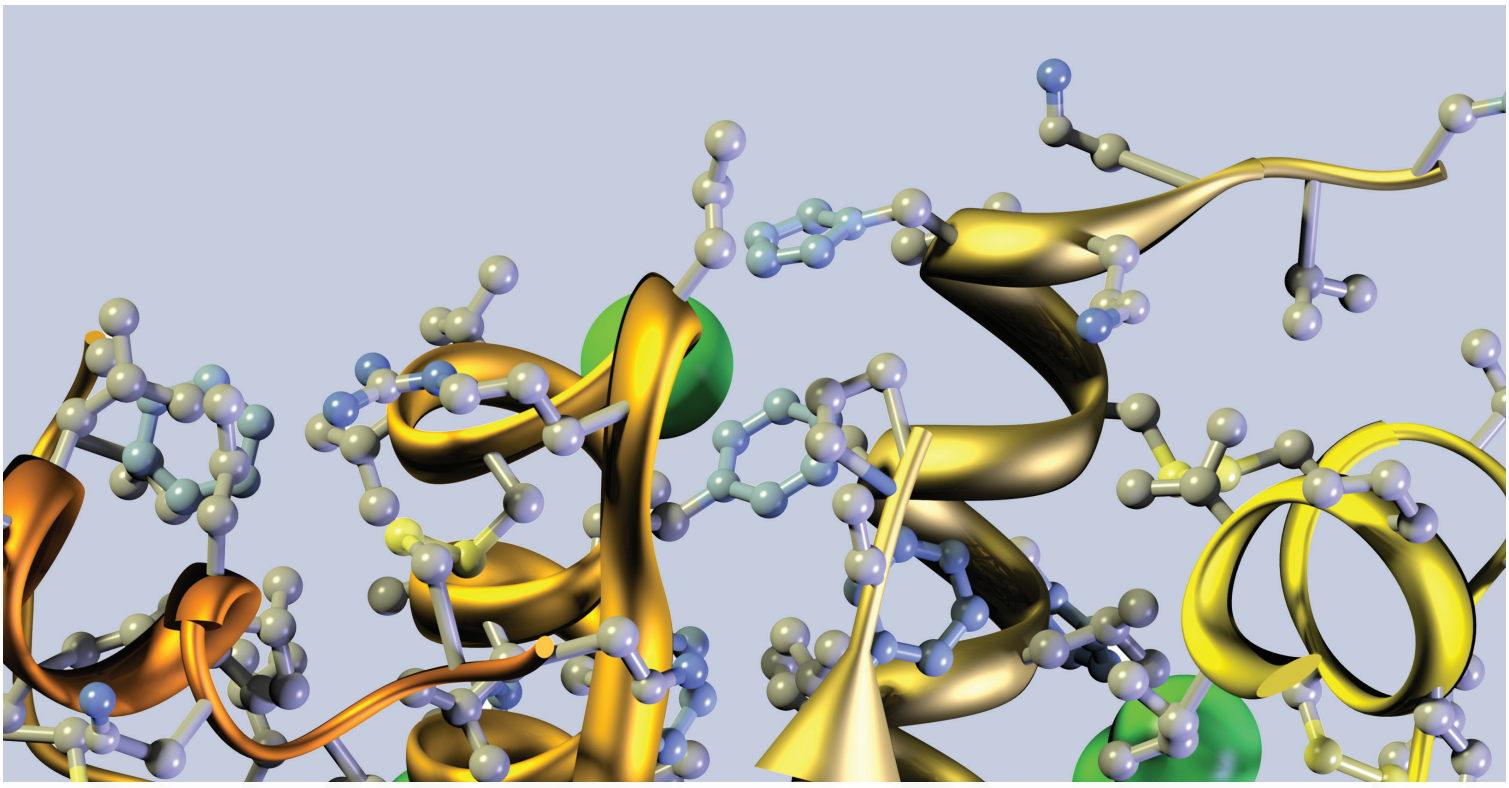
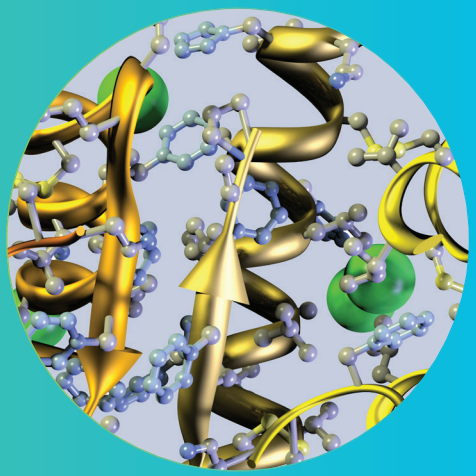


# Focus: Protein Isolation & Purification

Protein Isolation and Purification is a series of steps that extract the proteins from cells or tissues and separate them from the non-protein mixture. The resulting mixture of proteins are separated by differences in their size, binding affinity, and chemical properties.

For more information on products that fit each step in this workflow, visit **vwr.com/protein-isolation.**

**2020**



# Avantor® J.T.Baker® BAKERBOND® PROchievA™ recombinant protein A affinity chromatography resin

Enabled by a new, proprietary protein A derived ligand, J.T.Baker® BAKERBOND® PROchievA™ provides best-in-class purification performance for monoclonal antibodies, Fc-fusion proteins, and IgG antibody type molecules.

Designed and manufactured by Avantor to the high standards established by our J.T.Baker® brand, the BAKERBOND® PROchievA™ resin is designed for high performance in the critical affinity chromatography step of mAbs and Fc-fusion protein manufacturing. Its new ligand provides an independent chromatography resin supply alternative for protein A resins, delivered in a non-flammable storage solution through Avantor's global supply chain.

Used with Avantor's proven J.T.Baker® family of process chromatography buffers and additives, the BAKERBOND® PROchievA™ resin can provide biopharma operations with greater efficiencies and higher purity profiles within the affinity chromatography step.

