3M Science. Applied to Life.™

Product Information Sheet

3M™ Harvest RC Chromatographic Clarifier

Single-stage chromatographic purification for recombinant protein therapeutic manufacturing

Clarification using 3M™ Harvest RC Chromatographic Clarifier provides many benefits including fewer processing steps, higher yield and lower production time and costs.

This single-stage single-use chromatographic clarification solution is the next generation in harvest and clarification technology. It is designed as an efficient option for harvesting and clarification of modern cell cultures.

3M™ Harvest RC Chromatographic Clarifier improves process economics with:

- **Scalability from bench to commerical production**
- **Predictable performance**
- **High product recovery**
- **Whole cell removal and minimize cell sheer**
- **Streamlined process and smaller footprint**

Innovative design and performance

3M™ Harvest RC Chromatographic Clarifier encapsulates innovative synthetic fibrous anion exchange (AEX) chromatography media and a 0.2 µm polyether sulfone (PES) membrane. This enables a single-stage clarification process of low to high-density cell culture (>40 million cells per mL) with high recovery, and high fidelity of soluble and insoluble contaminant separation.

Cells are bound inside the media by electrostatic charge interaction with the AEX chromatographic fibers. This results in the efficient retention of large and small particulates without developing a surface cake layer. The media can also remove soluble impurities which results in cleaner effluent than centrifugation or depth filtration.

Before and after using 3M™ Harvest RC Chromatographic Clarifier: turbidity reduction in a single stage

Key features and benefits:

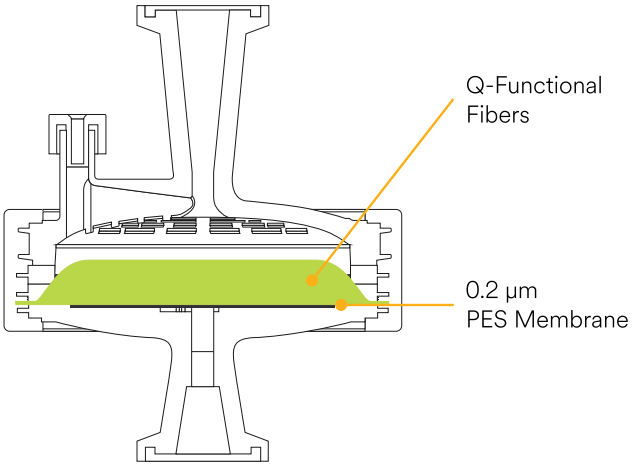
- Simplification of high cell density cell culture fluid clarification unit operations
- Optimized for PCV high density CHO cell culture (5-8% PCV)
- Replacement of primary, secondary, and guard membrane clarification stages
- Typical product recovery of 95+% (capsules)
- Synthetic chromatographic harvest media with chemically defined extractables
- Predictable scaling from discovery to manufacturing
- Lower total cost of manufacturing compared to centrifugation and depth filtration
- Lower consumption of buffer and water compared to depth filtration
- Capsules fit into laboratory to manufacturing scale workflows

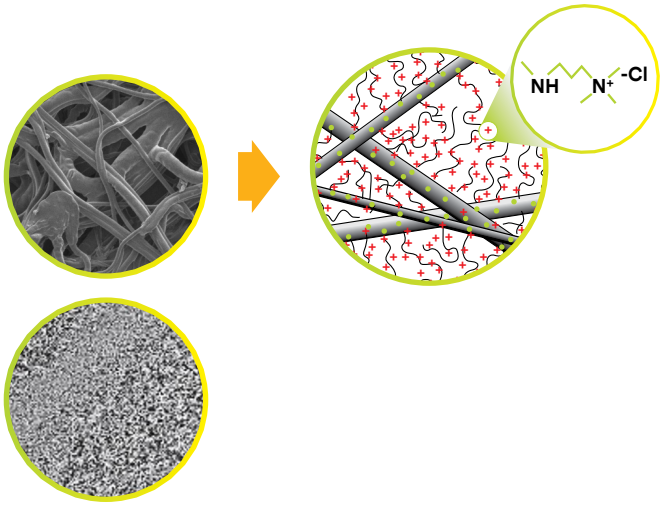
3M™ Harvest RC Chromatographic Clarifier – Single step chromatographic clarification encapsulated solution

The innovative synthetic fibrous AEX chromatographic clarification media enables a single-stage clarification process of low to high-density CHO cell culture (> 40 million cells per mL) with high product recovery, and high fidelity of soluble and insoluble contaminant separation.

