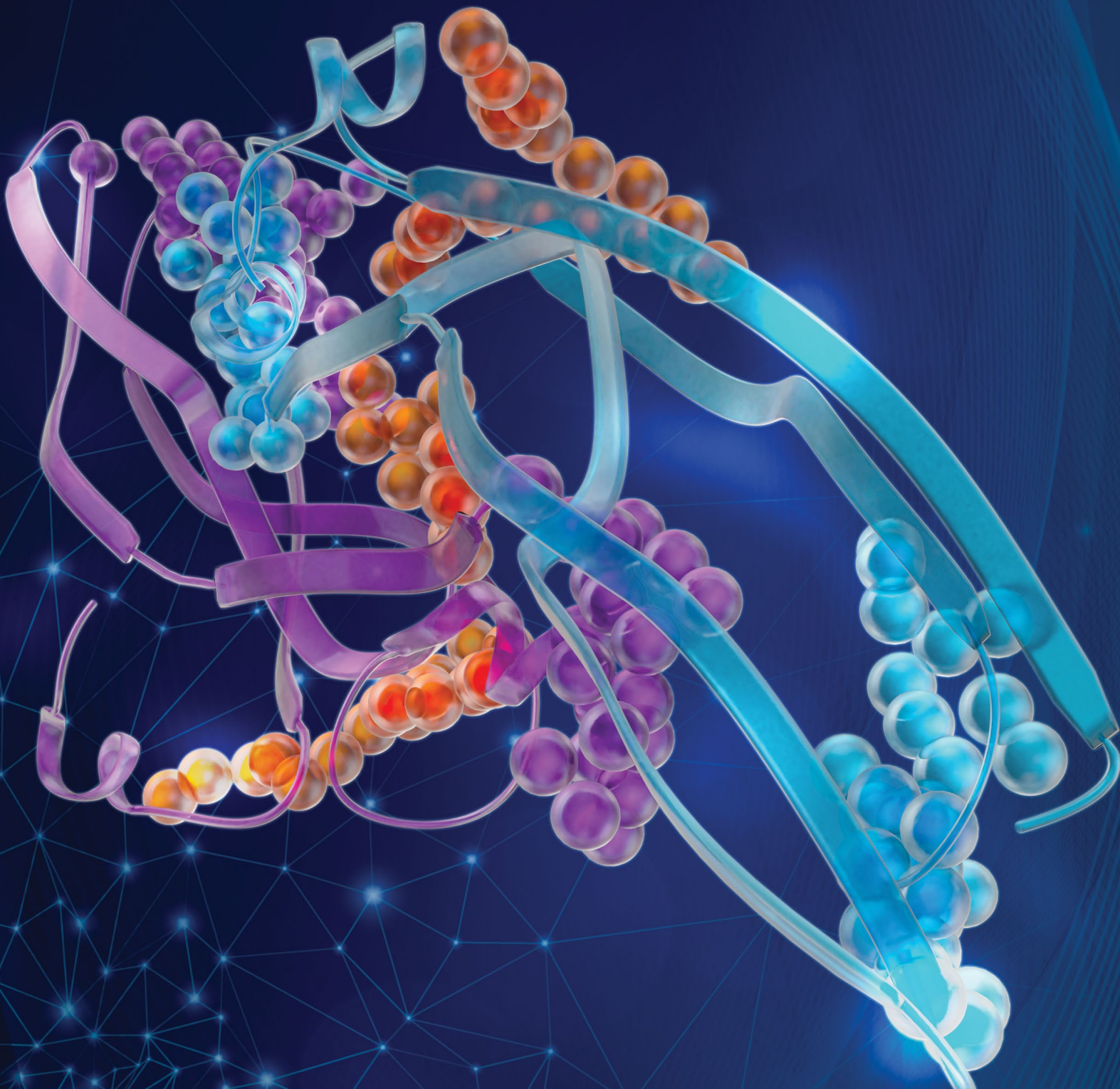


PARTNER WITH BIO-TECHNE
REALIZE YOUR PROTEIN & CELL BIOLOGY POTENTIAL

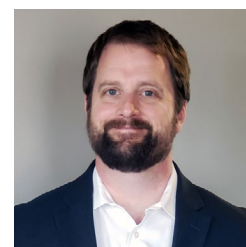


bio-techne[®]

YOUR BUSINESS, OUR SUPPORT

HARNESS OVER 40 YEARS OF PROTEIN MANUFACTURING EXPERTISE WHEN YOU CHOOSE BIO-TECHNE AS A PARTNER

"Through R&D Systems, Bio-Techne has a long history of providing our customers with the highest quality proteins on the market. Our team of scientists are dedicated to utilizing our cutting-edge expression and purification procedures to give our customers the best proteins available. We offer extensive analytical capabilities and bioassay services to ensure a protein has the physical characteristics and bioactivity that our customers require."



