

# Avantor<sup>®</sup> bioprocessing solutions

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FROM CELL LINE  
DEVELOPMENT &  
CULTURE TO COMPLETE  
FILL AND FINISH

SOLUTIONS THAT  
ENABLE YOUR PROCESS



# Setting science in motion to create a better world



## WE ARE AVANTOR®

From discovery to delivery, Avantor is a global manufacturer and distributor of high-quality products, services and solutions to professionals in the life sciences and advanced technologies industries. We focus on the things that matter most to you, providing exceptional convenience, collaboration and customization to help ensure your success.

Our channel brand, VWR, part of Avantor, offers an integrated, seamless purchasing experience that is optimized for the way you do business. Through our global e-commerce platform, you can access our own brands as well as those from thousands of other manufacturers, so you can get exactly what you need to support your processes.

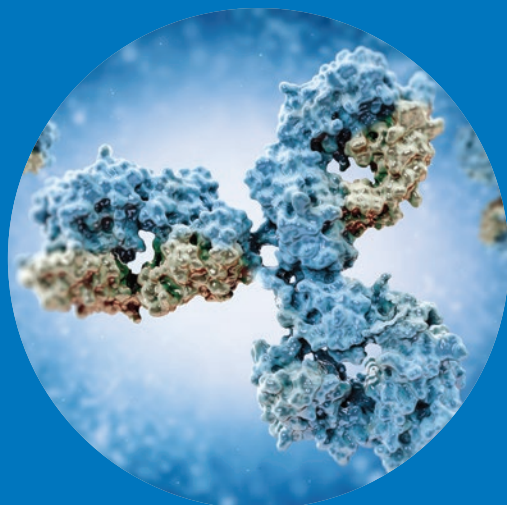


## BIOPHARMACEUTICALS: ENABLING BREAKTHROUGHS IN BIOLOGICS

Today's biologics provide breakthrough solutions for many of the world's most challenging diseases and chronic conditions.

As a supplier for the largest biopharmaceutical companies in the world, Avantor is trusted to provide the products, services and solutions needed to quickly move from the small-scale bench, scaling up in the pilot plant, to full production, reaching the market faster with new scientific breakthroughs in medicine.

When you work with Avantor, you gain a strategic partner with customizable manufacturing solutions, high-quality cGMP materials and specialized services. Backed by extensive regulatory and technical process expertise, we play a vital role in helping to increase drug yield, lot-to-lot consistency and, most importantly, drive results that benefit the world.



# Avantor

## bioprocessing solutions

As innovative new biologics become ready for production, your bioprocessing technology must be equal to the challenge.

Each stage of your bioprocessing system is influenced by the preceding step. To optimize your process, you need to:

- Select the correct expression system
- Choose the right medium and feed for your bioreactor to achieve maximum cell density and productivity
- Capture, clarify and concentrate the target protein efficiently
- Obtain the purified protein through downstream processes
- Package the protein formulation during final fill in the required configuration



### A STRATEGIC PARTNER FOCUSED ON YOUR SUCCESS

Serving your needs from discovery to commercial launch, Avantor is a strategic partner with an industry-leading array of resources to serve every step in your production: upstream, downstream and fill and finish.

We combine unique expertise with the broadest portfolio of products and materials in the industry. Everything we offer is engineered and manufactured for the most stringent quality standards and regulatory requirements—whether it is a vaccine, monoclonal antibody, recombinant protein, cell therapy or gene therapy.

### GLOBAL DISTRIBUTION WITH LOCAL EXPERIENCE

In addition to our own range of self-manufactured media components, chemicals and other products for bioprocessing, VWR, part of Avantor, provides access to many top industry brands. Choose from an even broader selection of media, components and buffers, process biochemicals, excipients and single-use solutions to address upstream and downstream processes as well as final fill formulations.



