

# VWR BIOPROCESSING SOLUTIONS

## **Enabling Your Process with Innovative Choice**

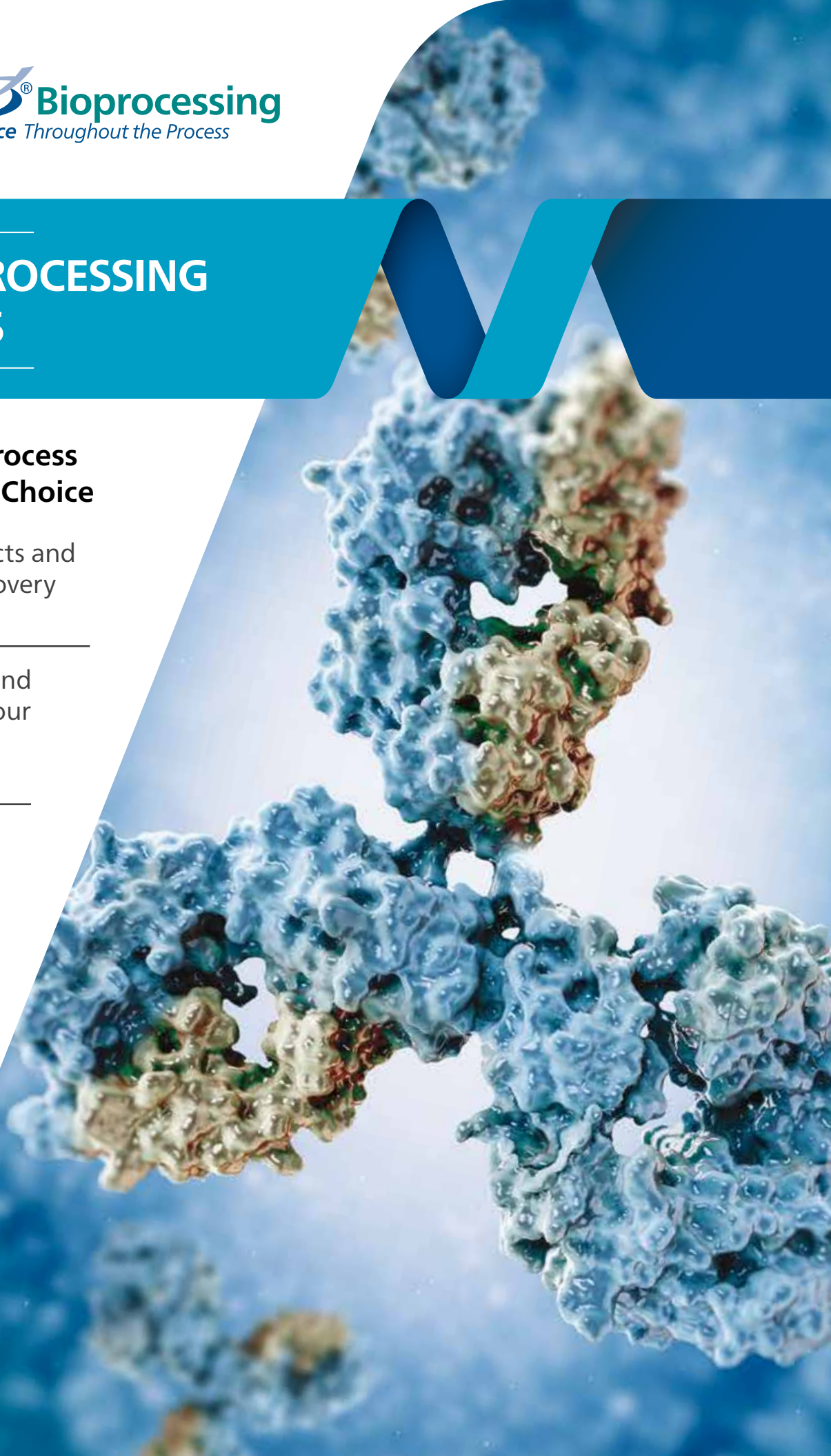
Dependable products and  
expertise from discovery  
to manufacturing

---

Ensure the quality and  
reproducibility of your  
biomanufacturing  
process

---

Reliable and  
transparent supply  
chain resources



---

# VWR BIOPROCESSING SOLUTIONS

ENABLING YOUR PROCESS WITH  
INNOVATIVE CHOICE

---



VWR has solutions to address your needs as you manufacture your biologic of interest during upstream, downstream and final fill steps.