## FEATURES

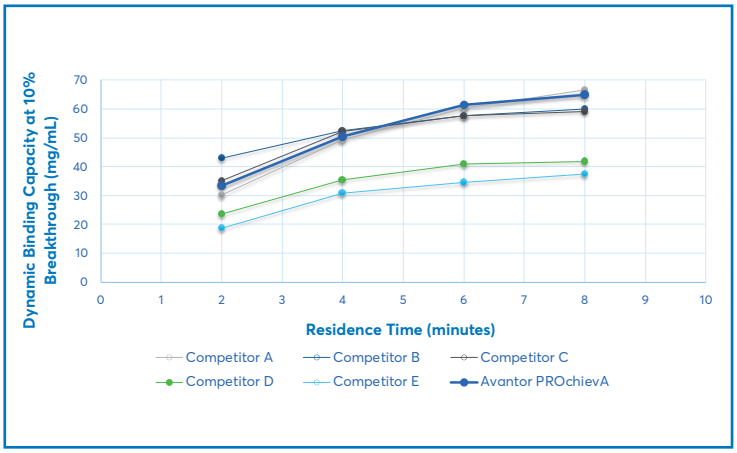
- Proprietary ligand developed exclusively by Avantor with demonstrated first-class dynamic binding capacity for mAbs and improved protein purification capability in other complex molecules
- Standard agarose backbone for ease-of-use and supply reliability
- Traditional particle size allows for use of established column packing procedures and operating protocols
- Delivery in a non-hazardous, non-flammable buffer solution to eliminate burdensome handling requirements

## PROVEN DYNAMIC BINDING CAPACITY

Dynamic binding capacity is a primary driver to process intensification as it directly drives resin and buffer consumption, cycle time, and capital investment. BAKERBOND® PROchievA™ resin provides equivalent dynamic binding capacities as the best-in-class protein A resins on the market today and significantly higher performance relative to the most commonly used protein A resins on both the process development lab and manufacturing scale.

The high DBC and high column linear velocity offered by BAKERBOND® PROchievA™ affinity chromatography resins gives biopharma operations the ability to intensify downstream throughput while generating higher purity mAb products.

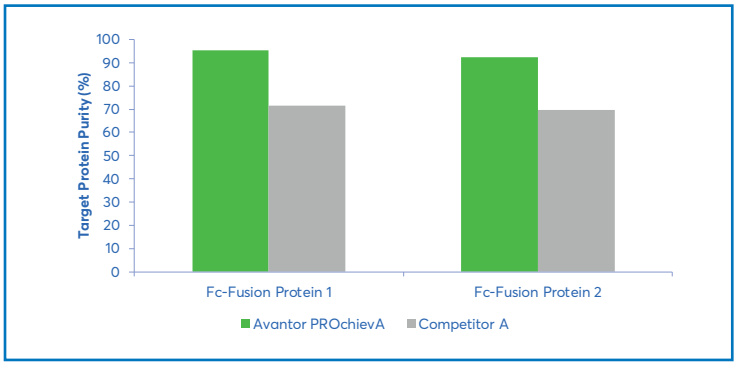
In addition, the porous 75µm particles and inherent lack of fines enable high flow rates to be used during purification, resulting in higher efficiency in downstream processing.




Using purified human IgG1.

## HIGHER PURITY LEVELS

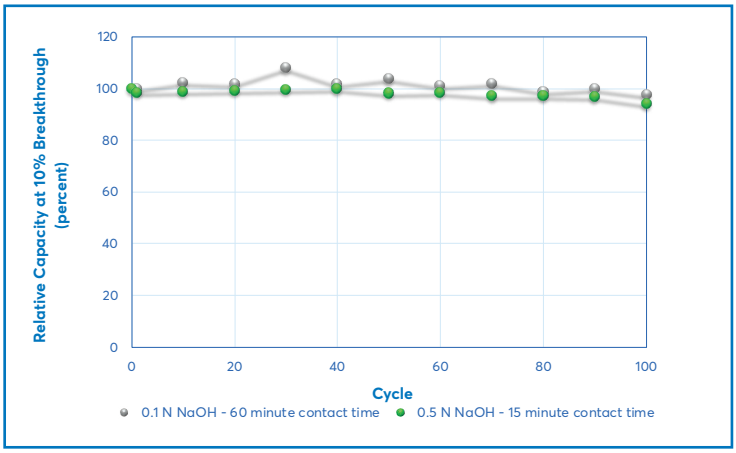
As biologic molecules become more complex, so will the demands on downstream processing. In several applications the BAKERBOND® PROchievA™ resin has been shown to deliver higher levels of protein purity, thus reducing the burden on subsequent purification operations. Several examples are shown in the emerging market for Fc-fusion proteins.




Testing performed on two different Fc-fusion proteins.

## ALKALINE STABILITY

The proprietary ligand in the BAKERBOND® PROchievA™ resin has been engineered to be stable under alkaline conditions, so standard clean-in-place (CIP) procedures using sodium hydroxide can be performed. As a result, the BAKERBOND® PROchievA™ chromatography resin will retain its high dynamic binding capacity through several purification cycles, providing cost-effective means for performing multiple purifications.




Each cycle represents equilibration, load, wash, elute and CIP with 3CV NaOH.

## CONVENIENT PACKAGING

The BAKERBOND® PROchievA™ resin comes conveniently packaged in a non-hazardous/non-flammable storage buffer, eliminating many of burdensome shipping, handling, and storage requirements common among protein A resins.

## PROCESS AND APPLICATIONS SUPPORT

Avantor has deep expertise in process chromatography optimization and can work with you to help ensure that the BAKERBOND® PROchievA™ affinity chromatography resin delivers the improved performance you need in your protein A purification step. Technical support from our scientists and application specialists is available from our multiple global research and innovation centers.