# Trust Avantor to help you overcome unique bioprocessing challenges

## QUALITY & CHOICE

### PRODUCTION CHEMICALS

Avantor-manufactured and distributed products provide structured choice and risk mitigation

Global cGMP manufacturing capabilities backed by global change notification programs for regulated materials

Lot-to-lot consistency and comprehensive supportive testing from our brands of high-purity direct materials

## EXPERTISE

Field-based specialists to help you select the most appropriate direct materials for your processes

Data-driven answers to your toughest biopharmaceutical challenges—from gene to protein to final formulation

## CONVENIENCE

Global cGMP logistics footprint ensures product integrity and prompt delivery globally

Special logistics and supply chain services, including

- Product certifications provided electronically and/or with shipments
- Customer-reserved inventory to help enable assurance of supply
- Custom pallet programs and barcoded labeling

Global e-commerce platform enables you to get what you need, when you need it

## CUSTOMIZATION

Custom cGMP manufacturing capabilities for direct materials for BioPharma manufacturing—from small scale to high volume manufacturing

Addressing your custom purity needs, new product development and synthesis from cell culture supplements, elemental impurity controlled buffers, through novel excipients

Wide range of packaging alternatives to fit your process for both powder and liquid materials

### SINGLE-USE SOLUTIONS

Open Architecture Model vertically integrated on bags, stoppers & fittings supporting choice of your systems

Comprehensive Supplier Management Program with qualified 1st and 2nd sources of key components

Complete sterility validation program to mitigate risk

Extensive fluid handling connectivity knowledge

- Single-Use Facilities
- Hybrid Facilities
- Conversion from Self Assembled Parts

Collaborative approach to designing your solution

Local Single-use Experts

Expedited Design & Approval Process

- Designs < 5 Days
- Validation Packs < 5 Days

Global logistics footprint

100+ standard products

Fully custom solutions designed for specific applications

Ability to develop custom components & parts

Customized skid systems with disposable fluid paths

### SERA

#### Proven sera performance & consistency

Proprietary manufacturing methods result in lot-to-lot and bottle-to-bottle consistency

Quality you can see in the crystal clear, vibrant color of each bottle of sera

#### Nutritionally superior sera

Unique collection & manufacturing techniques preserve more naturally-occurring growth factors found in serum

#### Industry-leading traceability & quality

Independent labs used for all lot release criteria

ISIA traceability certification confirms truth in labeling

#### Sera Supply stability

Strong supply partnerships and a vertically-integrated raw material supply chain provide long-term assurance of supply

#### Unmatched operational sera support & service

Flexibility in meeting each customer's unique needs

Multiple lot sampling, large volume reserves, and storage solutions

Proven track record of operational excellence, support, and on-time delivery

# Upstream technology

## UPSTREAM AND CELL CULTURE

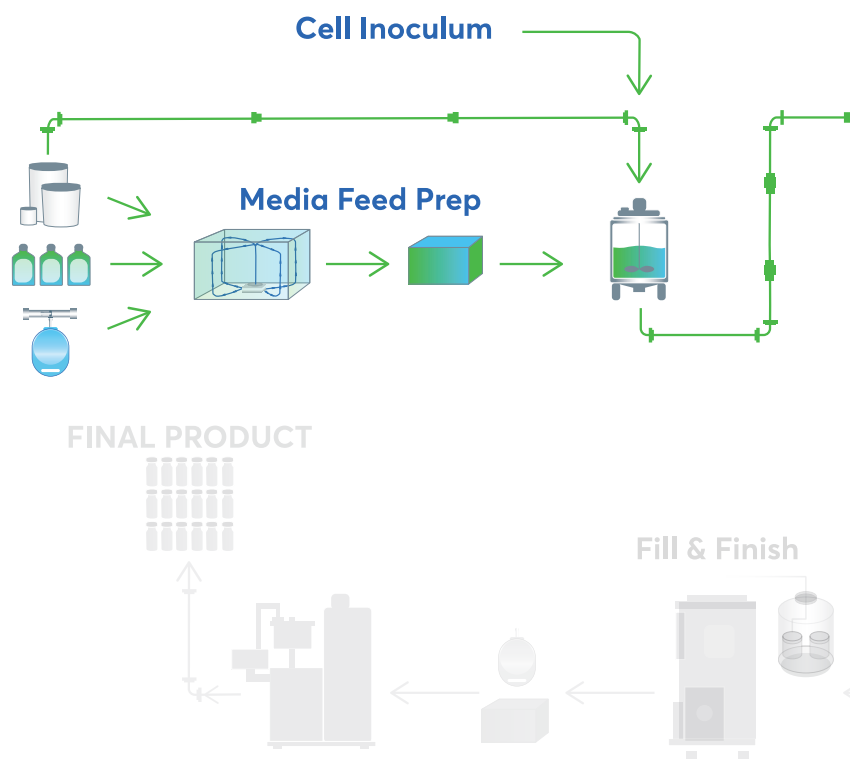
Launching a new cell line is never easy—which is why we have built a robust offering of upstream and cell culture products engineered to enable your production scale-up with maximum efficiency and quality.

