifications are essential for activity and function of the Shh signaling domain.

Since its initial release in 2003, we have released three different versions of Recombinant Human Shh. In the development of each new protein, we have modified both the method of production and sequence to provide increased biological activity.

Released in 2015 - the new Recombinant Shh High Activity (catalog #8908-SH) - shows 200-fold greater activity than other available Shh proteins.

## POST-TRANSLATIONAL MODIFICATION ANALYSIS OF NATURALLY-MODIFIED RECOMBINANT HUMAN SHH

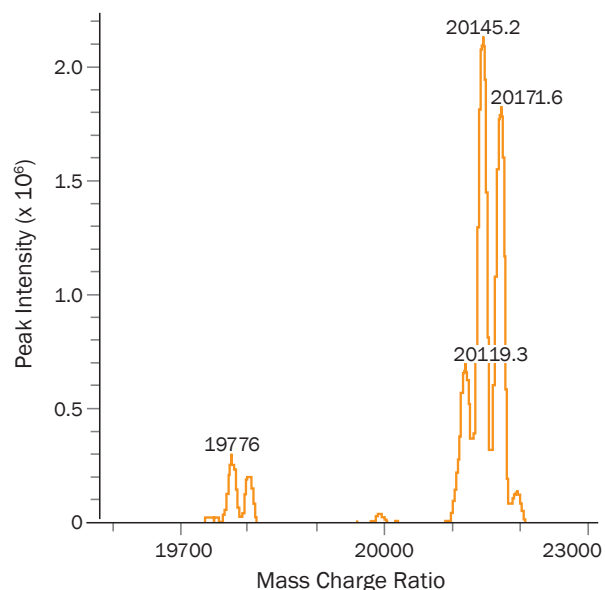
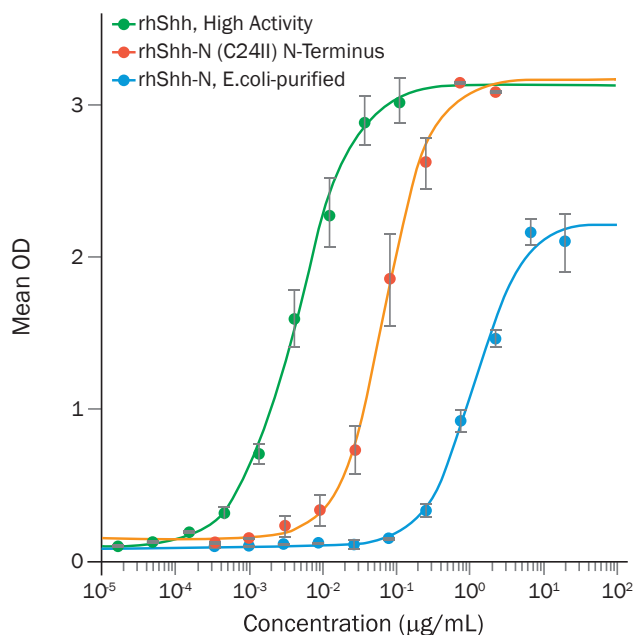


FIGURE 1. LC/ESI-MS analysis of Recombinant Human (rh)Shh, High Activity (Catalog #8908-SH) shows mass peaks at 20119 and 20145 Da, indicating that rh Shh is modified with a single cholesterol molecule at the C-terminus. The peak at 20172 Da indicates that rhShh is also modified with a single fatty acid at the N-terminus. The small mass peak at 19776 Da corresponds to rhShh modified with only cholesterol.

## NATURALLY-MODIFIED RECOMBINANT HUMAN SHH IS OVER 200-FOLD MORE ACTIVE THAN OTHER AVAILABLE SHH PROTEINS



Recombinant Human Shh proteins induce alkaline phosphatase production when added to mouse mesenchymal stem cells. Recombinant Human Shh, High Activity (catalog #8908-SH; green), purified from HEK293 cells and containing the correct post-translational modifications, is over 14-fold more active than *E.coli*-purified Recombinant Human Shh-N (C24II) N-Terminus (Catalog #1845-SH; red line), and over 200 fold more active than *E.coli*-purified Recombinant Human Shh-N (Catalog # 1314-SH; blue line)

