

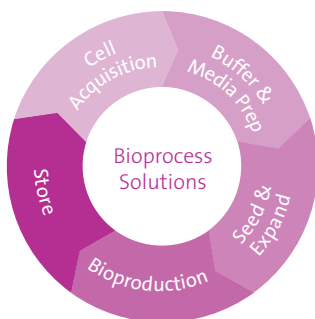
Scale-Up Solutions for
Cell Therapy and

CORNING

Bioprocesses



CORNING



Corning is built upon a foundation of innovation and manufacturing excellence. Over the past 160 years, we have strived to offer the highest quality products to ensure reproducibility and reliability in your daily operations. While our experience is undeniable, our expertise in product applications completes the spectrum of support we offer.

Corning single-use adhesion and suspension cell culture products enable scale-up in Bioprocess and Cell Therapy. From cell line development and process development to GMP manufacturing, our vessels provide the necessary platform to accomplish your goals. Supporting products such as Closed System Solutions, media, and advanced surfaces round out the product offering, providing a complete solution.

This brochure serves as a product overview. For additional specifications including ordering information, applications notes, and technical information, please visit our websites www.corning.com/lifesciences and www.cellgro.com.

Characteristics of Corning® Bioprocessing Products

Bioprocess Product	Surface Area/ Capacity	Surface Treatments									
		Closed System Capability	Not Treated	Tissue Culture Treated	Corning CellBIND® Surface	Positive Charge	Ultra-Low Attachment Surface	Corning Synthemax® II Surface	ECM Mimetic	Matrigel™ Matrix	Biological ECM
Microcarriers	360 cm ² /g	✓	✓	✓	✓	✓	–	✓	✓	✓	✓
HYPERStack® Vessels	6,000 - 60,000 cm ²	✓	✓	✓	✓	–	–	✓	✓	✓	✓
CellSTACK® Chambers	636 - 25,440 cm ²	✓	✓	✓	✓	–	✓	✓	✓	✓	✓
E-Cube™ System	8,500 cm ²	✓	–	✓	✓	–	–	✓	✓	✓	✓
CellCube® Module	8,500 - 85,000 cm ²	✓	–	✓	✓	–	–	✓	✓	✓	✓
Roller Bottles	490 - 1750 cm ²	✓	✓	✓	✓	–	–	✓	✓	✓	✓
Erlenmeyer Flasks	125 mL - 3L	✓	✓	–	–	–	–	–	–	–	–
Disposable Spinner Flasks	125 mL - 3L	✓	✓	–	–	–	–	–	–	–	–
Reusable Glass Spinner Flasks	125 mL - 36L	✓	✓	–	–	–	–	–	–	–	–

✓, available; ✓, please inquire; –, not available.

Surface Binding Properties

Surface	Binding Interactions
Not Treated	Hydrophobic surface characteristic provides decreased attachment support for sticky cells
Tissue Culture Treated (TCT)	Treatment supports cell attachment
Corning CellBIND Surface	Increased oxygenation provides greater surface consistency for loosely attaching cell lines, low-serum applications and cryopreserved cells
Positive Charge	Cationic charge enhances cell attachment
Ultra-Low Attachment Surface	Hydrogel surface treatment prevents attachment of cells for applications requiring tumor spheroid and embryoid body formation
Corning Synthemax II Surface	Xeno-free, synthetic surface supports stem cell culture
ECM Mimetic	Synthetic, animal-free fibronectin and collagen-I based peptide surfaces that enable serum-free, defined cell culture
Matrigel Matrix	Feeder-free surface for attachment and differentiation of both normal and transformed anchorage-dependent epitheloid and other cell types
Biological ECM	Collagen, fibronectin, and laminin support improved cell attachment, propagation and differentiation

SUSPENSION VESSELS

Corning® Erlenmeyer flasks, disposable spinner flasks, and reusable ProCulture® glass spinner flasks offer many options for suspension culturing. They can be used in process development, for troubleshooting existing large-scale production, or for small-scale GMP manufacturing.



Our online technical library includes posters and Applications Notes to support our suspension vessels, including:

Disposable Spinner Flasks for Scale Up or Production of Proteins, SnAPPSHOT



Disposable Erlenmeyer Flasks

- ▶ Available in 125 mL to 3L plain and baffled designs
- ▶ Vent or flat cap
- ▶ Certified RNase-/DNase-free



Disposable Plastic Spinner Flasks

- ▶ Supports cultures with attachment-dependent microcarriers
- ▶ Available in 125 mL to 3L
- ▶ Vent or flat cap (500 mL to 3L)



ProCulture Glass Spinner Flasks

- ▶ Capacities up to 36L
- ▶ Unique impeller design ensures optimal stirring



Corning Synthemax® II, Corning CellBIND® Surface Microcarriers, Positive Charge, Collagen, and Not-treated

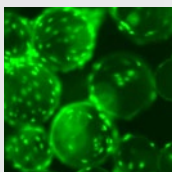
The most recent addition to our adhesion cell culture line, our microcarriers, allows for exponential increase in available surface area to meet your final scale-up demands.

- ▶ Available with various coatings to support the needs of many different cell types
- ▶ Compatible with our spinner flasks for process development and scale-up



Learn more about our suspension culture products, such as our microcarriers, by viewing this poster and many more on our website.