Our ultra-high-purity materials play an integral role across the entire biopharmaceutical production spectrum. Lot-to-lot product consistency and ultra-low impurity levels help to improve biologic yield and shelf life, increase purification yields and reduce bulk drug substance (BDS) degradation.

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 allow seamless transfer from bench to pilot scale and onto manufacture scale.

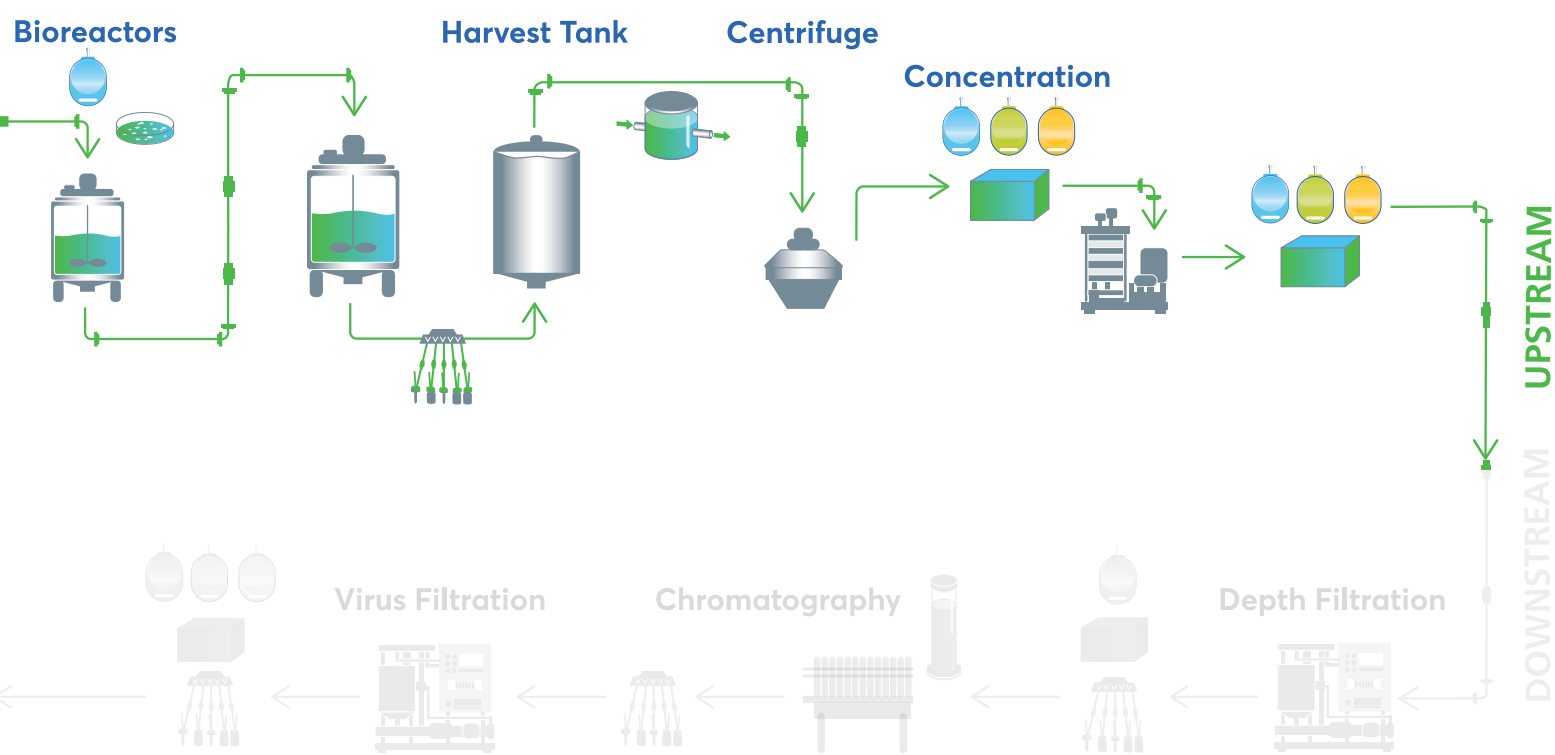
## SINGLE-USE SOLUTIONS

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



PRODUCTS ENGINEERED FOR MAXIMUM EFFICIENCY AND QUALITY  
IN YOUR PRODUCTION SCALE-UP

SERA	PRODUCTION CHEMICALS					SINGLE-USE SOLUTIONS			
 Media & Supplements	 Buffers & Salts	 Sugars	 Excipients	 Additives	 Tubes & Connectors	 Tank Liners	 Media Mixing Bag	 3D Liquid Bag	