**Contact your Avantor sales representative to learn more about J.T.Baker® BAKERBOND® PROchievA™ chromatography resin or other BAKERBOND® resins.**

## KEY APPLICATION INFORMATION

| | |
|---|---|
| **Functionality** | IgG antibody and Fc-fusion protein capture |
| **Functional Group** | Recombinant protein affinity ligand for IgG antibodies |
| **Dynamic Binding Capacity** | >65mg hIgG/mL at 8 minutes residence time[1] |
| **Average Particle Size** | 70–80 µm |
| **Binding Buffers** | HEPES, PBS, Tris |
| **Binding pH Range** | 7.0–8.0 |
| **Elution pH Range** | 3.0–4.4 |
| **Cleaning pH Range** | 11.0-14.0 |
| **Shipping Stability** | 200 mM sodium acetate, 2% alcohol, 2% benzyl alcohol, 2–8°C |

[1] Dynamic binding capacity was determined at 10% breakthrough.

# Designed for high-performance

### J.T.BAKER® BAKERBOND® PROCHIEVA™ RECOMBINANT PROTEIN A RESIN, AFFINITY CHROMATOGRAPHY COLUMNS, AVANTOR

### OFFERS SUPERIOR DYNAMIC BINDING CAPACITY WITH EXCELLENT ALKALINE STABILITY LINKED TO AVANTOR'S PROPRIETARY LIGAND

The new protein A resin is designed for high-performance in the critical affinity chromatography step used in the purification of mAbs, Fc fusion proteins, and other similar IgG-like molecules.

Designed and manufactured by Avantor to the high standards established for our J.T.Baker® brand chemicals, BAKERBOND® PROchievA™ recombinant protein A resin can be used with other J.T.Baker® BAKERBOND® resins to enhance the separation power of your chromatography process steps.

| Description | Capacity | Cat. No. |
|---|---|---|
| BAKERBOND® PROchievA™ protein A resin, lab column, box of 1 | 1 ml | **JTC789-11** |
| BAKERBOND® PROchievA™ protein A resin, lab column, box of 5 | 1 ml | **JTC789-07** |
| BAKERBOND® PROchievA™ protein A resin, lab column, box of 1 | 5 ml | **JTC789-18** |
| BAKERBOND® PROchievA™ protein A resin, lab column, box of 5 | 5 ml | **JTC789-25** |

| Description | Pack Size | Particle Size | Cat. No. |
|---|---|---|---|
| **Accessories** | | | |
| BAKERBOND® PROchievA™ protein A resin | 25 ml | FIO (Target 68µm-78µm) | **JT7899-01** |
| BAKERBOND® PROchievA™ protein A resin | 100 ml | FIO (Target 68µm-78µm) | **JT7899-02** |

For additional pack sizes, please contact your VWR sales rep.

# Lightweight convenience

## VWR® 200 HOMOGENIZER

### HOMOGENIZE SAMPLES WITH VOLUMES AS SMALL AS 0.03 ML, OR AS LARGE AS 1L

- Lightweight handheld homogenizer unit
- For processing within various tube sizes to small beakers
- High-torque motor with variable speed adjustment of 5000 to 33,000 rpm
- Use handheld unit or post mount to a stand
- VWR® Generator probe sold separately

The VWR® 200 Homogenizer unit has a 144 watt, high-torque motor with variable speed adjustment, allowing for homogenization in mere seconds and a maximum noise level of only 68dB


| Description | Electrical | Volume Range | Speed Range | Cat. No. |
|---|---|---|---|---|
| **Homogenizer** | | | | |
| VWR® 200 Homogenizer | 120V | 0.5 mL Tube to 1L ($H_20$) | Analog: 5000–35,000 rpm (with Separate ON/OFF Switch) | **10032-336** |

| Description | For Use With | Cat. No. |
|---|---|---|
| **Accessories** | | |
| VWR® Flat-Bottom Generator Probe, 5×75 mm | For 0.5 - 2 mL Tubes, Model 200; 250; 15D; 25D | **10032-562** |
| VWR® Saw-Tooth Generator Probe, 7×95 mm | For 1.5 - 10 mL Tubes, Model 200; 250; 15D; 25D | **10032-566** |
| VWR® Open-Slotted Generator Probe, 30×200 mm | For Large Beakers and Containers, Model 250; 300D; 400D; 25D | **10032-574** |

VWR LIFE SCIENCE

## Effective and convenient

### VWR LIFE SCIENCE PROTEASE INHIBITOR COCKTAILS

- Effectively preserves the native state of proteins
- Convenient 100X concentration, except for 97063-082 which is 20X

| Description | Size | Application | Cat. No. |
|---|---|---|---|
| Protease Inhibitor Cocktail, General Use | 1 mL | Contains a mix of protease inhibitors: AEBSF, Aprotinin, E-64, Bestatin and Leupeptin | **97063-970** |
| Protease Inhibitor Cocktail, General Use, with EDTA | 1 mL | Contains a mix of protease inhibitors: AEBSF, Aprotinin, E-64, Bestatin and Leupeptin | **97063-972*** |
| Protease Inhibitor Cocktail, Mammalian | 1 mL | Contains protease inhibitors for mammalian cell use: AEBSF, Aprotinin, E-64, Bestatin, Leupeptin and Pepstatin | **97063-010** |
| Protease Inhibitor Cocktail, Plant | 1 mL | Contains a mix of protease inhibitors: AEBSF, E-64, Bestain, Pepstatin, Leupeptin and 1, 10-Phenanthroline | **97065-102*** |
| 20X Protease Inhibitor Cocktail, Bacterial | 5 mL | Contains a mix of protease inhibitors: AEBSF, E-64, Bestain, Leupeptin and EDTA Disodium Dihydrate | **97063-082*** |

*These products are not available in Canada. Please contact your Avantor Life Science Specialist for information about similar products available in your region.