Achieving maximum cell density and productivity goals in your bioreactor, capturing and purifying the desired protein, and dispensing the formulated protein in its patient-ready configuration are not mutually exclusive objectives. **Each stage of bioprocessing is influenced by the steps preceding it.**

VWR's team of industry and technical experts understand these holistic influences and can help identify solutions that will meet your needs through product choice, operational excellence, and differentiated services.



### PRODUCT CHOICE

- Unbiased Selection
- Raw, Direct & Indirect Materials
- Evolving & Expanding Catalog
- Process-Focused Solutions



### OPERATIONAL EXCELLENCE

- Global Reach with cGMP-Certified Warehouses & cGMP Manufacturing Facilities
- Enhanced Customer Analytics
- Dedicated Critical Materials Management Resources
- Sourcing & Management to Mitigate Risk



### DIFFERENTIATED SERVICES

- Custom Chemical Manufacturing that Scales to Your Needs
- **VWRCATALYST** Facility Support
- Single-Use Solutions
- Customized Technology Solutions

## PRODUCT CHOICE



## UPSTREAM & CELL CULTURE

### Enabling Your Scale-up with the Right Products and Quality Requirements

Whether your expressions system is prokaryotic (bacteria) or eukaryotic (mammalian, yeast), the biochemicals, supplements, and equipment we provide to grow organisms meet required quality and performance parameters that allows seamless transfer from R&D to pilot scale and onto manufacture scale.

- VWR Life Science Seradigm
- Fermentation Media & Additives
- Biological Buffers
- Inorganic Salts
- Sugars & Carbohydrates
- Proteins & Amino Acids
- Cell Culture Vessels
- Work Stations & CO<sub>2</sub> Incubators

### Production Biochemicals

VWR’s portfolio of production biochemicals can fulfill requirements for upstream applications. Outlined below you will find a table intersecting key suppliers by upstream bioprocessing application, representing structured product choice within VWR’s Production Chemicals for primary and secondary qualification.

|                                    | VWR Bioprocess Chemicals | VWR Life Science Seradigm | Avantor | BD | Decon Lab, Inc | Millipore Sigma | HIMEDIA | Honeywell | Macco | Encore Scientific | Puritan Products | Spectrum | Rocky Mountain Biologicals |
|------------------------------------|--------------------------|---------------------------|---------|----|----------------|-----------------|---------|-----------|-------|-------------------|------------------|----------|----------------------------|
| <b>Upstream &amp; Cell Culture</b> |                          |                           |         |    |                |                 |         |           |       |                   |                  |          |                            |
| Biological Buffers                 | x                        |                           | x       |    |                | x               |         |           |       |                   |                  |          |                            |
| Carbohydrates                      | x                        |                           | x       |    |                | x               |         |           |       |                   |                  |          |                            |
| Inorganic Salts                    | x                        |                           | x       |    |                | x               |         | x         | x     |                   |                  |          |                            |
| Media and Additives                | x                        | x                         |         | x  |                |                 | x       |           |       | x                 |                  |          | x                          |
| Proteins and Amino Acids           | x                        |                           |         | x  |                |                 | x       |           |       | x                 |                  |          | x                          |
| Other Materials                    | x                        | x                         | x       |    | x              | x               |         | x         | x     | x                 | x                | x        | x                          |

### VWR Single-Use Solutions

We provide state-of-the-art mixing vessels, liquid holding and dispensing bags, and custom-assembled sterile tubing and connectors designed to deliver fluid from mixing vessels to your seed bioreactors, then to the production-scale bioreactor, and onto protein capture, clarification, and concentration.