# Downstream technology

## DOWNSTREAM AND FILL & FINISH

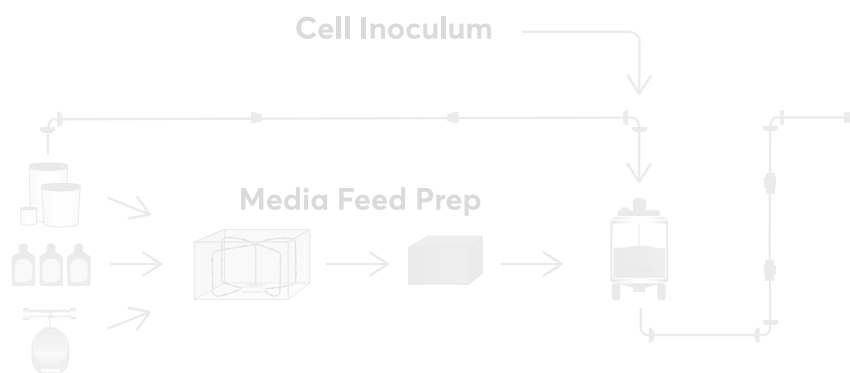
Maximizing BDS recovery and purification throughout the filtration steps and ensuring protein stability, solubility and bioavailability of the finished biologic are the core goals of both your downstream and fill and finish bioprocessing steps.

Avantor is ready to help. We understand that quality and stability of your target protein must be maintained during the sequential purification steps of your process. Our buffers and salts provide the quality and performance required to maintain protein attributes. They are available in powder form to allow preparation of solutions at concentrations defined during development or final buffer formulation.

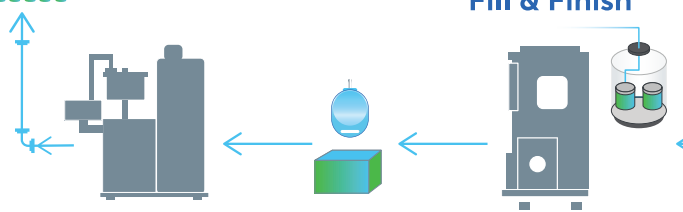
Our process chromatography media helps increase yield by improving the efficiency of your purification process and enhance selectivity by removing closely related impurities.

## 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 options to support sterile transfer of solutions between chromatography and filtration steps, then into collection bags and bottles or vials for the final product.