LGC BIOSEARCH™ TECHNOLOGIES
GENOMIC ANALYSIS BY LGC

## Highly specific cysteine protease to remove affinity tags

### SelecTEV™ PROTEASE, BIOSEARCH TECHNOLOGIES

**A 27 KD IMPROVED FORM OF TOBACCO ETCH VIRUS (TEV) PROTEASE ENGINEERED TO BE MORE STABLE, ACTIVE, AND SPECIFIC THAN THE NATIVE PROTEASE**

SelecTEV™ Protease can be used with the Expresso® Solubility and Expression Screening System vectors, which contain a TEV cleavage recognition site.

For research use only. Not for human or diagnostic use.

| Description | No. of Reactions | Cat. No. |
|---|---|---|
| SelecTEV™ Protease | 1,000 U | **10769-114** |
| SelecTEV™ Protease | 5,000 U | **10769-116** |

# Compact footprint

## VWR® POWER SUPPLY

### IDEAL FOR BASIC ELECTROPHORESIS APPLICATIONS

- Compact footprint, takes up minimal lab space
- 500 V/400 mA, 120 W maximum output
- 300 V/2000 mA, 300 W maximum output
- Ideally suited for vertical protein gels

The color touchscreen control panel is easy to use, allowing setting of voltage, amperage and run time. Four sets of output jacks allow connection of multiple electrophoresis tanks.


| Description | Voltage | Power | Cat. No. |
|---|---|---|---|
| **115 VAC Unit** | | | |
| VWR® Power Supply | 10 - 500 V | 120 W | **76196-454** |
| VWR® Power Supply | 10 - 300 V | 300 W | **76196-458** |
| **230 VAC Unit** | | | |
| VWR® Power Supply | 10 - 500 V | 120 W | **76196-456** |
| VWR® Power Supply | 10 - 300 V | 300 W | **76196-460** |

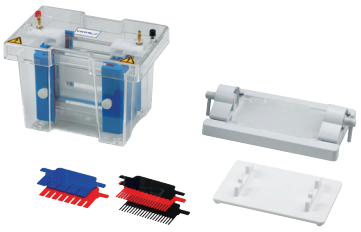
VWR LIFE SCIENCE

## Vertical electrophoresis tank for running up to four gels

### VWR® MINI VERTICAL PAGE SYSTEM

### IDEAL FOR PROTEIN ELECTROPHORESIS, IEF, AND BLOTTING

- Can run up to four gels
- Inserts for each application
- Electrode assembly for each insert
- Common buffer tank



The system features inserts for each application and a common buffer tank.

All spacers and combs are color-coded or labeled to indicate thickness. The 8- and 16-tooth combs are designed for multi-channel pipettor loading.

| Description | Buffer Volume | Cat. No. |
|---|---|---|
| Mini Vertical PAGE System | 250 mL | **89032-300** |

VWR

## Visualize your proteins easily and quickly

### COOMASSIE® BRILLIANT BLUE G-250, PROTEOMICS GRADE

**CAS 6104-58-1**
**$C_{47}H_{48}N_3NaO_7S_2$**
**Boiling Pt:**
**Flash Pt:**

**M.W.** 854,04 g/mol
**Density:** >1 g/cm$^3$ (20 °C)

| Size | Packaging | Cat. No. |
|---|---|---|
| 10 g | Amber Bottle | **97063-850** |
| 25 g | Amber Bottle | **97063-852** |
| 50 g | Amber Bottle | **97063-854** |

analytikjena
An Endress+Hauser Company

# Next generation of gel and blot imagers

## UVP CHEMSTUDIO PLUS IMAGING SYSTEMS, ANALYTIK JENA

### OFFERING 2 DIFFERENT CAMERA OPTIONS AND AN UPGRADABLE PLATFORM FOR NIR IMAGING THAT CAN MEET EVERY APPLICATION NEED


- Take images of the highest quality with deep cooling, efficient photon-to-signal conversion and high performance cameras
- Camera options include either the highest resolution 8.1MP camera or the exceptionally sensitive 3.2MP camera
- Wide aperture lens optics, capture more light in low-light applications (signals come faster and are stronger; this guarantees extremely fast image capture)
- Available as either a PC-operated unit or as a stand-alone instrument with an integrated color touchscreen
- Overhead white, green, red and blue LEDs come as standard in the series
- Includes Ethidium Bromide emission filter in an easy-to-access filter wheel with up to five positions
- Includes unlimited copies of VisionWorks® Software, with comprehensive features, optimizes image acquisition and analysis
- Unmodified raw data is collected, giving users the choice of applying image enhancement tools

The UVP ChemStudio systems were built with flexibility in mind, providing RGB detection as standard. These Chemiluminescent imaging systems offer high-resolution and sensitive imaging of gels, western blots, colorimetry, fluorescent westerns, NIR, colony plates, plants, IR dyes, and a wide range of fluorescent dyes. No matter your preferred research method, the UVP ChemStudio product family was built to streamline your protocol from detection to analysis, providing the most accurate quantitation of data for an unlimited range of applications.

Each UVP ChemStudio system comes with a 302 nm UV transilluminator and overhead RGBW LEDs as standard enabling a wide scope of fluorescent and nonfluorescent imaging applications. Optional NIR laser modules with excitation wavelengths of 660 nm and 787 nm are available to allow multiplex lighting for IR1 and IR2. The included Ethidium Bromide emission filter allows for imaging of the most common applications; additional filters are available for extended applications.

| Description | Electrical | Darkroom Configuration | Camera | Cat. No. |
|---|---|---|---|---|
| **115 V Units** | | | | |
| UVP ChemStudio PLUS 615 | 115 V | Slide2Hide Door | 3.2 MP 615 Camera, Automated 25 mm f/0.95 lens | **76307-478** |
| UVP ChemStudio PLUS touch 615 | 115 V | Slide2Hide Door and 15.6" Integrated Multi-touch Computer | 3.2 MP 615 Camera, Automated 25 mm f/0.95 lens | **76307-474** |
| UVP ChemStudio PLUS 815 | 115 V | Slide2Hide Door | 8.1 MP 815 Camera, Automated 42.5 mm f/0.95 lens | **76208-584*** |
| UVP ChemStudio PLUS touch 815 | 115 V | Slide2Hide Door and 15.6" Integrated Multi-touch Computer | 8.1 MP 815 Camera, Automated 42.5 mm f/0.95 lens | **76208-582*** |

*These products are coming soon to Canada. Please contact your Avantor Life Science Specialist for information about availability or similar products available in your region.