ANTHONY PERSON, PH.D.

Sr. Director of Protein Development, R&D Systems



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INDUSTRY-LEADING PROTEINS

Over 40 years of protein manufacturing knowledge and experience enables us to be first to market in new areas, as with our range of [avi-tagged proteins](#) and new [proteins for COVID-19 research](#).

UNBEATABLE BIOLOGICAL ACTIVITY

Our scientists go the extra mile to develop proteins of the highest quality for your business.

- Proprietary methods to guarantee accurate protein folding ensure that our proteins are biologically relevant
- With over 2000 different bioactivity assays performed on our catalog proteins, we provide the most accurate and relevant activity data for your protein of interest

QUALITY AND CONSISTENCY TIME AFTER TIME

We know that our partners need dependable products that deliver reproducible results, time after time. By investing in a Bio-Techne protein, you benefit from our rigorous quality control processes.

EXTENSIVE QUALITY CONTROL

Our QC measures include lot specific Certificates of Analysis, dedicated manufacturing space, monitoring of product stability over shelf life and transparent traceability of raw materials.

LOT-TO-LOT CONSISTENCY

Each new product lot is tested side-by-side with previous lots for purity, biological activity, and endotoxin level. We also routinely test a sample from an earlier lot to control for variability in the assay itself.

LOW ENDOTOXIN AND MICROBIAL BIOBURDEN

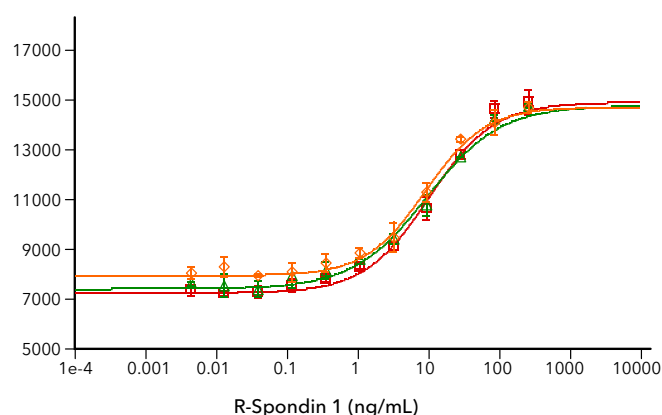
Each new production lot is assessed for endotoxin using the LAL assay to ensure levels as low as <0.01 EU/ug. Microbial contamination is ruled out using both direct plating and broth dilution.

ACCURATE PROTEIN SEQUENCES

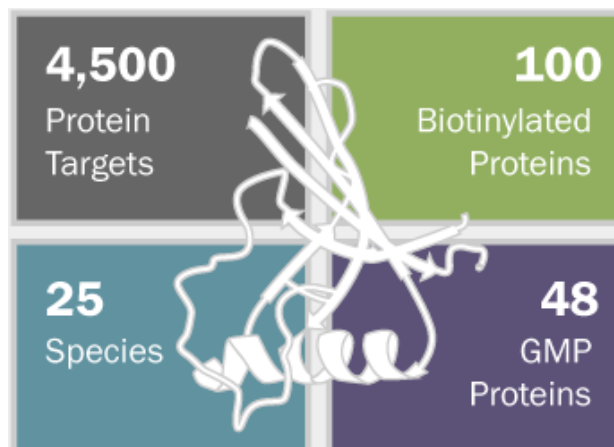
N-terminal amino acid sequence analysis is performed for every recombinant protein we develop.

BUFFER SYSTEMS

We take great care that our proteins are made, stored and shipped in physiologically relevant buffers for optimal bioactivity.



High Lot-to-lot Consistency and bioactivity of Human R-Spondin 1. Three independent lots of [Recombinant Human R-Spondin 1 \(R&D Systems, Catalog # 4645-RS\)](#) were tested for their ability to stimulate activation of beta-Catenin using a TOPflash beta-Catenin/TCF reporter assay in the HEK293T human kidney cell line, in the presence of 5 ng/mL [Recombinant Mouse Wnt-3a \(R&D Systems, Catalog # 1324-WN\)](#). Each trace represents data obtained from Recombinant Human R-Spondin 1 from a different manufacturing run.