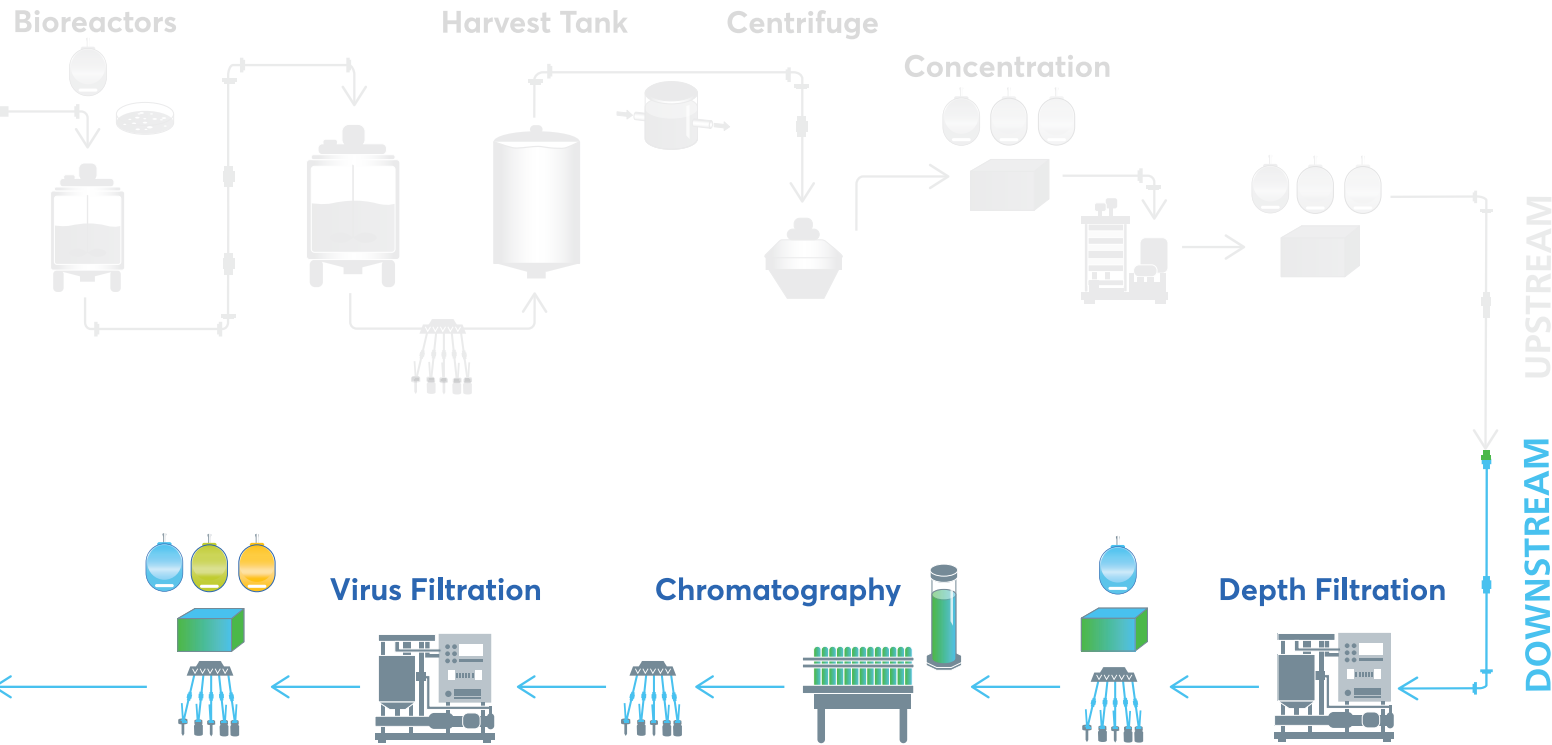
## FINAL PRODUCT





PRODUCTS TO SUPPORT QUALITY AND STABILITY OF YOUR TARGET PROTEIN  
THROUGHOUT THE PURIFICATION PROCESS

SERA	PRODUCTION CHEMICALS	SINGLE-USE SOLUTIONS						
 Media & Supplements	 Buffers & Salts	 Sugars	 Excipients	 Additives	 Tubes & Connectors	 Tank Liners	 Media Mixing Bag	 3D Liquid Bag



