



Purolite™ Affinity Resin Selection Guide

ECOLAB®

Contents

Introduction	3
Jetted Manufacturing of Chromatography Resins	4
Affinity Resin Properties and Descriptions	6
Affinity Chromatography Resins	7
Molecule Selection	13
Conclusion	18
References	18
Ordering Information	19

Introduction

In 1986, the Federal Drug Administration (FDA) approved Muromonab-CD3 as an immunosuppressant following kidney transplantation. This marked the first time a monoclonal antibody (mAb) was approved for patient care and ushered in a new era in drug development. Since then, nearly 200 mAbs have been approved for the treatment or prevention of disease.¹

The most recent advancement in biotherapeutics is the transition from canonical (traditional) mAbs to engineered, high-efficacy formats such as multi-specifics.

Purification of these molecules is a critical step within the broader manufacturing process to ensure impurities from biosynthesis are removed and do not impact the quality of the final biological product.

A typical purification workflow involves three stages — capture, intermediate purification, and polishing. The capture and intermediate stages utilize affinity chromatography resins, followed by one or two ‘polishing’ steps to remove trace impurities.

Affinity resins, particularly protein A (pA) resins, have emerged as the primary for the capture stage of purification due to the binding specificity offered. However, these specialized affinity resins, adequate equipment, and time-intensive procedures result in significant costs to drug developers.

Given the growing cost of purification and the expanding catalog of antibodies and antibody formats, selecting the appropriate affinity resin is critical to achieving process economics and product quality.

This Selection Guide discusses the use of Purolite Affinity Resins from Ecolab to perform the initial stages of mAb purification, highlighting the benefits of Jetted Technology to manufacture chromatography resins.

Jetted Manufacturing of Chromatography Resins

Both the resin material and manufacturing process will significantly impact the resin properties and, in turn, the resin performance.

Chromatography resins can be made of various materials. Purolite Resins are made using agarose, an ideal material for bioprocessing due to its hydrophilic nature and strong physical and chemical properties. These properties enable agarose-based resins to support purification at scale.

The manufacturing method employed for resin production is also important. The traditional method of agarose bead production, batch emulsification, involves dissolving the agarose in a chemical solvent, stirring the mixture to reduce the particle size, and extensively sieving the beads to help reduce the distribution in the range of bead sizes.

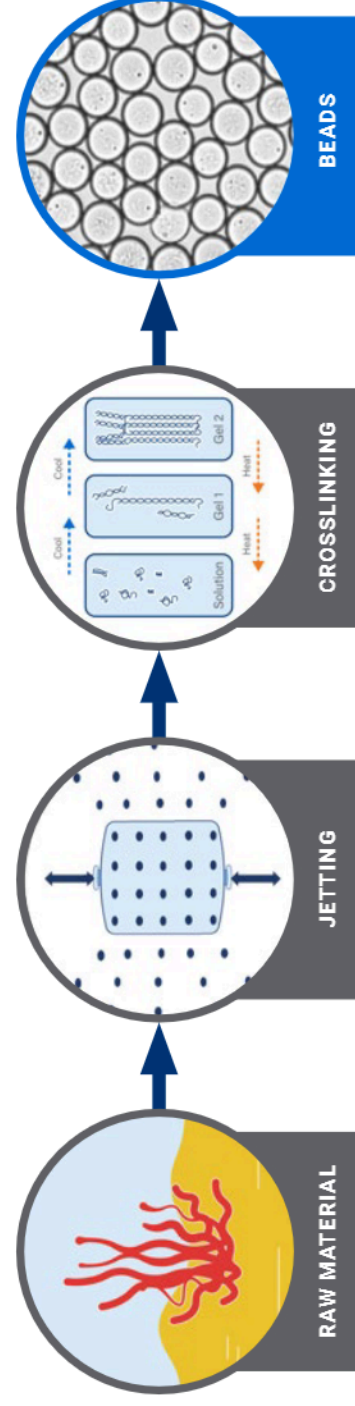
Ecolab employs the patented method of Jetted manufacturing technology to produce resin beads. The Jetting manufacturing process uses fewer chemical solvents and reduces the sieving process, allowing for shorter lead times while maintaining a narrower bead size distribution than traditional methods.