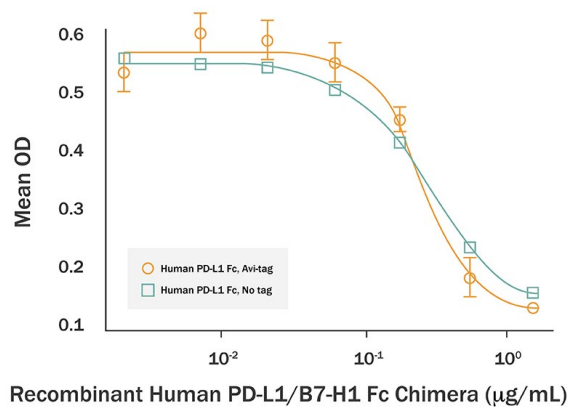
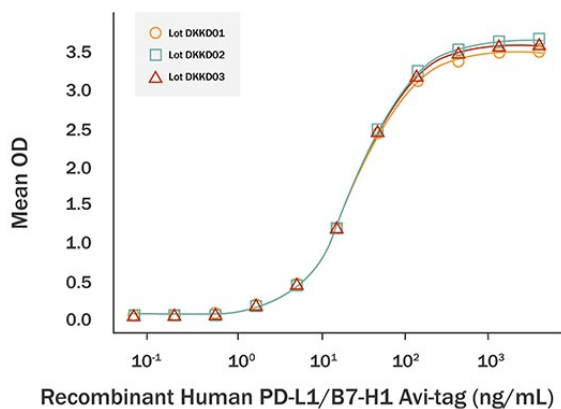
DISCOVER NEW AVI-TAG BIOTINYLATED RECOMBINANT PROTEINS

WHAT IS AN AVI-TAG PROTEIN?

Avi-tag proteins have a 15 amino acid fusion tag (avi-tag) on either the N or C terminus of the protein. This avi-tag is recognized by the BirA biotin ligase in the host cell, which binds to the avi-tag sequence and leads to the biotinylation of a lysine on the avi-tag. When the recombinant protein is expressed it will have a single biotin molecule on each protein with an avi-tag.

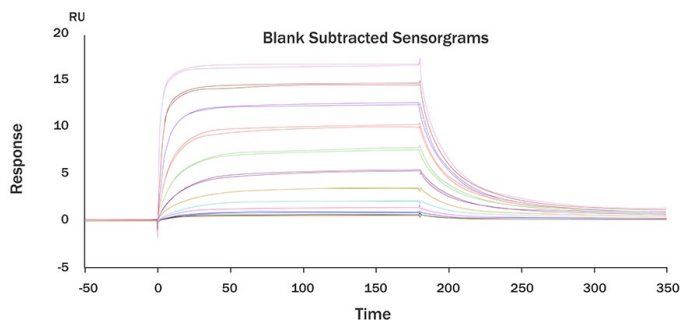
AVI TAG BIOTINYLATED PROTEINS OFFER THE FOLLOWING ADVANTAGES:

- Consistent labelling: Biotinylation only occurs on the single lysine residue in the avi-tag.
- Uniform orientation of protein: When bound to a streptavidin-coated surface, the avi-tagged protein orientation will be uniform due to the precise control over biotinylation.
- Equivalent bioactivity across your protein of interest: Restriction of the biotinylation to the avi-tag eliminates alteration to the rest of the protein, thereby retaining your protein's inherent bioactivity.



LOT-TO-LOT CONSISTENCY

Three independent lots of B7-H1/PD-L1 have near identical bioactivity when Recombinant Human PD-1 (#1086-PD) is coated at 1 µg/mL. Biotinylated Recombinant Human PD-L1/B7-H1 Avi-tag (# AVI156) binds with an ED50 of 8-48 ng/mL.



BIOACTIVITY

Both Biotinylated Recombinant Human PD-L1/B7-H1 Fc Avi-tag and unlabeled Recombinant Human PD-L1/B7-H1 inhibit anti-CD3 antibody-induced IL-2 secretion in human T lymphocytes. The similarity in activity highlights that the biotinylated Avi-tag protein is fully functional.

SURFACE PLASMON RESONANCE (SPR) DATA

Immobilized CD155/PVR-Fc Avi-tag (# AVI9174) bound to streptavidin CM5 chip binds to TIGIT-Fc (# 7898-TGB) with an affinity constant of 25.4 nM. Experiment performed on Biacore T200, GE Healthcare.

Each avi-tagged biotinylated protein is manufactured to the same industry-leading R&D Systems quality and consistency standards. Our custom protein development team can also work with you to create a protein solution to meet your specific research needs.

Learn more about Avi-Tag Biotinylated Proteins | randsystems.com/products/active-biotinylated-proteins

PROTEINS FOR COVID-19 RESEARCH

The COVID-19 global pandemic has resulted in the ongoing need to understand the pathogenicity of the SARS-CoV-2 virus, and develop effective therapies and vaccines. These all require biologically active and functional protein antigens for development.