# PROTEINS PRODUCED BY SCIENTISTS FOR SCIENTISTS

## BRINGING YOU THE BEST SOLUTIONS

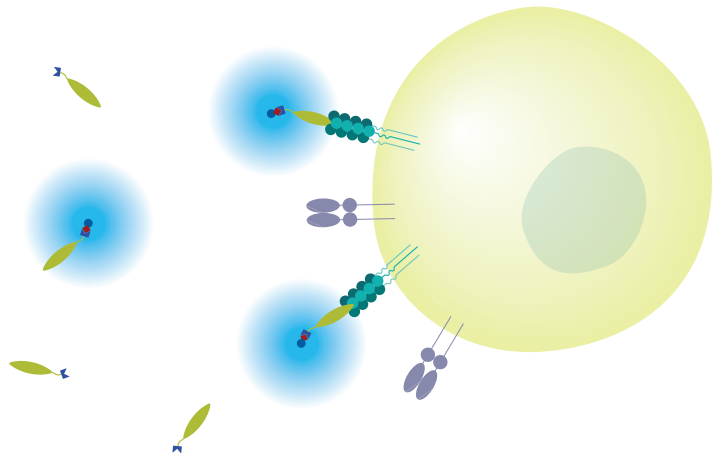
All R&D Systems proteins and products are born with the demands of our customers in mind, as they are developed by experienced researchers.

To make sure we bring only the best protein products to life, we use the latest science and technology, which ensures they are relevant and useful scientific tools.

## BIOTINYLATED PROTEINS

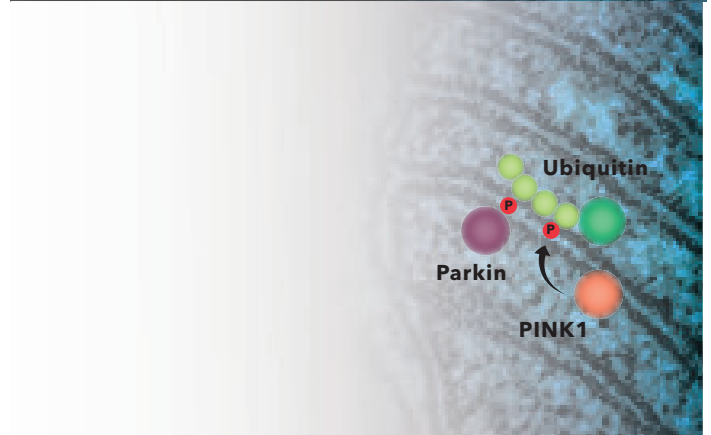
To help researchers understand physiological ligand/receptor interactions, versatile biotinylated protein harnesses the versatility of biotin and top quality R&D Systems proteins.

Our wide range of bioactive biotinylated proteins can be used in a wide variety of assays. When using streptavidin conjugates, the options for assay development to understand ligand expression and interactions are endless.



## UBIQUITIN PROTEASOME SOLUTIONS

R&D Systems rings ubiquitin proteasome researchers essential reagents such as ubiquitin, ubiquitin like proteins and their associated enzymes and other tools like substrates, inhibitors and time-saving kits.





# PRODOTS®

## LET THE GOOD TIMES ROLL

Maintenance of your cells in culture is essential, but reagent and media preparation can be time consuming. Save your time and do the lab work that really matters with ProDots®.

ProDots® proteins are proteins neatly packaged into easy-to-use pre-aliquoted lyophilized balls that can be rolled directly into cell culture media. The same R&D Systems protein quality - Just easier to use.

## ELIMINATE ALIQUOTING

Pre-aliquoted ProDots® proteins allow quick reconstitution at your desired concentration. Revolutionary new lyophilization technology allows instant 100% reconstitution in cell media.

## AVOID FREEZE/THAW CYCLES

Guaranteed stable in your lab refrigerator for 6 months.



# CELLXVIVO™

## IMMUNE CELL DIFFERENTIATION AT ITS SIMPLEST

Variability is a major challenge of *in vitro* leukocyte maturation and the harvesting of mature human immune cells.

To simplify and increase consistency in your cultures, R&D Systems offers CellXVivo™ kits to expand and differentiate mature lymphoid and immune cell types from enriched population of peripheral blood mononuclear cells (PBMCs).

## EFFICIENT IMMUNE CELL DIFFERENTIATION

All kits contain simple validated protocols and cocktails of R&D Systems cytokines optimized for targeted lymphoid or myeloid lineages.

## RELIABLE YIELDS

CellXVivo™ kits and cytokine cocktails are optimized for consistency time after time.

## Immune Cell Differentiation as easy as . . .

**1** **Isolate**  
your starting immune population

**2** **Incubate**  
cells in the Cytokine Cocktail from your chosen CellXVivo™ Differentiation Kit

**3** **Verify**  
and quantify differentiation

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BN224616600-US