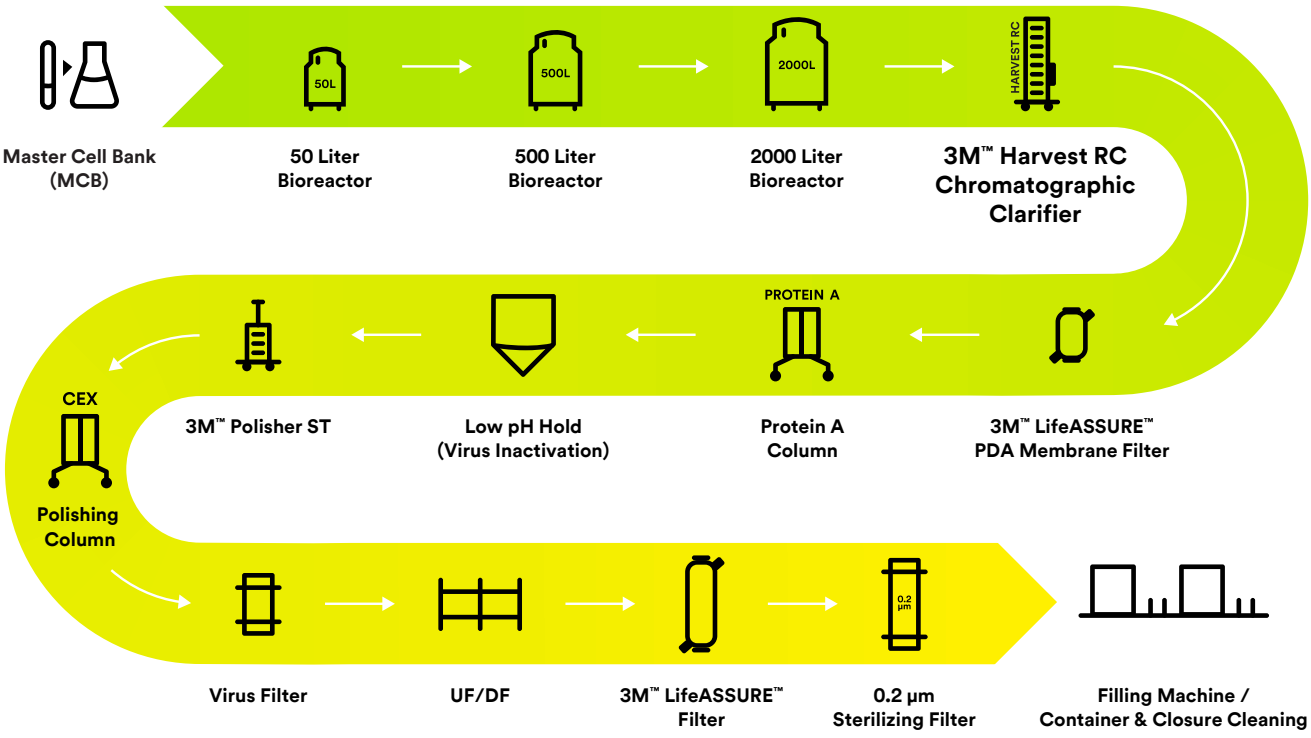
Downstream of the fibrous chromatographic clarification media is the 0.2 µm PES membrane which distributes the flow across the AEX media bed and enables protection of downstream sterilizing grade membrane filter. Also, 0.2 µm PES membrane enables simple process endpoint measurement using pressure reading.

Expanding fibrous media platform





Cell harvest simplified:



The next generation in harvest and clarification technology

Research & Development | **Scale-up** | **Manufacturing**

3M™ Harvest RC Chromatographic Clarifier product family: laboratory, pilot, and production capsules

Efficient workflows. Excellent clarity.

With 3M™ Harvest RC Chromatographic Clarifier, BT500, it's just 10 minutes to a high-quality sample for downstream processing.* No centrifuge is needed, and the easy-to-use, bottle-top vacuum clarifier enables high product recoveries and DNA reduction (<500ppb). Together, these properties let you streamline your upstream and downstream processes before they start, which eliminates complexity and improves workflow.