Human Mesenchymal Stem Cell Attachment and Expansion on Synthetic Corning Microcarriers in Defined, Xeno-free Corning stemgro® hMSC Medium, Poster



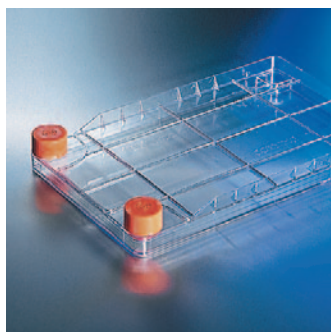
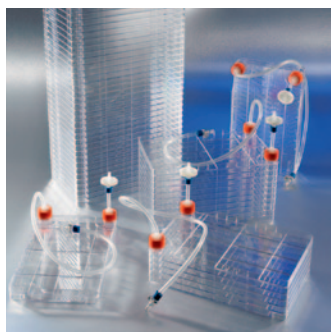
ADHESION VESSELS

Corning® adhesion vessels range from T-flasks and roller bottles to traditional multi-layered vessels, such as the CellSTACK® culture chamber, to the new HYPERStack® vessel featuring our HYPER, gas-permeable film technology. Our stackable cell culture products are manufactured under GMP conditions. Additionally, the Corning E-Cube™ and CellCube® products provide perfusion and fed-batch approaches and enable active process monitoring.



Learn more about our adhesion culture products, such as our HYPERStack vessels, by viewing this poster and many more on our website.

A Comparative Study Examining Corning HYPERStack Cell Culture Vessel Technology, Poster



Corning Roller Bottles

- ▶ One-piece polystyrene construction
- ▶ Smooth and expanded surfaces
- ▶ Supports legacy manufacturing platforms
- ▶ Available in 490-1750 cm² surface area

CellSTACK Culture Chambers

- ▶ Offer up to 25,440 cm² growth area per vessel
- ▶ Closed System customization can enhance process efficiency
- ▶ Available in 1, 2, 5, 10 and 40 layer chambers

HYPERStack Culture Vessels

- ▶ Feature Corning's High Yield **PER**formance (HYPER) technology
- ▶ Gas-permeable film allows gas exchange in a smaller footprint
- ▶ Available in 12, 36 and 120 and layer versions

E-Cube Culture System and CellCube 100-Stack Module

- ▶ Integrate the E-Cube and CellCube perfusion technology to enable process monitoring
- ▶ Available in 10, 25 and 100 layer modules

Corning offers a wide range of products that, when combined with our vessels, provides a complete solution for your bioprocess applications.



Look for additional posters and Applications Notes online for further detail on our supporting products, such as:

Corning® stemgro® hMSC Medium: A Serum-Free, Defined Medium for Efficient Expansion of hMSCs on Corning CellBIND® Surface, Application Note



Advanced Specialized Surfaces

Our innovative surfaces aid in optimizing a system with the greatest efficiency, and are featured on many of our vessels ranging from T-flasks to microcarriers.

- ▶ Pre-coated vessels available to support GMP environments



Media, Sera and Reagents

A large selection of media, sera, and reagents also enhances the product offering. We can customize formulations and offer large-scale media packaging solutions for your manufacturing needs.

- ▶ cGMP, ISO certified manufacturing process
- ▶ Complete documentation and traceability
- ▶ Animal-component-free manufacturing process



Closed System Solutions

Because we understand the need to maintain a closed system, we have developed Closed System Solutions comprised of vessels, tubing, filters, and connectors.

- ▶ Standard catalog items support many of our products
- ▶ Configure-to-order – choose from over 200 components to design your own solution
- ▶ Custom – choose additional components and we can qualify them

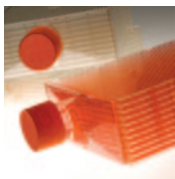


Media Bags

Corning media bags allow for sterile preparation and aseptic transfer of your important manufacturing materials. We provide a range of customizable options.

- ▶ Vials available for process development
- ▶ Sterile, ready to use
- ▶ A variety of surfaces cater to your specific application

DEVELOPMENT PRODUCTS



As an innovative company, we are committed to the continuous development of new product concepts. If you are interested in reviewing some of Corning's pipeline products serving Bioprocess and Cell Therapy, please contact Dawn Jackson, Business Development Manager of Bioprocess and Cell Therapy at JacksonD@corning.com or 978.442.2432.

ONLINE TECHNICAL RESOURCES AND TRAINING

Whether you have a quick question, you need to research, or want to troubleshoot on your own, Corning has an extensive online library of technical articles, protocols, videos, and presentations at your fingertips. Additionally, Bioprocess Sales Specialists and Field Applications Scientists are available to offer technical training and process support, scientific presentations, and supply chain support. Consider them an extension of your own team.

The Corning Scientific Seminar Series

- ▶ Free, online technical presentations
- ▶ Novel tips, best practices and proven techniques
- ▶ One-hour monthly seminars delivered by scientists
- ▶ Register or view past seminars on-demand at www.corning.com/lifesciences

Corning's Technical Information Website

- ▶ Technical articles, selection guides, bibliographies and protocols
- ▶ Available under Technical Resources at www.corning.com/lifesciences

YouTube Videos

- ▶ Multi-language, instructional videos
- ▶ Visit www.youtube.com/corninglifesciences

Live or Onsite Technical Support

Sometimes, cell culture can stump even the most seasoned veteran. When you need that extra support, another set of eyes or even onsite group training, our experts are there when and where you need them.

Corning's Technical Information Center (TIC)

- ▶ Direct access to well-trained and knowledgeable staff
- ▶ Call 800.492.1110 Monday through Friday from 8:00 am to 5:30 pm Eastern Time or by email at CLStechserv@corning.com

Corning's Onsite Training and Seminar Program

- ▶ Technical seminars and hands-on training at our site or yours
- ▶ For more information, contact Mark Rothenberg, PhD, Applications Manager at rothenbem@corning.com

Skype Support

- ▶ Video conferencing with an Applications Lab Scientist
- ▶ Contact your local Account Representative to schedule an appointment

CORNING | **FALCON**® **cellgro**® **AXYGEN**® **PYREX**® **GOSSSELIN**™

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