Our capabilities in the custom single-use transfer and collection assemblies include:

- Buffer & Media Transfer
- Sterile Fluid Connections
- Bioreactor Feed & Harvest
- 2D and 3D Bag Assemblies, Mixing Bags & Tank Liners

## PRODUCT CHOICE



## DOWNSTREAM & FINAL FILL

### Recovery and Purification Throughout the Filtration Steps and Ensuring Protein Stability, Solubility, and Bioavailability

We understand that quality and stability of your target protein must be maintained during the sequential purification steps of your process. VWR's portfolio of buffers and salts meet the quality and performance required to maintain protein attributes, and are available in powder form to allow preparation of solutions at concentrations defined during development or final buffer formulation.

- Biological Buffers
- Inorganic Salts
- Sugars & Carbohydrates
- Proteins & Amino Acids
- Excipients
- Chromatography Resins, Columns & Supplies
- Sterile Vials, Stoppers & Seals

### Production Biochemicals

VWR's portfolio of production biochemicals can fulfill requirements for downstream applications all the way through final formulation and filling into small volume vials. Outlined below you will find a table intersecting key suppliers by downstream bioprocessing application, representing structured product choice within VWR's offering of Production Chemicals for primary and secondary qualification.

|                                    | VWR Bioprocess Chemicals | Avantor | Decon Lab, Inc | Millipore Sigma | Honeywell | Macco | Encore Scientific | Puritan Products | Spectrum | Rocky Mountain Biologicals |
|------------------------------------|--------------------------|---------|----------------|-----------------|-----------|-------|-------------------|------------------|----------|----------------------------|
| <b>Downstream &amp; Final Fill</b> |                          |         |                |                 |           |       |                   |                  |          |                            |
| Biological Buffers                 | x                        | x       |                | x               |           |       |                   |                  |          |                            |
| Carbohydrates                      | x                        | x       |                | x               |           |       |                   |                  |          |                            |
| Excipients                         | x                        | x       |                | x               |           |       | x                 |                  | x        |                            |
| Inorganic Salts                    | x                        | x       |                | x               | x         | x     |                   |                  |          |                            |
| Proteins and Amino Acids           | x                        |         |                |                 |           |       | x                 |                  |          | x                          |
| Other Materials                    | x                        | x       | x              | x               | x         | x     | x                 | x                | x        | x                          |

### VWR Single-Use Solutions

Single-use assemblies are proving to reduce contamination risk, improve resource efficiency, and lower labor, energy, and process validation costs. We provide the right component and connection option to support sterile transfer of solutions between chromatography and filtration steps, then into collection bags and bottles or vials for the final product.

- Sterile Fluid Transfer & Filling
- Standard & Custom Products
- Aseptic Sampling
- Bulk Drug Substance

## PRODUCT CHOICE



**Biosafety Cabinets**



**Cleanroom Gloves**



**Disinfectants**



## ENVIRONMENTAL CONTROL

### Leading the Way in Controlled Environment Conditions

You can rely on VWR when you need to ensure ultraclean manufacturing conditions for your production facility. This carefully selected portfolio is specifically designed to help you prevent potential contamination and maintain aseptic conditions in cleanrooms and controlled environments:

- Protective Apparel
- Cleanroom Gloves
- Cleaning Systems
- Detergents & Cleaners
- Wipers
- Production Supplies
- Mats & Flooring
- Labeling & Documentation
- Environmental Monitoring
- Biosafety Cabinets
- Tubing
- Swabs

### Managing a Stable Environment Throughout the Process to Reduce Product Rejection

In addition to products from industry-leading manufacturers we also have a team of specialists with technical and industry experience who can recommend the best solutions to meet your needs. The VWR Controlled Environmental Specialist team is trained on ISO and IEST protocols, and as members of IEST and PDE, they stay current on industry trends and codes.