Our comprehensive offering includes the [SARS-CoV-2 Spike protein receptor binding domain \(RBD\)](#), the full ectodomain [SARS-CoV-2 Spike active trimer](#), and the Spike S1 and S2 subunit proteins. We also offer the SARS-CoV-2 [papain-like protease](#) and [3CL protease](#), as well as key host receptors such as [ACE-2](#).

BIOACTIVITY

The bioactivity of each COVID-19 related protein is tested in an appropriate biological system, including high affinity binding assays to ACE-2 and enzymatic reporter assays.

HOST EXPRESSION SYSTEMS, TAGS, AND LABELS

Host expression systems include insect cells (Sf21), CHO cells, and HEK293 cells. Versions with His tags, Fc tags, as well as amine biotinylated and avi-tag biotinylated proteins and enzymes are also available.

We've also performed in-depth analyses of the glycosylation profiles of our spike proteins expressed in different hosts.

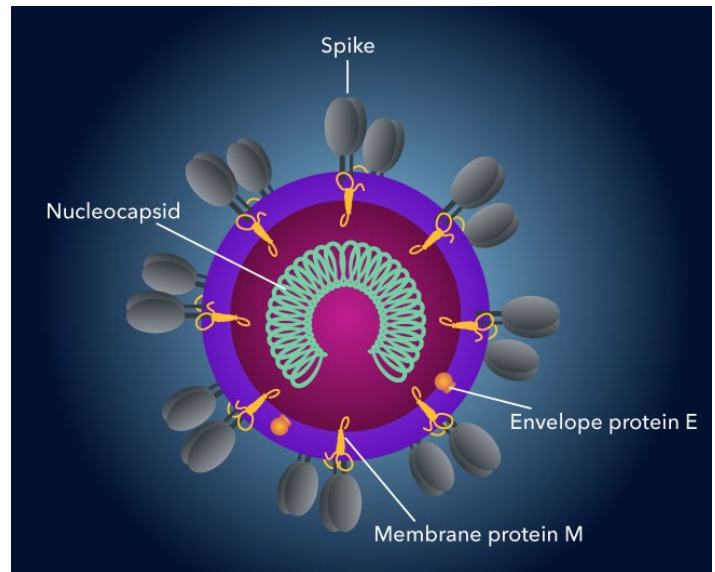
[Learn more](#) in our spike glycosylation app note.

SCALABILITY

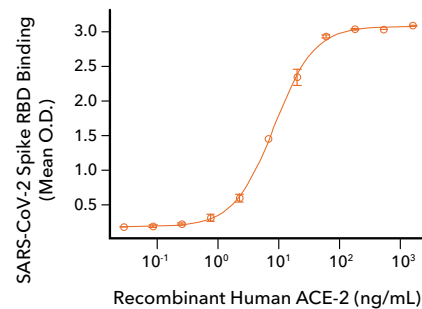
Proprietary high yielding manufacturing methods enable the scalability needed to meet your demands for assay development and production, and therapeutic quality control testing.

ADDITIONAL ANALYTICAL TESTING

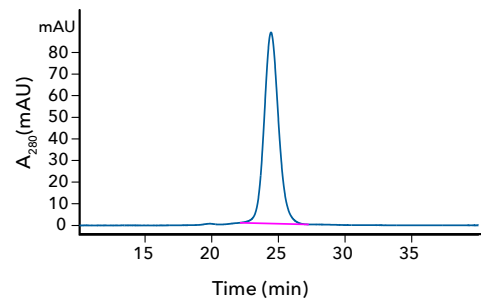
Size exclusion chromatography (SEC), mass spectrometry, capillary isoelectric focusing (cIEF), differential scanning fluorimetry (DSF), dynamic light scattering (DLS), and surface plasmon resonance (SPR) are also used to validate that our COVID-19 proteins have the correct size, structure or binding properties.



Structural Characteristics of the SARS-CoV-2 Virus. SARS-CoV-2 virus consists of a positive single-stranded RNA genome and four structural proteins, including the Spike (S), Envelope (E), Membrane (M), and Nucleocapsid (N) proteins. Cellular entry of SARS-CoV-2 is mediated by binding of the Spike protein to the ACE-2 receptor on the surface of host cells.



Bioactivity and Purity of Recombinant SARS-CoV-2 Spike RBD His-tag Protein. Recombinant SARS-CoV-2 Spike RBD His-tag Protein (#10500-CV) binds to Recombinant Human ACE-2 His-tag (#933-ZN) in a functional ELISA.