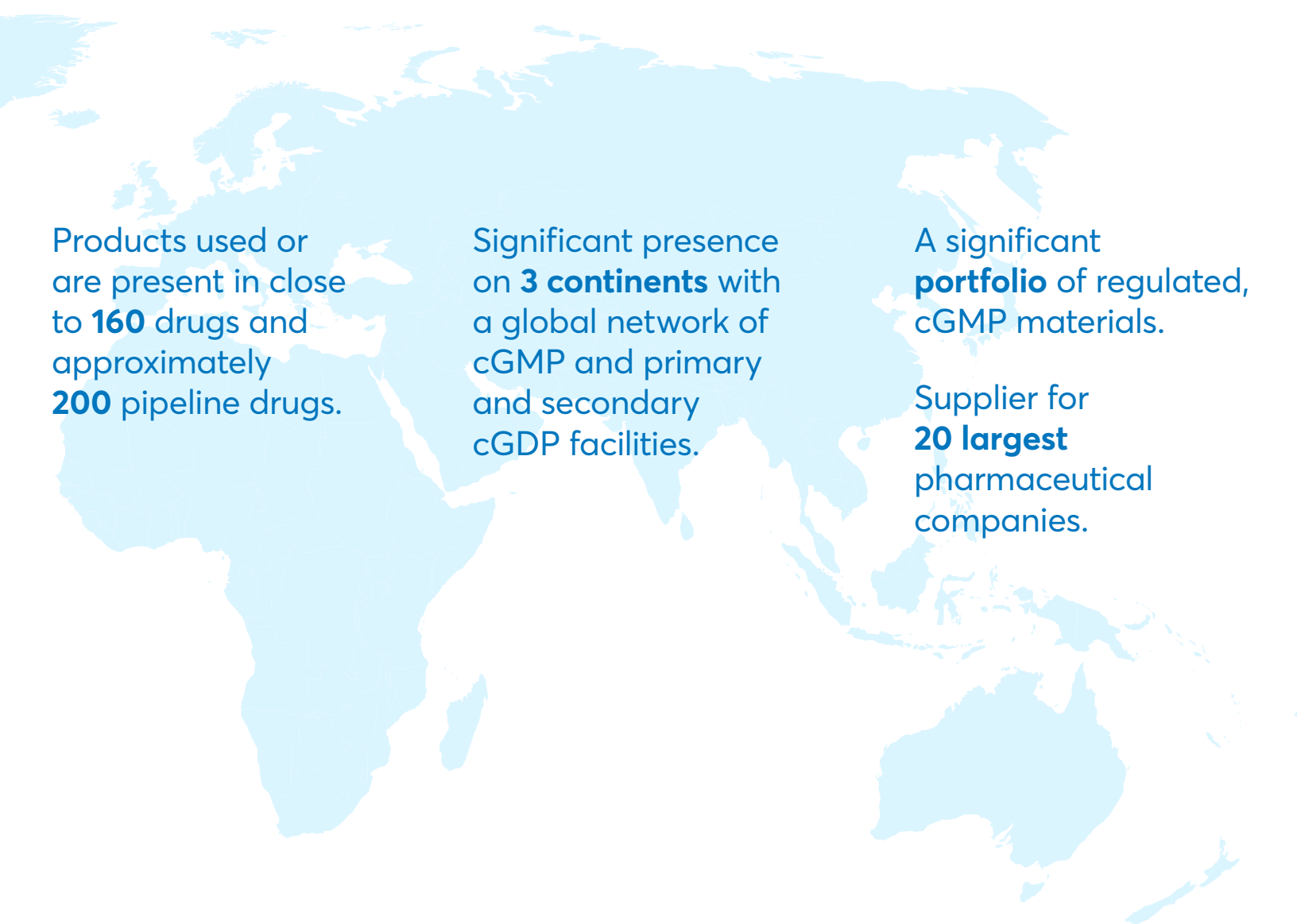
# Quality and supply chain security

Avantor's quality programs use a customer-centric approach designed to decrease complexity and fully satisfy the quality, regulatory and security demands you face every day.

Beyond our own operations, we have robust supply chains and security programs with our suppliers. We track and share how we're doing so you may benefit from enhanced regulatory compliance and minimized risk to drive cost-effectiveness and faster time-to-market for products.

- **Global network of cGMP and cGDP facilities:** Avantor's cGMP facilities offer manufacturing, packaging and subdivision capabilities to meet your needs. Our distribution facilities have been certified and comply with the International Pharmaceutical Excipients Council's (IPEC) guidelines for Good Distribution Practices (cGDP).
- **Change notification:** Customer notification through the Avantor Management of Change and Change Notification Service (CNS) programs help you stay in control of changing situations and minimize risks associated with changes to manufacturing processes.
- **Supplier auditing and integrity:** We conduct risk-based audits to understand the capabilities of new suppliers and collaborate with suppliers to promptly address corrective and preventive actions (CAPAs), should they arise.
- **Collaborative planning, forecasting and replenishment (CPFR):** We provide service level reports on assurance of supply through our Critical Materials Care team.
- **Documentation:** Certificates of Conformance, Quality or Analysis are available with SDS documents on **vwr.com** and **avantorinc.com**.

Our global cGMP manufacturing facilities are ISO-certified and meet U.S. FDA standards, which are considered among the strictest globally. We bring that level of high quality and rigor to every part of the world.



Products used or are present in close to **160** drugs and approximately **200** pipeline drugs.

Significant presence on **3 continents** with a global network of cGMP and primary and secondary cGMP facilities.

A significant **portfolio** of regulated, cGMP materials.

Supplier for **20 largest** pharmaceutical companies.

# Enabling your success with innovative choices

## PRODUCTION CHEMICALS

- Amino acids
- Antioxidants
- Biological buffers
- Carbohydrates
- Chromatography resins
- Cytokines & growth factors
- Mineral salts
- Peptones/hydrolysates
- Surfactants
- Vitamins

## CULTURE REAGENTS

- Media
- Sera
- Supplements

## SINGLE-USE SOLUTIONS

- Aseptic sampling
- Bags
- Connectors
- Filtration systems
- Manifolds
- Tank liners
- Tube sets
- 2D and 3D bags
- Mixing bags
- Supporting hardware & control systems
  - Containers
  - Media preparation systems
- Bottle assemblies



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