Cleaning Systems



Production Supplies

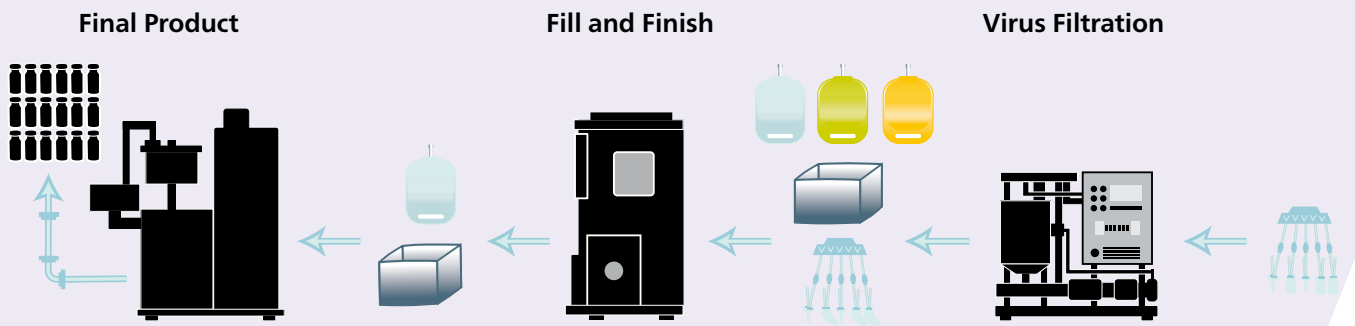
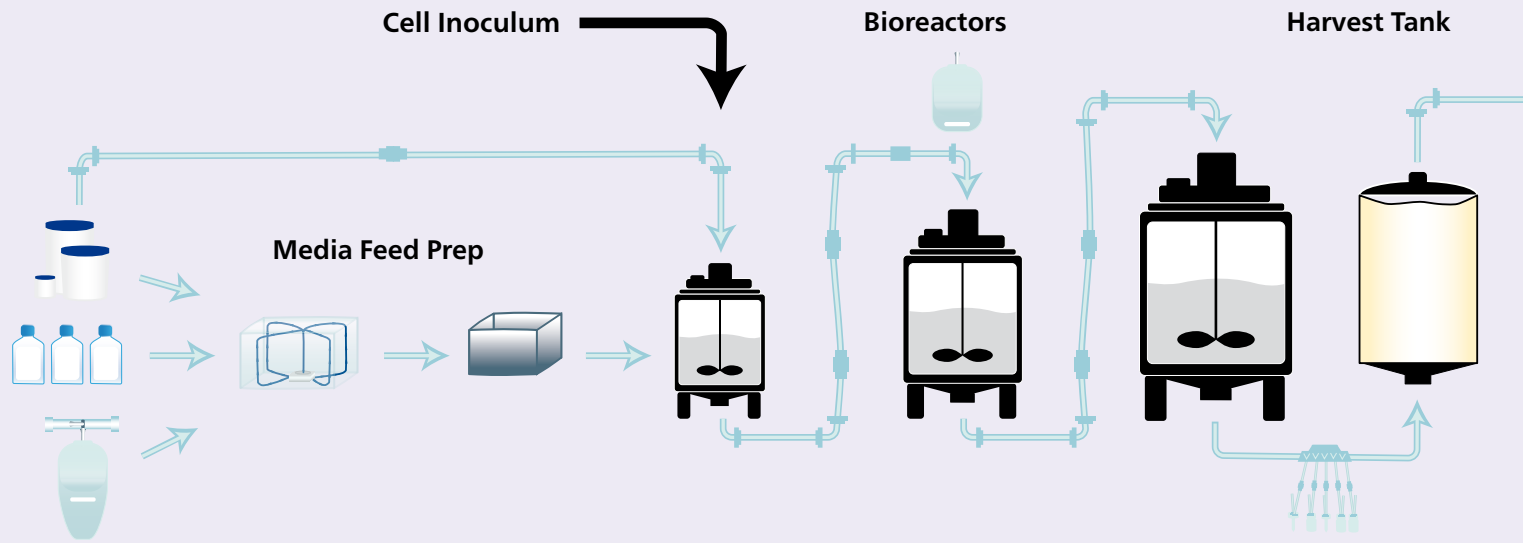