Analysis of SARS-CoV-2 Spike Protein by Size Exclusion Chromatography (SEC) Recombinant SARS-CoV-2 Spike Protein Active Trimer His-tag Protein (# 10549-CV) was analyzed SEC resulting in a single major peak. The predicted MW was calculated to be 373kDa, consistent with a trimeric conformation.

EXPERT CUSTOM PROTEIN SERVICES

WHAT SETS US APART?

WE DON'T SHY AWAY FROM DIFFICULT-TO-EXPRESS PROTEINS.

CUSTOM PROTEINS, ON DEMAND

Our custom recombinant protein expression and purification service routinely manufactures proteins of highest purity and bioactivity, and lowest endotoxin levels. We can also add your desired modifications to our existing catalog proteins including on demand conjugation services. Our vast selection of non-catalog proteins may include just the target for your project. Furthermore, our development team now offers custom GMP manufacturing options.

[Enquire about non-catalog proteins](#)

BUILD YOUR OWN SCREENING PLATFORM

Our proteins in a plate service allows you to select from a library of over 5000 bioactive proteins. Our scientists will then aliquot and map them in a high throughput format to your specifications. Allow us to take care of the routine, saving you precious time.

[Enquire about proteins in a plate](#)

MEET INDUSTRY REGULATIONS

With our expert regulatory affairs team, and facilities certified under compliance with ISO 9001:2015 / ISO 13485:2016/CMDR guidelines, your project can transition smoothly into regulatory submissions.

HEAR FOR YOURSELF

Find out directly from our dedicated custom team on how our custom services can help with your projects in our on-demand webinar: *"Ensure Research Progression with Custom Products and Project Services"*

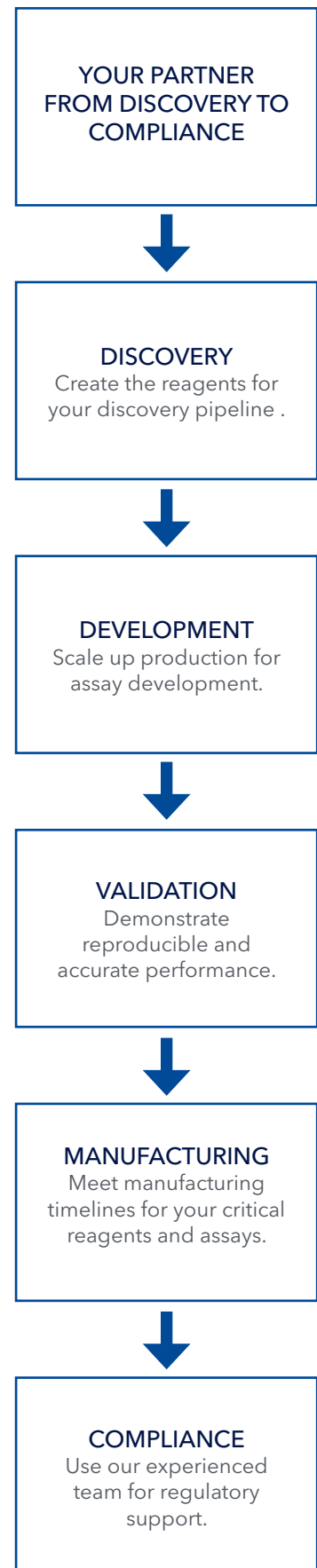


[Watch webinar on-demand](#)

ALLOW OUR EXPERTISE TO WORK FOR YOU

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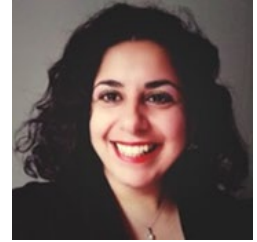


SPECIALITY CELL CULTURE MEDIA AND SUPPLEMENTS

WHAT SETS US APART?

OUR WORLD-CLASS XENO-FREE AND SERUM-FREE DEFINED MEDIA FORMULATIONS.

"We routinely optimise our media formulations using design-of-experiments (DOE), and a diverse portfolio of recombinant proteins and small molecules. We also have a large bank of cells including primary cells for media testing and optimization. To keep our media and supplements as consistent and specific as possible, we have developed a host of in house specialized assays to monitor growth, expansion, and differentiation for a variety of cell types."



YAS HEIDARI, PH.D.

Product Manager, Protein & Cell Biology, Europe

- All of our media and supplements are designed, produced, and validated in-house.
- Our fully defined and serum-free cell culture media help to decrease experimental variability.
- Each lot is checked for performance consistency, relieving you of unnecessary batch-to-batch screening.
- We routinely manufacture reagents with endotoxin levels below 0.1 EU/ug by LAL assay.