*Based on 5-8% PCV culture

Performance data

All performance data below is based on capsules. While it is representative of typical performance, results may vary depending on the format(s) used.

mAb product recovery

3M™ Harvest RC Chromatographic Clarifier is a single stage chromatography solution that effectively clarifies Chinese Hamster Ovary (CHO) harvest cell culture fluid (HCCF) across a wide range of cell densities, packed cell volumes (PCV), and turbidities.

3M™ Harvest RC Chromatographic Clarifier capsules consistently provide >95% mAb product recovery for high cell density cultures from the laboratory to the manufacturing scale.

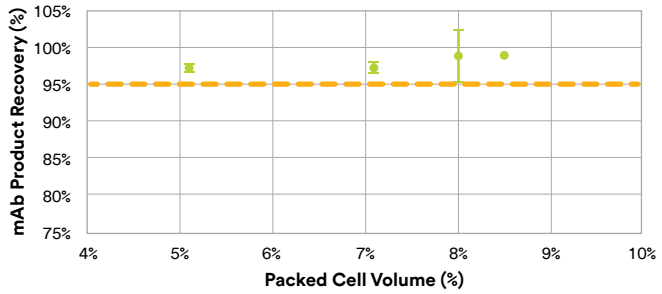


Figure 1A: mAb product recovery in clarification process at different packed cell volumes (N = 1 – 4)

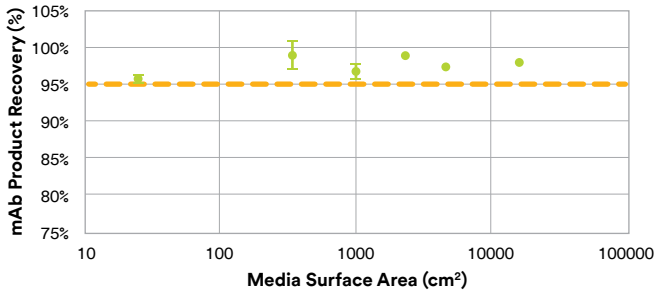


Figure 1B: mAb product recovery in clarification process at different media surface areas (N = 1 – 3)

Turbidity reduction

3M™ Harvest RC Chromatographic Clarifier provides consistent separation of cells, cell debris, and DNA from the target protein. Clarified cell culture fluid (CCCF) has low turbidity, typically <15 NTU. Additionally, consistently low acidified turbidity of CCCF indicates significant reduction of DNA in the clarified material. Low acidified CCCF turbidity is a measure of the amount of DNA present in the cell culture fluid. (Koehler et al. Biotechnology Progress. 2019;35:e2882)

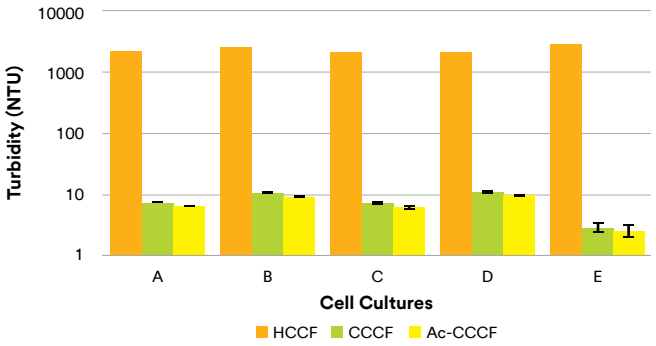


Figure 2: Turbidity Reduction by 3M™ Harvest RC capsules (N = 3 – 6). A – E are different CHO cell cultures at 5 – 8 % PCV.

Scalability

3M™ Harvest RC Chromatographic Clarifier capsules scale linearly across laboratory, pilot, and manufacturing scales.

Fibrous chromatographic clarification assures scalable performance from discovery to manufacturing scales. Performance is consistent from laboratory capsules (BC4 and BC25), scale-up capsules (BC340 and BC1020), to production capsules (BC2300 and BC16000) within ±20% of BC25 throughput.

Throughputs of 3M™ Harvest RC Chromatographic Clarifier capsules are scaled by area based on packed cell volume.