Protection Apparel



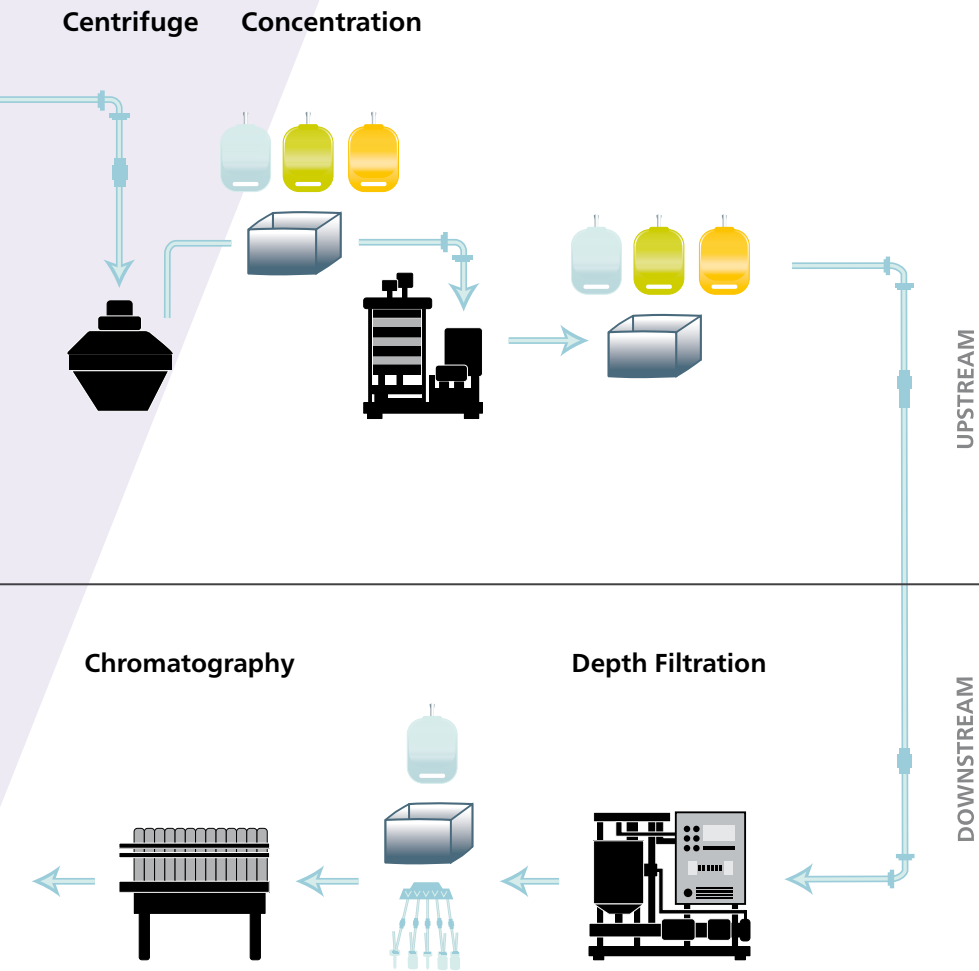
Wipers

# Delivering Innovative Product Choice Throughout Your Process



## Process Image Key

|   |  |   |                                      |   |
|---|--|---|--------------------------------------|---|
| <p><b>VWR Life Science Seradigm</b></p> | <p><b>Production Chemicals</b></p>                 | <p><b>VWR Single-Use Solutions</b></p>  | <p><b>Controlled Environment</b></p> | <p><b>Personal Protective Equipment</b></p> |
| <p>Media &amp; Supplements</p>          | <p>Buffers &amp; Salts    Sugars    Excipients</p> | <p>Tubes and Connectors    Tank Liners<br/>Media Mixing Bag<br/>3D Liquid Bag</p> |                                      |   |