FIND OUT MORE - OUR CELL CULTURE OFFERING



3D cell culture, stem cells, and organoids - culture, verify, differentiate, and analyse.
[View organoid reagents and resources](#)



N2-MAX and N21-MAX supplements - Consistent, chemically-defined, and serum-free formulations to enhance performance of your stem cell culture protocols
[Request a sample today](#)



ExCellerate™ - defined serum-free and xeno-free media for the robust expansion of immune cells.
[Find out more](#)



Browse all cell culture products and resources from R&D Systems.
[View cell culture essentials](#)



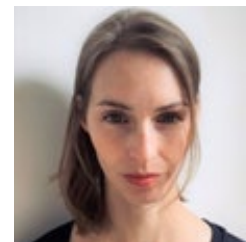
Custom cell lines - build your own cell lines, fast. Employ our genome engineering expertise including CRISPR-Cas9, viral vectors and transposons across any primary cell type, stem cells or immune cell populations to generate custom engineered transformed cell lines.
[View all Cell & Gene Engineering Services](#)

TARGETED PROTEIN DEGRADATION

WHAT IS TARGETED PROTEIN DEGRADATION?

Targeted Protein Degradation (TPD) refers to the use of heterobifunctional small molecule “Degraders” (e.g. PROTAC® molecules) to achieve knockdown of target proteins within cells. PROTAC® Degraders, also known as Active Degraders, consist of binding moieties for an E3 ubiquitin ligase and a target protein joined by a linker. The binding of both moieties results in the formation of a ternary complex between target protein and E3 ligase, leading to polyubiquitination of the target protein, its recognition by the proteasome and subsequent degradation. In this way efficient, sustained and highly selective protein knock-down can be achieved both *in vitro* and *in vivo*.

“Bio-Techne has built a powerful workflow solution for researchers in this exciting field. Our product range spans small molecule tools (Active Degraders; Degradation Building Blocks; the PROTAC® Panel Builder); Ubiquitin Proteasome System proteins; assays for TPD (Simple Western, TUBE, *in vitro* ubiquitination) and a target validation platform (TAG Degradation Platform). By developing and commercializing research tools for TPD we aim to empower the scientific community to realize the full potential of Targeted Protein Degradation.”



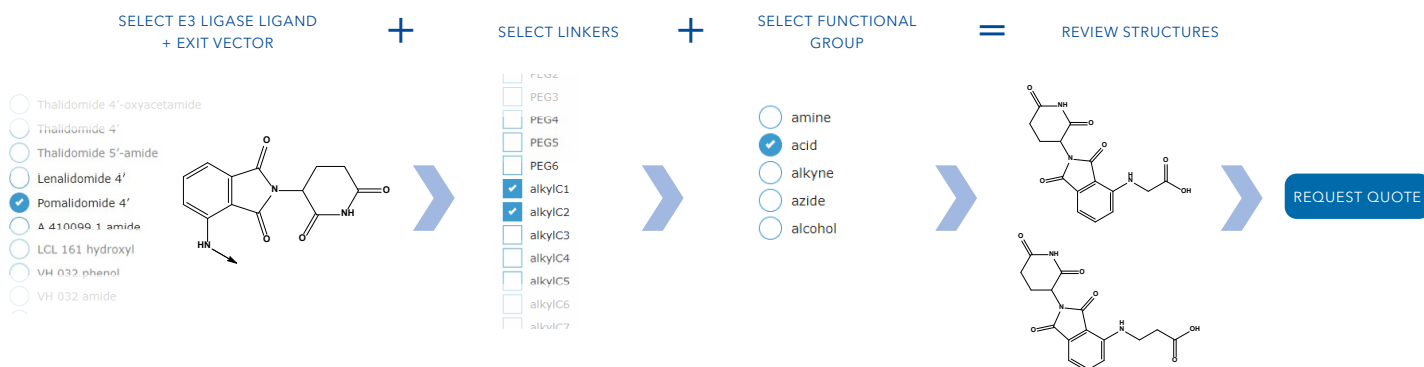
HANNAH MAPLE, PH.D
Innovation Manager, Tocris Bioscience

PROTAC® PANEL BUILDER

We have just made Degradation development easier for you with our new [PROTAC® Panel Builder online tool](#). You can use it to quickly select a bespoke collection of functionalized E3 ligase ligands plus linkers for your Degradation development project.

Select your preferred E3 ligase ligands and exit vectors (targeting VHL, Cereblon or IAP), Linkers (PEG or alkyl chains of variable length) and functional groups to couple to your target ligand of interest, and we will send you a quote for your chosen panel of Degradation building blocks.