During the Jetting manufacturing process, agarose is dissolved in water and pushed through precisely sized pores in a canister into a bath of mineral oil. The canister oscillates vertically at a consistent rate, “breaking” the agarose solution into uniformly sized droplets. The droplets harden as the beads cool and undergo cross-linking. The resulting beads are uniform in size, limiting the amount of sieving required and allowing the entire batch to be utilized for chromatography.

FIGURE 1

Schematic of the Jetting Process

Unlike traditional emulsification techniques, limited sieving is required in the Jetting process, resulting in fewer production steps and greater yield.



In this example, emulsified beads are targeted at 85 microns (µm) and the jetted beads are targeted at 50 µm. A marked difference in particle size distribution can be seen when comparing Jetted resin beads with emulsified resin beads.

Jetted manufacturing technology produces beads that are more uniform in size, centering on a single mean particle size. In contrast, emulsified beads exhibit a broad distribution of particle sizes within a specified range following the sieving process.

The consistent bead size of jetted resins enhances mass transfer and aids in target binding. In addition, reducing the sieving process produces a greater yield per run, helping reduce lead time.



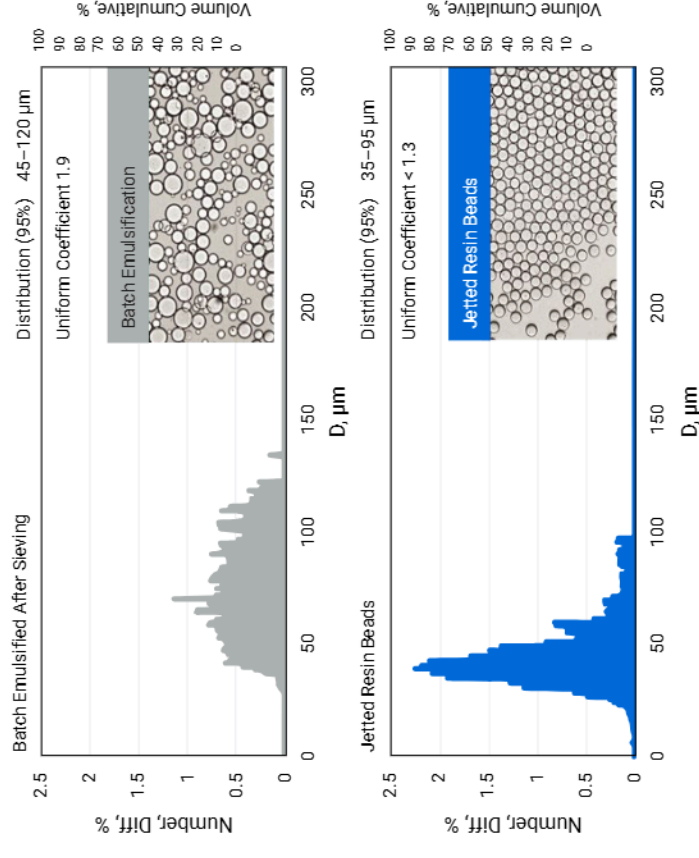
Learn how Jetted Technology supports sustainability and improves manufacturing efficiency.

www.puroliteresins.com/index/bioprocessing/jetting-technology

FIGURE 2

Particle Size Distribution Comparison

Graph and microscope comparison of emulsified resin beads after extensive sieving and jetted resin beads with limited sieving. In this comparison, the emulsified bead is targeted at 85 µm, with an average range of 45–120 µm. The jetted bead is targeted at 50 µm.



Affinity Resin Properties and Descriptions



DYNAMIC BINDING CAPACITY

Antibody binding to the resin at a specific residence time (g/L). Used to calculate the required resin volume and processing cycles for clarified cell culture fluid (CCF). Impacts overall process economy.



pH WINDOW

Workable pH range allowing optimal recovery and elution volume. Limits aggregation, particularly for pH-sensitive molecules.



ALKALINE STABILITY

Maximum recommended NaOH concentration for an effective cleaning strategy. Extends resin lifespan and supports CIP and SIP strategies.



PROTEASE RESISTANCE

Ligand resistance to endogenous protease present in mAb feed. Prolongs resin lifetime.



PROTEIN A LEAKAGE

The amount of protein A ligand detected in mAb eluted from the column (ppm). Simplifies polishing step when levels are low.



PRESSURE FLOW

Maximum operating flow rate determined by column dimensions and rigidity of base bead. Influences the final scale and dimensions of a manufacturing operation.