ZYMO RESEARCH
*The Beauty of Science is to Make Things Simple*

# Isolate and purify with ready-to-use columns

## HIS-SPIN PROTEIN KITS, ZYMO RESEARCH

### A METHOD FOR FAST HIS-TAGGED PROTEIN PURIFICATION

- Fast (5 minute) method for the purification of His-tagged proteins from cell free extracts
- Screen bacterial colonies directly on the basis of protein expression vs. plasmid DNA
- No special instrumentation is required other than a benchtop microcentrifuge

The His-Spin Protein Miniprep™ provides researchers with a method for fast His-tagged protein purification. The easy-to-follow procedure is based on a nickel-charged His-Affinity Gel (IMAC), innovative protein purification, and unique Zymo-Spin™ Column technology. Up to 1 mg of His-tagged protein can be purified in as little as 5 minutes and can be eluted into as little as 100 µL of the provided His-Elution Buffer. The purified protein can be used directly for enzymatic assays, protein biochemical analyses, SDS-PAGE, as well as other protein based applications.


| Description | Size | Cat. No. |
|---|---|---|
| His-Spin Protein Miniprep™ | 10 Preps | **77001-992** |
| His-Spin Protein Miniprep™ | 50 Preps | **77001-994*** |
| His-Affinity Gel | 14 mL | **77001-996*** |

*These products are coming soon to Canada. Please contact your Avantor Life Science Specialist for information about availability or similar products available in your region.

Agilent Technologies

# Immunoaffinity depletion of high abundant proteins

## MULTIPLE AFFINITY REMOVAL SYSTEM, AGILENT TECHNOLOGIES

### EASILY ISOLATE AND IDENTIFY PROTEINS

To more easily isolate and identify proteins in biological samples, such as serum, plasma, and cerebrospinal fluid (CSF), the Agilent Multiple Affinity Removal System is designed to chromatographically eliminate interfering high-abundance proteins from biological samples.

| Featured MARS Column | Cat. No. |
|---|---|
| Hu-14, 4.6 x 100 mm | **76193-636** |

| Description | Size | Cat. No. |
|---|---|---|
| **Components** | | |
| Multiple Affinity Removal Reagent Kit | | **76204-928** |
| Multiple Affinity Removal Buffer A | 1 l | **76204-926** |
| Multiple Affinity Removal Buffer B | 1 l | **76204-924** |
| Human Serum Albumin | 1 ml, 20 mg/ml | **76204-922** |
| Spin filters for Gel Matrix | 0.22 µm | **76204-920** |
| Spin Concentrators | 4 ml | **76204-918** |

Additional column and spin cartridge formats available. Please contact your Avantor Life Science Specialist for assistance in choosing the best column for your application

# Easily isolate MBP-tagged proteins with reusable resin


### AMYLOSE RESIN, NEW ENGLAND BIOLABS

**AFFINITY MATRIX USED FOR ISOLATION OF PROTEINS FUSED TO MALTOSE-BINDING PROTEIN**

- Highly specific binding of protein of interest fused to MBP allows for one-step purification
- MBP is easily removed from the protein of interest by Factor Xa Protease
- Binding capacity of >4mg MBP5*-paramyosin ΔSal fusion protein/ml amylose resin
- Can be used multiple times and can be regenerated

Amylose resin is an affinity matrix used for the isolation of proteins fused to maltose-binding protein (MBP). It is intended for use in a gravity flow column

| Description | Pack Size | Type | Cat. No. |
|---|---|---|---|
| Amylose Resin | 15 mL | Liquid | **101227-544** |
| Amylose Resin | 100 mL | Liquid | **101227-542** |

# Purify or desalt your protein

### VWR® CENTRIFUGAL FILTERS

- Polypropylene housing
- Membrane options available

Filter housings are constructed of polypropylene and are available with a polyethersulfone (PES) or nylon membrane.

Filters with nylon membrane are ideal for prefiltration clean-up of large agarose or acrylamide gel debris prior to further purification with an MWCO device.

| MWCO | Pore Size | Color | Cat. No. |
|---|---|---|---|
| **Polyethersulfone (PES) Membrane** | | | |
| 3K | — | Gray | **82031-344** |
| 10K | — | Blue | **82031-348** |
| 30K | — | Red | **82031-354** |
| **Nylon Membrane** | | | |
| — | 0.2 µm | Aqua | **82031-356** |
| — | 0.45 µm | Berry | **82031-360** |

PALL Laboratory

# A new, innovative process for clarifying and sterile filtering cells for protein purification workflows

Centrifugation and filtration have been widely accepted as techniques required for clarifying complex cell cultures to recover extracellular proteins such as monoclonal antibodies (mAbs). However, these steps can be time consuming and costly for labs growing their cultures in 24-well plates. This scientific brief offers an alternative to the use of centrifugation/filtration/flocculation to clarify and sterilize mammalian cell cultures. It describes an assessment of a new 24-well clarification and sterile filtration plate and a 24-well sterilization-only filter plate for the recovery of proteins present in the supernatant.