From mg to g scale, we offer unparalleled quality and customer service.



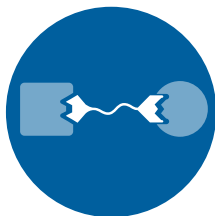
PROTAC® Panel Builder Process.

For more information on Degradation development, take a look at our recent publication on “[Developing degraders: principles and perspectives on design and chemical space](#)” Maple et al. *Med. Chem. Comm.*, 10, 1755-1764 (2019)

PROTAC® is a registered trademark of Arvinas Operations, Inc., and is used under license.

View PROTAC® Panel Builder | tocris.com/protac-panel-builder

TARGETED PROTEIN DEGRADATION



ACTIVE DEGRADERS

Get started with our range of degrader molecules for key proteins of interest. We also offer a selection of controls and other related small molecules.

[View Active Degraders & Controls](#)



DEGRADER BUILDING BLOCKS

Develop your own degraders for your protein of interest using our offering of chemical building blocks.

[View Degradation Building Blocks](#)



TAG DEGRADATION PLATFORM

In TAG degradation the target protein is expressed as a fusion protein, which is targeted for ubiquitination. This allows for *in vivo* validation of targets with no known ligands.

[View TAG Degradation Platforms](#)



ASSAYS FOR TARGETED PROTEIN DEGRADATION

For a reliable and quantitative method of measuring knockdown, our Simple Western™ automated western blotting systems are rapid, gel-free, blot-free, and hands-free.

[Learn More about Simple Western](#)



E3 LIGASES AND RELATED PROTEINS

To complement our range of degraders, we also offer superior quality Ubiquitin Proteasome System (UPS) proteins, including E3 ligase enzymes and other proteins.

[View E3 Ligase Products](#)

CUSTOMER DEGRADER SERVICES

In addition to our catalog products we offer a range of custom services including:

- Custom Degradation Building Blocks - tailored panels for specific development projects, or for customers' internal libraries.
- Biological Testing of Degradation - Simple Western™ analysis of the percentage knockdown of the target protein, to inform further chemical optimization work on the degradation molecules.
- Custom Protein Services - custom production, purification, and characterization of UPS proteins, particularly E3 ligase enzymes.
- Custom Cell Engineering Services - Custom knock-in cell lines for the dTAG and aTAG platforms.

Get in touch - Custom TPD Services | tpd@bio-techne.com

Learn more about Targeted Protein Degradation | tocris.com/tpd

GMP REAGENTS FOR CELL THERAPY MANUFACTURING

As the promise of regenerative cell and tissue therapies grows, so does the need for high quality raw materials and ancillary components for ex vivo stem cell manufacturing. With a growing portfolio of GMP-grade cytokines, growth factors, small molecules, and media, we are dedicated to making these therapies a reality. Our brand new GMP manufacturing facility will enable large-scale production of GMP-grade materials well into the future.

"Our ability to develop and manufacture over 90% of our reagents in-house is a core capability that sets us apart from the competition. It gives us remarkable control over reagent optimization during product development. In addition, development, manufacturing, and quality personnel are on site to quickly answer any question regarding reagent specifications and use."



LINDSEY CLARKE, PH.D
Sr Manager, Global Product Marketing,
Cell & Gene Therapy

GMP GROWTH FACTORS AND CYTOKINES

We are dedicated to supplying a consistent, safe, and traceable supply of GMP-grade growth factors and cytokines to stem cell therapy manufacturers and offer the largest selection of recombinant human GMP proteins on the market. Our new convenient ProDot format helps to minimize handling time and risk by further closing processes.

[View all GMP Proteins](#)

[View more about GMP ProDots](#)

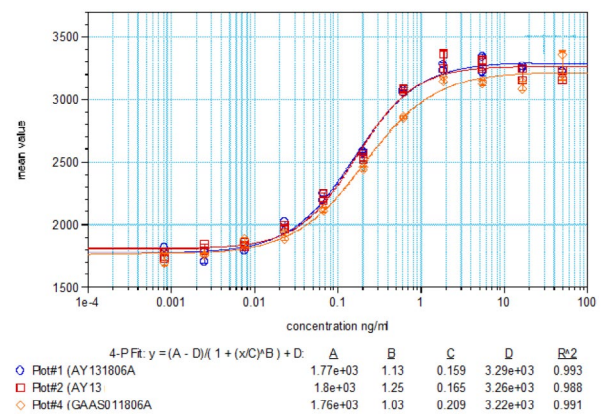


Bio-Techne enables a seamless transition of your basic research to translational due to equivalent performance of our RUO and GMP proteins.