VIRAL CLEARANCE

Potential clearance of adventitious virus present in mAb feed (contributes to overall log reduction). Contributes to product safety and process robustness.



MASS TRANSFER

The speed at which monoclonal antibodies bind to ligands and buffer transition. Enable process intensification and sustainability through rapid cycling or continuous affinity capture.

Affinity Chromatography Resins

Over the last three decades, as downstream purification has evolved, affinity resins have seen improvements in capacity, stability, and throughput. These advancements have mirrored industry demands to improve productivity and cost-effective manufacturing of therapeutics.

In recent years, the development of molecules aimed at enhancing drug efficacy, particularly those used for cancer treatment, has led to challenges in expression and purification. These challenges are largely due to the increased complexity of the molecules and their resemblance to product-related impurities. This trend, and the subsequent growth of multi-specific formats, has driven a "toolbox" approach to purification.

For molecules containing the Fc-binding region, protein A resins remain the primary method for performing the capture stage. However, novel affinity resins have emerged, offering innovative features to meet specific purification challenges. For example, wider elution windows to limit aggregation risks or enhanced alkaline stability to maintain capacity under harsh cleaning-in-place regimens.

Overall, the development of advanced affinity resins has expanded screening options for therapeutic drug developers and addressed common industry needs, such as biosimilar and generation II production, process intensification, and dual sourcing.

When selecting an affinity resin, consideration must be given to the target molecule and its characteristics in relation to contaminants, as well as the effects on overall productivity and compatibility with the facility, all while ensuring robustness and promoting cost-effectiveness.

Purolite Dura Cycle™ A50

Dura Cycle A50 is engineered to purify monoclonal antibodies (mAbs) and associated protein constructs under variable cleaning strategies.

Building on Ecolab's foundational Purolite Resin, Dura Cycle A50 supports process intensification strategies for efficient purification.

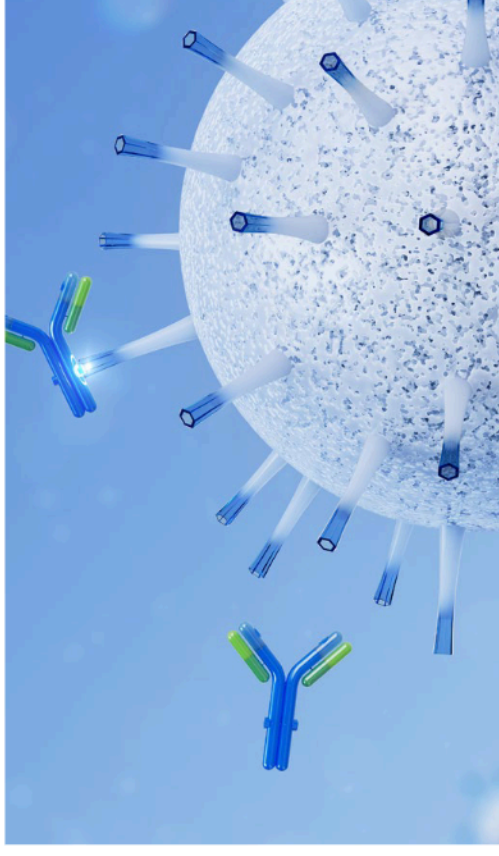
Dura Cycle A50 delivers:

- Resistance up to 0.5 M NaOH
- pH elution window $\text{pH} \leq 4.5$
- Dynamic binding capacity > 80 g/L
- Maximum durability to proteolytic enzymes (often present in clarified cell culture feed)



Learn how Dura Cycle A50 can increase your process efficiency.

www.puroliteresins.com/index/bioprocessing/dura-cycle



✕ NaOH STABILITY

Sodium hydroxide (NaOH) is an industry standard for the cleaning-in-place protocol but can reduce resin capacity over time.

The alkaline stability offered by Dura Cycle A50 allows for the implementation of more aggressive cleaning strategies without compromising resin lifetime.

Purolite Praesto™ AP+ Resin Platform

Praesto AP+80 and AP+50 resins are designed for the purification of a wide range of mAbs and related constructs.

Praesto AP+80 offers good capacity and flow characteristics designed for speed and easy implementation in conventional column bed heights.

Praesto AP+50 offers our highest capacity and resin utilization to support process intensification.