## THE PROBLEM

In recent years, biopharmaceutical research processes have demonstrated major improvements in the quality and recovery of mAbs, which to an extent have been associated with culturing the expressing cell lines at high cell densities. This work has generated a great challenge in cell clarification, sterilization, and further downstream processing. These processes must remove large amounts of biomass and increased levels of contaminating cell debris generated during cell culture and harvesting.[1]

Traditionally, centrifugation and a combination of filtration methods have been widely accepted as techniques required for clarifying complex suspension cell cultures. Following cell culture, laboratory users manually move their samples to a centrifuge for clarification. The centrifugation process typically requires about 20 minutes. After centrifugation, the user has to recover the clarified supernatant from each sample and filter the protein product of interest through use of a sterile 0.2 µm a sample, some laboratories will process the samples through a 0.45 µm sterilizing-grade membrane does not clog.

In all, this time consuming and tedious manual workflow often requires more than 1 hour to process a single 24-well plate. In addition, it adds significant variability to the process. Each additional step in the clarification and sterilization process costs time and leads to increased sample loss due to adding hold-up volumes and reductions in protein recovery. Additionally, every additional step increases the potential for mistakes, lost samples, and process error.

Regardless of the cell line development path taken, the use of 24-well culture plates for growth is often a pivotal part of the process. Attempts are now being made to reduce costs, processing times, and errors. This is achieved by continuous optimization of the cell clarification and sterilization steps to increase the yield of antibodies and proteins per volume of culture.

## NEW TECHNOLOGY COMBINES CELL CLARIFICATION AND STERILIZATION IN ONE STEP

Cell growth in a 24-well plate presents challenges for fast and efficient clarification and sterilization of the proteins of interest. To help streamline protein purification workflows, new technology has been developed that employs a 24-well, multi-layer filter plate combining the cell clarification and sterile filtration functions.

The plate incorporates a top layer with a depth filter that efficiently clarifies the culture through capture of whole cells and removal of large cellular debris. A lower layer consisting of a dual 0.65/0.2 µm Supor® EKV membrane provides high-performance sterile filtration. With either a vacuum manifold or a centrifuge, high-density cell cultures (such as CHO or HEK) can be quickly processed resulting in the capture of cells, cell debris, and other aggregates in the filter media. This filter combination effortlessly recovers proteins from whole cell cultures of up to 25M+ cells/mL. The filter plate consolidates two or more separate processes (clarification and sterilization) into one workflow step that can be completed in less than 20 minutes. Subsequently, the samples can be moved downstream for analysis or purification. As an additional benefit, the cell clarification and sterilization filtration plates use seven times less plastic consumables by weight than traditional forms of recovery — significantly reducing disposal costs and environmental burden.

## 24-WELL FILTER PLATE DESIGNED FOR WORKFLOWS REQUIRING ONLY STERILE FILTRATION

A companion 24-well filter plate is now available for use in general sterile filtration workflows where only sterile filtrate is required. This filter plate is well suited for high-volume (up to 7 mL) plate-based sterile filtration needs such as media, reagent, serum, or proteins. This plate features an upstream 0.65 µm membrane integrated with a downstream highly asymmetric 0.2 µm membrane for fast and efficient sterile-grade filtration.

## FURTHER INFORMATION AND APPLICATIONS

Both of the previously discussed 24-well filter plates are gamma-irradiated, automation friendly, and compatible with centrifugation and vacuum manifold workflows. For laboratories that do not have a centrifuge adapter, a vacuum manifold can be substituted as a lower-cost option. Both plates come individually bagged and include a collection plate and lid.

These innovative filter plate technologies can be applied to a variety of cell culture and protein purification workflows, including clone selection and candidate analysis, cell expansion studies, recombinant protein isolation prior to analysis, cell clarification, process optimization, and sterile filtration.

## RESULTS AND DISCUSSION

Testing was conducted to determine the performance of the 24-well clarification and sterilization filter plate and the 24-well sterile filtration plate.

The data in Table 1 are the average of the data collected with the high-density CHO cell cultures.

The data shows that the 24-well filter plates behaved similarly when used under vacuum or centrifugation, with respect to parameters such as media pH, conductivity, optical density, and protein recovery. The pH and conductivity of the samples were in a similar range before and after filtration through the 24-well

| 5 mL Concentrated CHO cell culture at 26 Million Cells/mL Upstream | Upstream Culture | Downstream Filtrate (Vacuum: 15 inHg) | Downstream Filtrate Centrifugation: 1,000 x g) |
|---|---|---|---|
| Processing Time (trapped in filter) | – | 20.2 ± 6.3 min | 15 min |
| Hold-up Volume | – | 300 – 450 µL | 400 – 450 µL |
| pH | 7.2 | 7.3 | 6.8 |
| Conductivity (µS/cm) | ≈ 10,100 | ≈ 9,200 | ≈ 9,800 |
| Turbidity (NTU) | ≈ 1,900 - 2,600 | ≈ 1.8 | ≈ 2.4 |
| Optical Density at 600 nm | ≈ 18 - 19 | 0 | 0 |
| Total Protein Recovery (%) | – | 98.3 ± 8.2 | 95.4 ± 11.4 |
| IgG Recovery (%) | – | 91.3 ± 11 | 85.0 ± 6.9 |

**TABLE 1:** Parameters recorded for the CHO cell culture with a concentration of 2.6 x 107 CHO cells/mL and processing with the 24-well clarification and sterilization filter plate.

| Step | Initial Culture | Clarification | Filtration Supernatant (0.2 µm filter) | |
|---|---|---|---|---|
| Plate | – | 24-well Depth + EKV | 24-well EKV | |
| Material (HEK 293T cell culture/ supernatant) | HEK293T at 2 – 4 million cells/mL (Upstream) | HEK293T cell culture at 2 million cells/ mL (Upstream) | Supernatant of HEK293T cell culture at 4 million cells/mL (Upstream) | |
| Sample | Upstream culture | Downstream filtrate (Vacuum: 7 mL/15 inHg) | Downstream filtrate (Vacuum: 7 mL/15 inHg) | Downstream filtrate (Centrifugation: 6 mL, 1,000 x g/5 min) |
| Processing Time | – | 4.3 ± 0.4 min | 2.7 ± 0.7 min | 5.0 min |
| pH | 7.1 – 7.6 | 7.2 | | |
| Conductivity (µS/cm) | ≈ 10, 836 | ≈ 10,906 | | |
| Turbidity (NTU) | ≈ 81 – 226 | ≈ 0.91 | | |
| Optical Density at 600 nm | ≈ 1.3 – 2.0 | 0.001 | | |
| Total Protein Recovery (%) | – | 101.2 ± 0.4 | 101.2 ± 1.0 | 99.4 ± 1.0 (Max of 5.4 mg total protein) |