## UPSTREAM:

- Media & Additives
- Serum
- Biological Buffers
- Inorganic Salts
- 2D and 3D Single-Use Bag Assemblies, Mixing Bags & Tank Liners
- Single-Use Sterile Fluid Connections

## DOWNSTREAM:

- Biological Buffers
- Inorganic Salts
- Sugars/Carbohydrates
- Excipients: Proteins & Amino Acids
- 2D and 3D Single-Use Bag Assemblies, Mixing Bags & Tank Liners
- Single-Use Sterile Fluid Connections

## FINAL FILL:

- Biological Buffers
- Inorganic Salts
- Sugars/Carbohydrates
- Excipients: Proteins & Amino Acids
- 2D and 3D Single-Use Bag Assemblies & Tank Liners
- Single-Use Sterile Fluid Connections
- Sterile Vials, Stoppers & Seals

## ENVIRONMENTAL CONTROL:

- Protective Apparel
- Cleaning Systems
- Disinfectants
- Wipers
- Production Supplies



## MANAGING YOUR RISK

### Offering Reliable and Transparent Supply Chain Solutions

Built on a foundation of supply chain innovation, our goal is for our customers to have a consistent and reliable experience where ever they are in the world. We designed our quality and security programs to provide a customer-centric approach that offers flexibility and solutions, thereby decreasing the complexity our customers experience around quality, regulatory and security requirements. This includes operations that meet ISO and cGMP compliance standards and necessary document and product certificates.

### VWR Manages Risk and Maintains Security Through:

- **Quality and Change Control:** through our own internal Quality Assurance team and Change Control systems to ensure compliance.
- **Collaborative Planning, Forecasting, and Replenishment (CPFR):** enabling then demonstrating through service level reports on assurance of supply through the Critical Materials Care team.
- **Documentation:** ensuring availability on vwr.com such as Certificates of Conformance, Quality, or Analysis and making them available with the SDS's.
- **cGMP Certified Distributor Program:** demonstrated through 14 of our distribution facilities that have been cGMP certified to be compliant with IPEC guidelines by an outside qualified auditor.
- **Local Support:** by leveraging VWR's field-based technical experts across 5 continents who will help you match your requirements to high-quality suppliers of bioprocessing materials.
- **Supplier Auditing & Integrity:** conducting risk-based audits enables us to understand the capabilities of new suppliers and collaborate effectively to address corrective and preventive actions (CAPA).



## SUPPORTING YOU WHEREVER YOU ARE

VWR has an extensive network of regional distribution centers, manufacturing facilities, and customer-care call centers, leading in global reach with operations in 34 countries. We also operate 14 distribution facilities across three continents certified for Good Distribution Practices (cGDP) by a qualified outside auditor under International Pharmaceutical Excipient Council’s (IPEC) guidelines:

- |             |                     |                 |
|-------------|---------------------|-----------------|
| Atlanta, GA | Houston, TX         | Leuven, Belgium |
| Boston, MA  | Philadelphia, PA    | Dublin, Ireland |
| Chicago, IL | Portland, OR        | Lutterworth, UK |
| Denver, CO  | Toronto, Canada     | Singapore       |
| Fresno, CA  | Manati, Puerto Rico |                 |

---

### SINGLE-USE SOLUTIONS

---

#### Get Connected...

Our solution provides product **choice, services**, and the **expertise** to help navigate through the various fluid handling challenges, component options and quality and regulatory compliance constraints of the single-use world.

#### At VWR, Our Goal Is to Help Accelerate Your Scientific Innovation by Providing Solutions that Allow You to Focus on Your Work and Keep Your Production Line Running

Through our single-use solutions, we can help solve unique problems in all areas of a biopharmaceutical manufacturing operation. Our custom single-use transfer and collection assembly capabilities include:

- Solutions for All Process Equipment Providers
- Successful Design & Fabrication of Connectivity for the Manufacture of Licensed Biologics
- Expedited Design & Approval Process
- Unmatched Global Logistics & Planning
- Predictable Delivery Timetable
- Quality, Regulatory Compliance & Supplier Management Program that Mitigates Risks
- 100+ Standard Solutions in Stock
- Comprehensive Customization Capabilities

---

### VWRCATALYST

---

Our skilled scientific and technical personnel re-focus scientific time to help you accelerate productivity and drive innovation, from research to development.