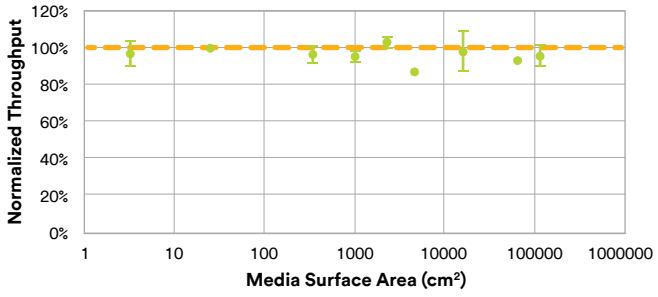


Figure 3: Scalability from laboratory to scale-up and production capsules (N = 1 – 5, 6 cell cultures)

Performance data (continued)

Cell loading capacity

3M™ Harvest RC Chromatographic Clarifier utilizes advanced Q functionalized fibrous chromatography media to achieve single-stage clarification, enabling predictable and consistent cell loading capacity for CHO cell culture fluid for a wide range of packed cell volumes.

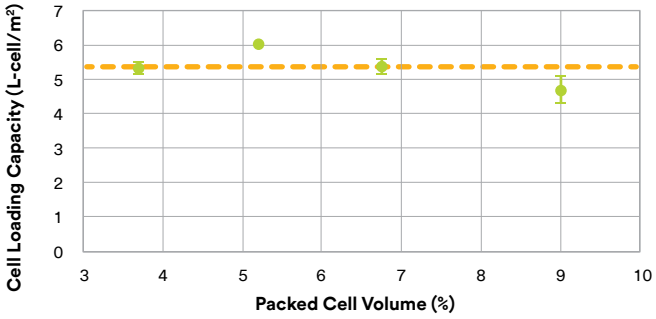


Figure 4: Cell loading capacity of 3M™ Harvest RC capsules for CHO harvested cell culture fluid at different packed cell volumes (N = 2 - 3)

Cell shear

The low-pressure chromatographic clarification relies on charge rather than size or density. This results in minimal cell shear compared to conventional depth filtration processes even at medium and high cell densities. Cell shear was evaluated by lactate dehydrogenase (LDH) assay (Sigma-Aldrich 11644793001).

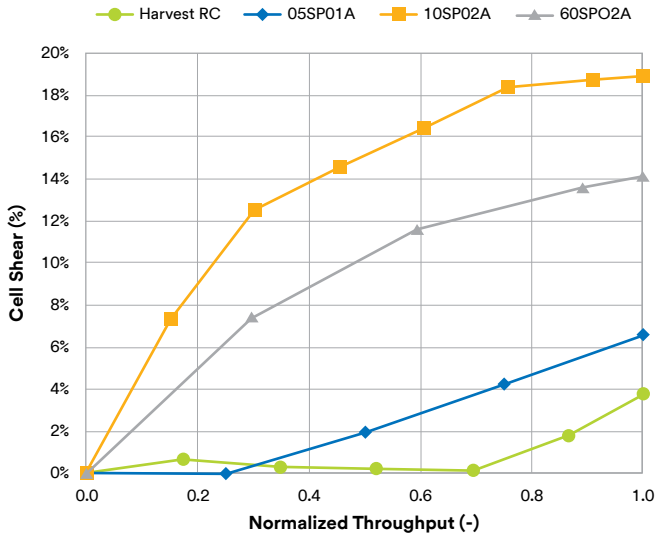


Figure 5: Minimal cell shear of 3M™ Harvest RC during clarification of 8% PCV CHO cell culture at 100 LMH.

Robust sterile filter protection

Due to the highly effective chromatographic reduction of soluble and insoluble contaminants, 3M™ Harvest RC Chromatographic Clarifier enables efficient clarification, and is capable of effective protection of final sterilizing grade membrane filter down to 0.1 µm pore size.

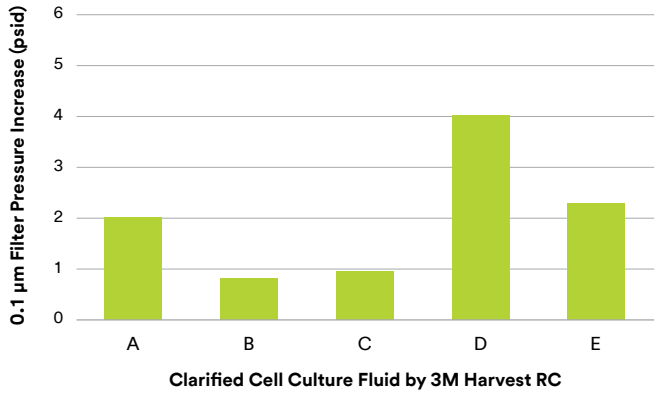


Figure 6: 0.1 µm sterile filter pressure increase at 500 L/m2. A – E are clarified fluids of CHO harvested cell culture fluids at 8%PCV by 3M™ Harvest RC capsules.