**TABLE 2:** Parameters recorded for the HEK293T cell cultures at 2 – 4 x 106 cells/mL and processing with the 24-well clarification and sterilization filter plate and the 0.2 µm sterile filtration plate, respectively.

plates for both the CHO cell culture (Table 1) and the HEK293T culture (Table 2), indicating that none or negligible amounts of filtering media material were released downstream to the filtered samples. The removal of cells can also influence the pH and conductivity, but the effect was not observed here.

The turbidity and optical density showed that after filtration of the mammalian cell cultures or supernatant of the HEK293T culture, the filtrates obtained with both 24-well filter plates contained clarified media with minimal breakthrough.

For the protein recovery, it was observed that > 95% of the overall total proteins from the CHO or HEK293T cell cultures were recovered when 24-well plates were used.

The IgG recovery was lower than for the total proteins when the CHO cell cultures were used. The most likely cause for this is differences in the methods of detection used, or potentially from damage to the CHO cells during the initial concentration of the cell culture.

## CONCLUSION

This study's objective was to assess the efficiency of the 24-well, multi-layer clarification and sterile filtration plate and the 24-well sterile filtration plate when used with mammalian cell suspensions. High-density CHO cell suspension, artificially concentrated, and HEK293T cell cultures were used with the 24-well filter plates processed by vacuum or centrifugation.

The data indicates that both processes performed equivalently. The suitability of the 24-well plate for the clarification of mammalian cell cultures, in particular for high-density CHO cells (up to 2.6 x $10^7$ cells/mL) and HEK293T cells (up to 4 x $10^6$ cells/mL), was demonstrated. Total protein recovery (from ≈ 5 to 10 mg initial total proteins) was determined to be greater than 95% with the 24-well plates regardless of the plate type used.

These tests demonstrated that the new filter plates achieved high recovery rates and low hold-up volumes. Reductions in handling and filtration steps reduces the risk of protein loss and improves workflow efficiency. The proteins were filtered from cell cultures in less time and with fewer workflow steps than traditional protein purification workflows.

Our study indicated that the performance of these new 24-well filter plates is commensurate with the traditional cell clarification and sterilization technologies available on the market and can now be completed in less time and with less steps.

## REFERENCES

1. Identification and tracking of problematic host cell proteins removed by a synthetic, highly functionalized nonwoven media in downstream bioprocessing of monoclonal antibodies. 2019. Journal of Chromatography A, 1595, pp 28-38.

# Rapid, efficient concentration of proteins and nucleic acids

## MACROSEP® ADVANCE CENTRIFUGAL DEVICES, PALL LABORATORY

### QUICKLY CONCENTRATES UP TO 20 ML OF BIOLOGICAL SAMPLE WITHOUT VALUABLE SAMPLE LOSS

- Available with low protein-binding Omega™ and Supor® (PES) membranes
- Omega modified PES membranes come in a wide range of MWCOs, color-coded for easy identification and result in typical recoveries of >90%
- Supor (PES) membranes come in 0.45 and 0.2µm pore sizes for a wide variety of microfiltration applications
- Ultrasonically welded seals prevent bypass or seal failure


| MWCO | Color | Pore Size | Cat. No. |
|---|---|---|---|
| **Omega membrane** | | | |
| 1K | Yellow | | **89233-882** |
| 3K | Gray | | **89131-974** |
| 10K | Blue | | **89131-980** |
| 30K | Red | | **89131-986** |
| 100K | Clear | | **89131-992** |
| **Supor membrane** | | | |
| | Aqua | 0.2 µm | **89131-996** |
| | Wildberry | 0.45 µm | **89132-000** |

# Lab-scale tangiental flow filtration - complete solution

## MINIMATE™ EVO TANGENTIAL FLOW FILTRATION SYSTEM AND CAPSULES, PALL LABORATORY

### REUSABLE TFF DEVICES AND SYSTEM FOR BIOPROCESSING APPLICATIONS ACCELERATES AND SIMPLIFIES PROCESSING OF UP TO 1 L

- High product recovery
- Minimal sample loss
- Greater efficiency
- Gentle processing

| Description | Electrical | MWCO | Cat. No. |
|---|---|---|---|
| **Tangential Flow Filtration Systems** | | | |
| EVO Tangential Flow Filtration System | 110 to 230 VAC | | **76409-724** |
| **Tangential Flow Filtration Capsules** | | | |
| Minimate Capsule with Omega Membrane | | 1K | **29301-900** |
| Minimate Capsule with Omega Membrane | | 3K | **29301-902** |
| Minimate Capsule with Omega Membrane | | 5K | **29301-904** |
| Minimate Capsule with Omega Membrane | | 10K | **29301-908** |
| Minimate Capsule with Omega Membrane | | 30K | **29301-910** |
| Minimate Capsule with Omega Membrane | | 50K | **29301-912** |
| Minimate Capsule with Omega Membrane | | 70K | **29301-914** |

# Innovative and flexible design features

### SpectraDrop™ PLATE SYSTEMS, MOLECULAR DEVICES

**OFFERS A HIGH THROUGHPUT AND ACCURATE SOLUTION FOR LOW VOLUME MEASUREMENT**

- High throughput
- Innovative design
- Accelerated sample prep
- Increased productivity

Innovative and flexible design features enable accelerated sample preparation time and increased laboratory productivity of DNA, RNA, and protein samples as low as 2 µL

The SpectraDrop™ Micro-Volume Plate incorporates a specially designed adapter and slide pair providing uniform multi-sample assembly.