**VWRCATALYST** improves quality, safety, and regulatory compliance while at the same time reducing total operating costs through our wide range of services customized for the Bioprocessing industry:

- Large-Scale Media Preparation
- Buffer Mixing
- Manage Supply Chain for R&D Cell Banks
- Execute Small-Scale Studies
- Maintain GMP Records & SOPs
- Maintain Consumable Supplies
- Manage Single-Use Needs
- Transport Tanks & Equipment
- Pack & Recycle Chromatography Equipment
- Perform Routine Analytical Methods
- Equipment Cleaning & Sterilization
- Maintain Batch Process Records
- Process Sample & Sample Management
- Waste Handling

## VWR CUSTOM MANUFACTURING

VWR enables the advancement of science by providing high-quality chemicals and services, customized to your product or manufacturing needs. We use operational excellence to deliver solutions that enable research, testing, production, and commercialization across the globe.

### Our Core Custom Capabilities Include:

- Liquid Manufacturing, Dispensing & Packaging
- Powder Manufacturing, Dispensing & Packaging
- Assembly & Finishing

### We Are Committed to Providing the Highest Manufacturing Services. As We Align with Your Needs, We Remain Dedicated to:

- Flexibility & Innovation
- Supply Chain Security
- Quality & Regulatory Compliance
- Operational Excellence
- Breadth of Capabilities
- Product Transfer & Design

### Focus on Your Core Business — Let VWR Take Care of Sourcing, Production, Testing, and Documentation of Your Chemicals



# ENABLING YOUR PROCESS WITH INNOVATIVE CHOICE



## VWR Life Science Seradigm

Fetal Bovine Serum  
Assurance of Supply  
Quality Assurance  
Measures at the Source  
Multiple Lot Testing  
Fully Certified Supply  
Chain for Traceability by  
the International Serum  
Industry Association (ISIA)  
Consistent, Reliable  
Performance

## Production Chemicals

Biological Buffers  
Carbohydrates  
Inorganic Salts  
Media & Additives  
Proteins & Amino Acids  
Excipients  
VWR Custom  
Manufacturing  
Services  
Strategic Sourcing  
cGMP Compliant  
Warehousing

## VWR Single-Use Solutions

Standard & Custom Products  
Buffer & Media Transfer  
Sterile Filtration  
Bioreactor Feed  
& Harvest  
Bulk Drug Substance  
Aseptic Sampling & Filling  
2D and 3D Bag Assemblies  
& Tank Liners  
Application Specific  
Connections  
Sampling Methods  
Mixing Vessels

## Controlled Environment

Protective Apparel  
Cleanroom Gloves  
Cleaning Systems  
Detergents & Cleaners  
Wipers  
Production Supplies  
Mats & Flooring  
Procurement & Supply  
Management Services  
**VWRCATALYST**  
Bioprocessing Facility  
Support



1.800.932.5000 | [vwr.com](http://vwr.com)

Prices and product details are current when published; subject to change without notice. | Certain products may be limited by federal, state, provincial, or local regulations. | VWR makes no claims or warranties concerning sustainable/green products. Any claims concerning sustainable/green products are the sole claims of the manufacturer and not those of VWR International, LLC. All prices are in US dollars unless otherwise noted. Offers valid in US and Canada, void where prohibited by law or company policy, while supplies last. | VWR, the VWR logo and variations on the foregoing are registered (®) or unregistered trademarks and service marks, of VWR International, LLC and its related companies. All other marks referenced are registered by their respective owner(s). | Visit [vwr.com](http://vwr.com) to view our privacy policy, trademark owners and additional disclaimers. ©2017 VWR International, LLC. All rights reserved.