Product Specifications







Product Name	BC4	BC25 Luer	BC25 Sanitary	BC340	BC1020	BC2300	BC16000
Model Name	EMP201HRC2FA	EMP301HRC2FA	EMP303HRC2FA	EMP513HRC2FA	EMP533HRC2FA	EMP710HRC2FA	EMP770HRC2FA
Global Part Number	70-0203-5331-7	70-0203-5332-5	70-0203-5333-3	70-0203-5335-8	70-0203-5336-6	70-0203-5337-4	70-0203-5339-0
EMEA Part Number	7100241969	7100236863	7100236867	7100236865	7100236866	7100236845	7100236846
Height x Diameter	5.9 cm x 4.3 cm (2.3 in x 1.7 cm)	5.3 cm x 7.7 cm (2.1 in x 3.0 in)	8.6 cm x 7.7 cm (3.4 in x 3.0 in)	10.4 cm x 24.1 cm (4.1 in x 9.5 in)	15.2 cm x 24.1 cm (6.0 in x 9.5 in)	5.7 cm x 45.2 cm (2.2 in x 17.8 in)	20.3 cm x 45.2 cm (8.0 in x 17.8 in)
Dry Weight	14.3 g	69.2 g	75.8 g	1.1 kg	1.6 kg	3.4 kg	9.8 kg
Media Surface Area	3.2 cm^2	25 cm^2	25 cm^2	340 cm^2	1020 cm^2	2300 cm^2	1.61 m^2
Cell Culture Volume Range (5-8% PCV)[1]	20 - 32 mL	150 - 250 mL	150 - 250 mL	2 - 3.4 L	6 - 10 L	14 - 23 L	100 - 160 L
Weight Wet Post Blow Down	17.2 g	81.2 g	88.1 g	1.2 kg	2.1 kg	4.4 kg	16.3 kg
Fill Volume[2]	5.6 mL	27.6 mL	28.2 mL	0.66 L	1.7 L	3.3 L	16.3 L
Hold up Volume Post Blow Down[3]	3.0 mL	12.0 mL	12.3 mL	0.16 L	0.47 L	1.1 L	6.5 L
Capsule Material	Polypropylene	Polypropylene, Glass Filled Polypropylene	Polypropylene, Glass Filled Polypropylene	Polysulfone, Polypropylene, Glass Filled Polypropylene, Thermoplastic Elastomer, Fluorocarbon	Polysulfone, Polypropylene, Glass Filled Polypropylene, Thermoplastic Elastomer, Fluorocarbon	Polycarbonate, Polypropylene, Glass Filled Polypropylene, Thermoplastic Elastomer, Silicone	Polycarbonate, Polypropylene, Glass Filled Polypropylene, Thermoplastic Elastomer, Silicone
Inlet / Outlet Connections	Luer-Lok	Luer-Lok	Sanitary	Sanitary	Sanitary	Sanitary	Sanitary
Maximum Inlet Pressure[4]	3.4 bar	2.8 bar	2.8 bar	3.1 bar	3.1 bar	3.4 bar	3.4 bar
Maximum Differential Pressure	2.4 bar	2.4 bar	2.4 bar	2.4 bar	2.4 bar	2.4 bar	2.4 bar
Maximum Temperature	40 °C (104 °F)	40 °C (104 °F)	40 °C (104 °F)	40 °C (104 °F)	40 °C (104 °F)	40 °C (104 °F)	40 °C (104 °F)
Required Preconditioning Flush Volume[5]	8 mL	62.5 mL	62.5 mL	0.85 L	2.55 L	5.8 L	40.3 L
Recommended Use Flow Rate	0.53 mL/min	4.2 mL/min	4.2 mL/min	57 mL/min	170 mL/min	0.38 L/min	2.68 L/min
Storage Conditions	Controlled indoor temperatures: 0-30 °C (32-86 °F) in original sealed packaging	Controlled indoor temperatures: 0-30 °C (32-86 °F) in original sealed packaging	Controlled indoor temperatures: 0-30 °C (32-86 °F) in original sealed packaging	Controlled indoor temperatures: 0-30 °C (32-86 °F) in original sealed packaging	Controlled indoor temperatures: 0-30 °C (32-86 °F) in original sealed packaging	Controlled indoor temperatures: 0-30 °C (32-86 °F) in original sealed packaging	Controlled indoor temperatures: 0-30 °C (32-86 °F) in original sealed packaging
Shelf Life	Up to 2 years from the date of manufacture @30 °C maximum storage temperature	Up to 2 years from the date of manufacture @30 °C maximum storage temperature	Up to 2 years from the date of manufacture @30 °C maximum storage temperature	Up to 2 years from the date of manufacture @30 °C maximum storage temperature	Up to 2 years from the date of manufacture @30 °C maximum storage temperature	Up to 2 years from the date of manufacture @30 °C maximum storage temperature	Up to 2 years from the date of manufacture @30 °C maximum storage temperature
cGMP Compliant	No	No	No	Yes	Yes	Yes	Yes
GLP Compliant	Yes	Yes	Yes	No	No	No	No