Save time, money and resources, and achieve smooth transition to the clinic.

WE ROUTINELY OFFER THE FOLLOWING:

- Batch-to-batch consistency
- Serum-free, xeno-free & animal-free production
- Process transparency & traceability
- Scalability
- Microbiological testing
- Security of supply
- Equivalent performance from RUO to GMP



Activity Data: Recombinant Human IL-7 GMP Protein, CF (#207-GMP) shows equivalent activity to research-grade Recombinant human IL-7 Protein, CF (#207-IL/CF). Measured in a cell proliferation assay using PHA-activated peripheral blood lymphocytes (PBL).

All products are manufactured under compliance with ISO 9001:2015 and/or ISO 13485:2016/CMDR guidelines. Manufacturing is in line with USP Chapter <1043>, Ancillary Materials for Cell, Gene, and Tissue-Engineered Products; Ph. Eur. General Chapter 5.2.12, Raw Materials of Biological Origin for the Production of Cell-based and Gene Therapy Medicinal Products; USP Chapter <92>, Growth Factors and Cytokines Used in Cell Therapy Manufacturing.

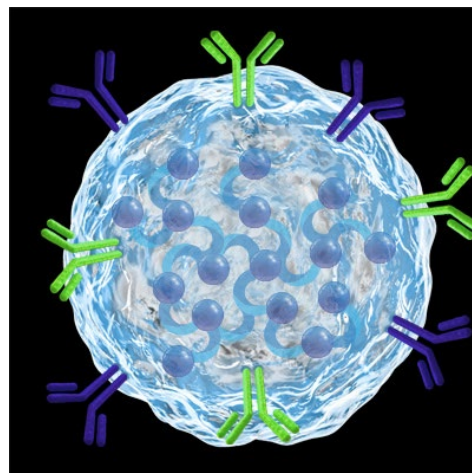
GMP PRODUCTS FOR CELL THERAPY MANUFACTURING

CELL CULTURE MEDIA, SUPPLEMENTS AND CLOUDZ™ CELL ACTIVATION KITS

Our cell culture media and supplements are manufactured following cGMP guidelines. Our supplements support the expansion of many cells under cGMP grade culture conditions. We are ready and prepared to support your therapy development from the research to clinical phase. Furthermore, our new pioneering Cloudz™ expansion technology is a dissolvable bead-based technology for the robust and reliable expansion of cells *ex vivo*.

[View cell culture solutions](#)

[View all Cloudz kits](#)



GMP SMALL MOLECULES

As stem cell therapies enter the clinic, there is a requirement for cGMP reagents to assure therapeutic safety and suitability. Tocris Bioscience supports GMP manufacturing by offering the first cGMP small molecules for stem cell therapy.

[View GMP Small Molecules](#)

TOCRIS
a biotechne® brand

PRODUCT NAME	DESCRIPTION	CATALOG #
Y-27632 dihydrochloride	Selective p160ROCK inhibitor	TB1254-GMP
CHIR 99021	Selective GSK-3 inhibitor	TB4423-GMP
XAV 939	Tankyrase Inhibitor	TB3748-GMP
SB 431542	Potent and selective TGF-β inhibitor	TB1614-GMP

Selection of popular GMP small molecules from Tocris Bioscience

OUR SUPPORT TEAMS ARE READY FOR YOUR INQUIRY

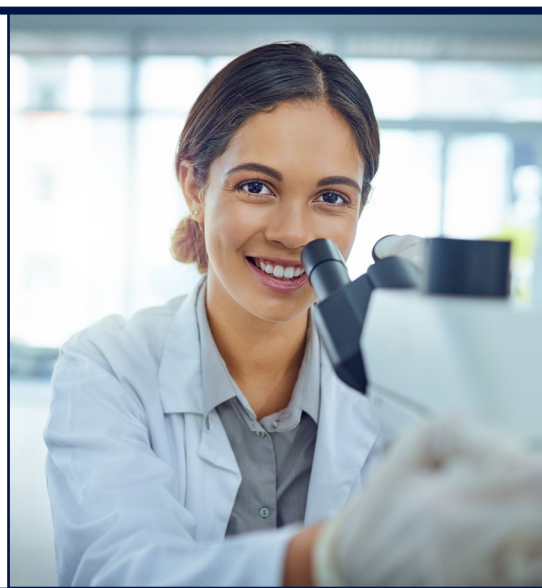
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GLOBAL: INFO@BIO-TECHNE.COM

EUROPE, MIDDLE EAST, AFRICA : INFO.EMEA@BIO-TECHNE.COM

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