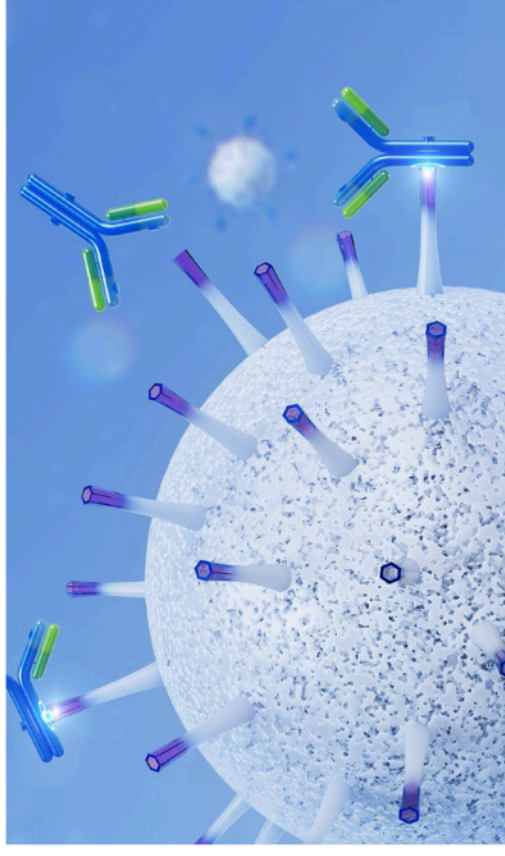
Praesto AP+ Resin Platform delivers:

- Resistance up to 0.1–0.5 M NaOH
- Dynamic binding capacity > 60 g/L (AP+80) and > 70 g/L (AP+50)
- High-capacity recovery at extended residence times
- Recombinant modified C-domain



Learn how the Praesto AP+ platform offers cost-effective solutions to molecule development.

<https://www.purolite.com/index/bioprocessing/praesto-ap-plus-platform>



✕ COST-EFFECTIVE PRODUCTION

Achieving cost-effective purification while maintaining safety and efficacy is critical to many drug developers.

Over multiple projects, the Praesto AP+ Resin Platform offers substantial savings — and comparable performance — to competitor resins.

Purolite Praesto Jetted A50 HipH

Praesto Jetted A50 HipH is engineered to expedite discovery and purification workflows for pH-sensitive antibody molecules.

High elution pH enhances the viral clearance potential of the protein A capture step when utilizing the resin. By addressing aggregation during the initial stages, Praesto Jetted A50 HipH reduces the burden on downstream polishing steps.

It is the recommended resin to address purification challenges often encountered when purifying multi-specifics and Fc-fusion formats.

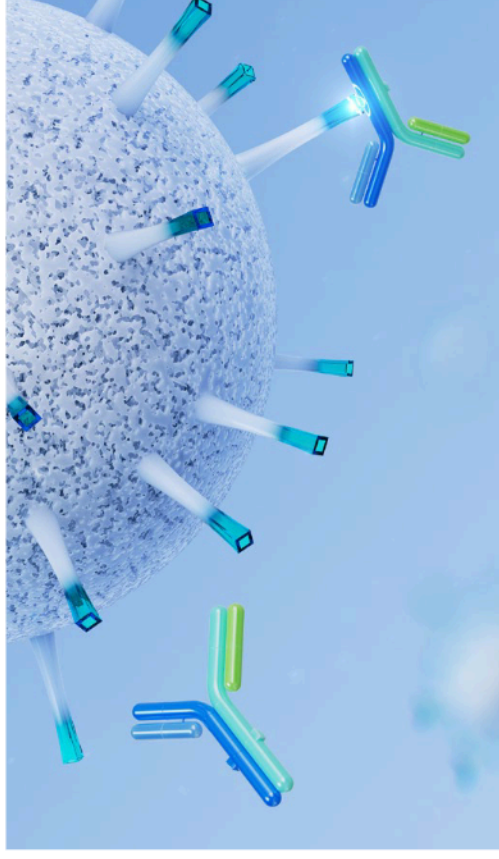
Praesto Jetted A50 HipH delivers:

- Resistance up to 0.1 M NaOH
- pH elution window $\text{pH} \leq 5.0$
- Dynamic binding capacity > 60 g/L
- Maximum purity and recovery of antibody formats sensitive to low pH



Learn how Praesto Jetted A50 HipH purifies complex molecules.

www.puroliteresins.com/index/bioprocessing/praesto-jetted-a50-hiph



✕ pH WINDOW

Acid-sensitive molecules become unstable at typical elution levels (pH 3–3.5), significantly decreasing product yield.