Product Name	WP6	CT15	BT500
Model Name	EMP006HRC2FA	EMP015HRC2FA	EMP051HRC2FA
SAP Number	70-0203-5328-3	70-0203-5329-1	70-0203-6542-8
EMEA Part Number	7100242700	7100245350	7100302871
Height x Diameter	12.8 cm x 8.5 cm x 8.8 cm (5.0 in x 3.4 in x 3.5 in)	2.9 cm x 6.1 cm (1.2 in x 2.4 in)	16.1 cm x 11.1 cm (6.3 in x 4.4 in)
Dry Weight	Plate (w/ Media): 100 g Collector Plate: 110 g	10 g	250 g
Cell Culture Volume Range (5-8% PCV)[1]	15 mL per well	15 mL	500 mL
Fill Volume[2]	15 mL per well	15 mL	500 mL
Capsule Material	Polycarbonate	Polycarbonate	Polycarbonate
Maximum Temperature	40 °C (104 °F)	40 °C (104 °F)	40 °C (104 °F)
Maximum Relative Centrifugal Force	750 x g	750 x g	N/A
Recommended Relative Centrifugal Force	400 x g	400 x g	N/A
Recommended Processing Time	10 minutes	10 minutes	N/A
Maximum Vacuum Pressure	N/A	N/A	1.03 bar (15 psi)
Recommended Vacuum Pressure	N/A	N/A	0.52 bar (7.5 psi)
Storage Conditions	Controlled indoor temperatures: 0-30 °C (32-86 °F) in original sealed packaging	Controlled indoor temperatures: 0-30 °C (32-86 °F) in original sealed packaging	Controlled indoor temperatures: 0-30 °C (32-86 °F) in original sealed packaging
Shelf Life	Up to 2 years from the date of manufacture @30 °C maximum storage temperature	Up to 2 years from the date of manufacture @30 °C maximum storage temperature	Up to 2 years from the date of manufacture @30 °C maximum storage temperature
cGMP Compliant	No	No	No
GLP Compliant	Yes	Yes	Yes

Footnotes:

1. Cell Culture Volume Range is the estimation for CHO cell culture fluid at 5 - 8% packed cell volume
2. Fill Volume is defined as the volume of liquid that is required to fill the capsule.
3. Post Blow-Down Hold-Up Volume is defined as the volume of the residual liquid after air/gas blow down
4. Do not use this product for continuous service with compressed gasses. The use of compressed gas is permissible for post-use integrity testing and blow down purposes.
5. A Preconditioning Flush is required for the product to be compliant with USP Biological Reactivity Tests, including USP <87> and <88> Class VI. Refer to Installation and Operation Instructions for complete instructions on how to perform the preconditioning flush.

For more information about the **3M™ Harvest RC Chromatographic Clarifier,** contact your local sales or application engineering representative by calling **1-800-243-6894,** option 4**,** or visiting us at **3M.com/bioprocessing**

Intended Use: 3M™ Harvest RC products are intended for use in biopharmaceutical processing applications of aqueous based pharmaceuticals (drugs) and vaccines in accordance with the product instructions and specifications, and cGMP requirements (for BC340, BC1020, BC2300 and BC16000) or GLP requirements (for CT15, WP6, BC4 and BC25), where applicable.

Since there are many factors that can affect a product's use, the customer and user remain responsible for determining whether the 3M product is suitable and appropriate for the user's specific application, including user conducting an appropriate risk assessment and evaluating the 3M product in user's application.

Restrictions on Use:
For CT15, WP6, BC4 and BC25: For laboratory use only. Not intended for use with materials that will be used on humans or animals.
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