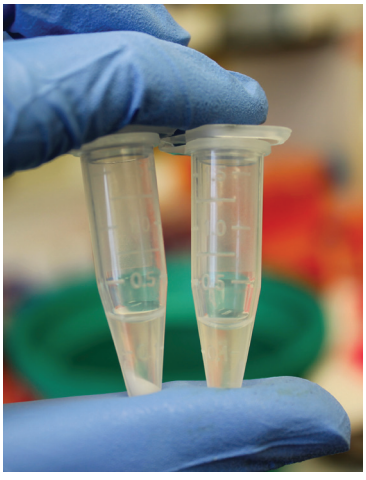
| Description | Sample Capacity | Cat. No. |
|---|---|---|
| SpectraMax® 190 UV/VIS Absorbance Reader with SpectraDrop™ Micro-Volume Starter Kit and SoftMax Pro Software | 24 x 2 µL Samples | **89230-746** |
| SpectraMax® Plus 384 UV/VIS Absorbance Reader with SpectraDrop™ Micro-Volume Starter Kit and SoftMax Pro Software | 24 x 2 µL Samples/Cuvettes | **89230-748** |
| SpectraMax® Plus 384 UV/VIS Absorbance Reader with SpectraDrop™ Micro-Volume HTS Kit and SoftMax Pro Software | 64 x 2 µL Samples/Cuvettes | **89230-750** |

# Keep your protein, lose everything else

### SALT ACTIVATED NUCLEASE, VWR

**A VERY ACTIVE, NON-SPECIFIC ENDONUCLEASE FROM PICHIA PASTORIS THAT CLEAVES DOUBLE- AND SINGLE-STRANDED DNA AND RNA**

US ONLY



- Store frozen (-20 – 0°C)
- Stable 6 months stored cold (2 – 8°C) and two years frozen (-20 – 0°C)
- SAN tolerates multiple freeze-thaws

It is active at above neutral pH (optimal pH 8.5) over a wide temperature range (10- 40°C), and unlike other nucleases it has optimum activity at high concentrations of salt (0.5M NaCl). SAN is ideal for use in removal of DNA and RNA from cell extracts and protein samples. Thus, it is very useful in recombinant protein purifications.

| Description | Size | Cat. No. |
|---|---|---|
| Salt Activated Nuclease | 5KU | **10147-170** |

This product is not available in Canada. Please contact your Avantor Life Science Specialist for information about similar products available in your region.

# Active microbial air sampling

## TRIO.BAS™ DUO KITS, HARDY DIAGNOSTICS

### INTRODUCING THE NEXT GENERATION OF MICROBIAL AIR SAMPLERS FOR VIABLE PARTICLES


- Two aspirating heads with easy manipulation bayonet closure
- Ability to use two different culture media at the same time
- Save sampling time by doubling the aspirated volume of air

All of the air samplers are lightweight, with an antibacterial techno-polymer shockproof body. They have a long lasting battery and are IP65 protected from dust and water.

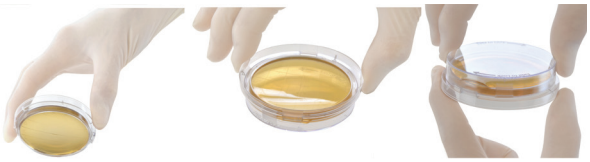
Per USP 797, "Impaction is the preferred method of active air sampling. Use of settling plates for qualitative air sampling cannot be relied upon and shall not be used solely to determine the quality of air in the controlled environment."

| Description | Flow Rate | Head Type | Cat. No. |
|---|---|---|---|
| **Trio.Bas™ DUO Kits** | | | |
| Trio.Bas™ DUO Kit | 100 L/Min. | Contact Plate | **76076-708** |
| Trio.Bas™ DUO Kit | 100 L/Min. | Petri Plate | **76169-646** |
| Trio.Bas™ DUO Kit | 200 L/Min. | Contact Plate | **76076-710** |
| Trio.Bas™ DUO Kit | 200 L/Min. | Petri Plate | **76169-648** |

# Sterile contact plates for environmental monitoring

## Lok-Tight™ SABDEX (SABOURAUD DEXTROSE) AGAR WITH LECITHIN AND TWEEN® 80, HARDY DIAGNOSTICS

### IRRADIATED, TRIPLE BAGGED CONTACT PLATE WITH FRICTION LID HELPS TO ENSURE STERILITY IN YOUR ENVIRONMENTAL TESTING PROGRAM



- Sterile by irradiation - Validated for a Sterility Assurance Level of $10^{-6}$
- Triple bagged, two nylon inner bags and one outer Mylar® bag that is heat sealed
- Tear notch on outer bag for easy opening; no scissors required
- New moisture control packaging format prevents moisture buildup and ensures safe and sterile transfer

| Description | Storage Temperature | Packaging | Cat. No. |
|---|---|---|---|
| Lok-Tight™ Sabdex (sabouraud Dextrose) Agar with Lecithin and Tween® 80, Irradiated, Triple Bagged, Contact Plate, Friction Lid | — | 15×65 mm CP | **76200-284** |
| Lok-Tight™ D/E Neutralizing Agar, Irradiated, Triple Bagged, USP, Contact Plate, Friction Lid, Optional Locking Feature | | 15×65 mm CP | **76200-278** |
| Lok-Tight™ Tryptic Soy Agar (TSA), with Lecithin and Tween® 80, USP, Irradiated, Triple Bagged, Contact Plate, Friction Lid, Optional Locking Feature | — | 15×65 mm CP | **76200-280** |
| Tryptic Soy Agar (TSA), with Lecithin and Tween® 80, USP, Irradiated, Triple Bagged, Red Tinted Contact Plate | — | 15×65 mm CP | **76200-282** |

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