Aggregates, host cell proteins (HCPs), nucleic acids, and viruses are detrimental to downstream antibody purification.

Effective Viral clearance is critical for validation and process robustness

Purolite Praesto 70 CH1

Praesto 70 CH1 is engineered to provide high productivity when targeting the human CH1 domain across IgGs and mAbs.

Praesto 70 CH1 facilitates the purification of multi-specifics and antigen-binding fragments (Fabs). Its selectivity makes it the recommended resin for complex purifications where the target molecule closely resembles associated contaminants.

Compared to alternative CH1 resins, Praesto 70 CH1 offers improved alkaline stability, allowing for the adoption of standard CIP protocols.

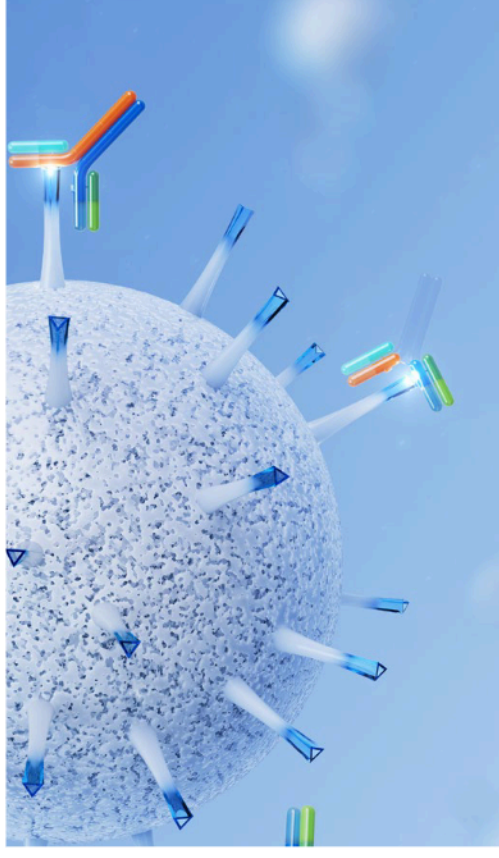
Praesto 70 CH1 delivers:

- Resistance up to 0.1 M NaOH
- Dynamic binding capacity > 50 g/L



Learn how Praesto 70 CH1 purifies complex molecules.

www.puroliteresins.com/index/bioprocessing/praesto-70-ch1



✕ DYNAMIC BINDING CAPACITY

Dynamic binding capacity significantly influences process economics, impacting yield, efficiency, and overall cost.

Praesto 70 CH1 offers up to twice the dynamic binding capacity of established CH1 resins, providing therapeutic drug developers with a competitive advantage.

Purolite Praesto Jetted A50

Praesto Jetted A50 is engineered to purify monoclonal antibodies and associated protein constructs, supporting numerous FDA-approved antibody-based therapies.

The first agarose chromatography resin manufactured via sustainable Jetted Technology, Praesto Jetted A50 introduced novel performance and sustainability benefits to the bioprocessing industry.

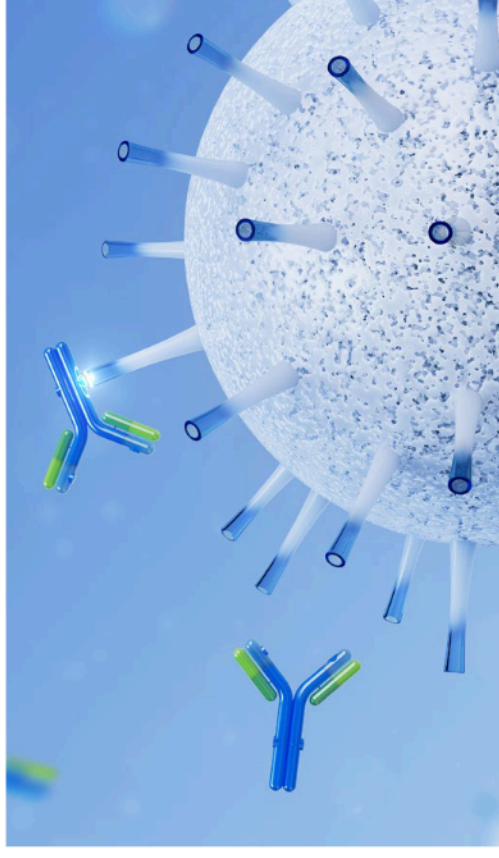
Praesto Jetted A50 delivers:

- Resistance up to 0.1 M NaOH
- Dynamic binding capacity > 70 g/L
- High capacity and recovery at short residence times



Learn about Ecolab's landmark bioprocessing resin.

www.puroliteresins.com/index/bioprocessing/praesto-jetted-a50



✕ JETTED TECHNOLOGY

Jetted manufacturing technology produces beads that are more uniform in size, compared to the traditional method of emulsification.

The uniform particle size and highly cross-linked agarose base beads of Praesto Jetted A50 provide increased surface area without compromising performance.

Molecule Selection

This section serves as a tool to guide a resin selection process based on the specific criteria necessary. Selection of a resin for the capture stage typically begins with the identification of the target molecule.

Once the target molecule is determined and evaluated, the structure and binding sites of the target molecule will determine the potential affinity resins that can be utilized. In addition, the potential to remove product-related impurities, while maintaining product stability and maximizing recovery, should also be evaluated.

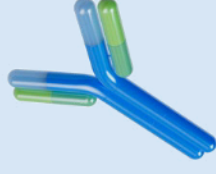
In addition, flow properties and capacity should be considered to ensure the resin will perform efficiently under the process conditions.

Finally, consideration should be given to the scale of production and impact on process economy.



TRADITIONAL MAB

Highly specific antibodies targeting distinct antigens, the most commonly used protein type in the development of therapeutic medicines.



MULTISPECIFICS AND FUSION PROTEINS

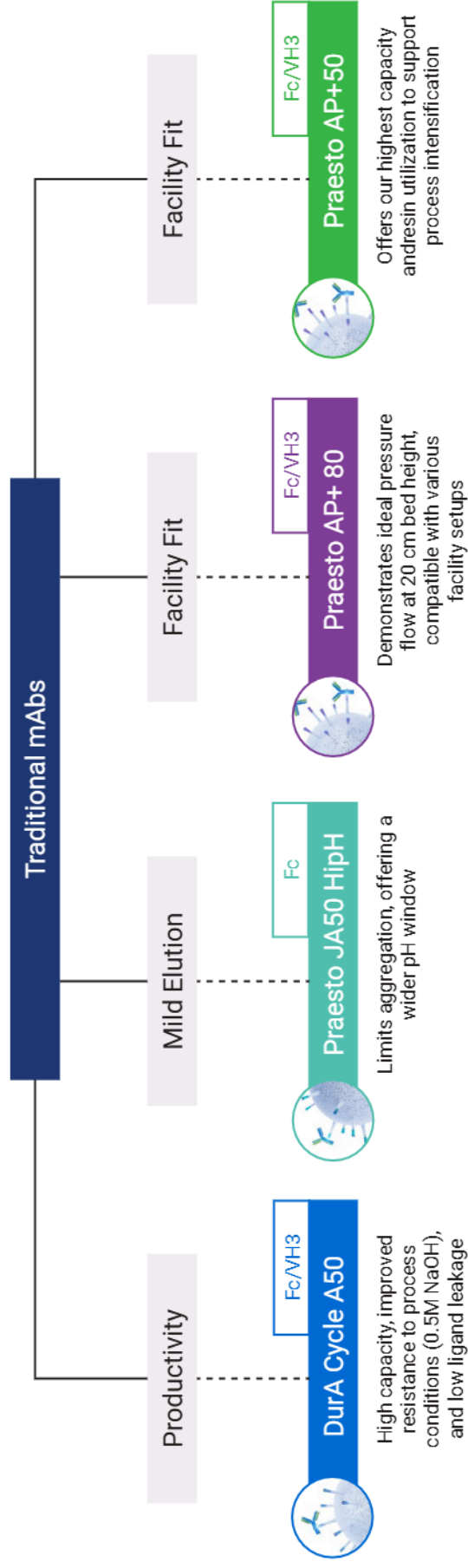
Engineered to bind to multiple targets simultaneously, enabling more complex interactions and offering unique applications in therapeutic drug development.

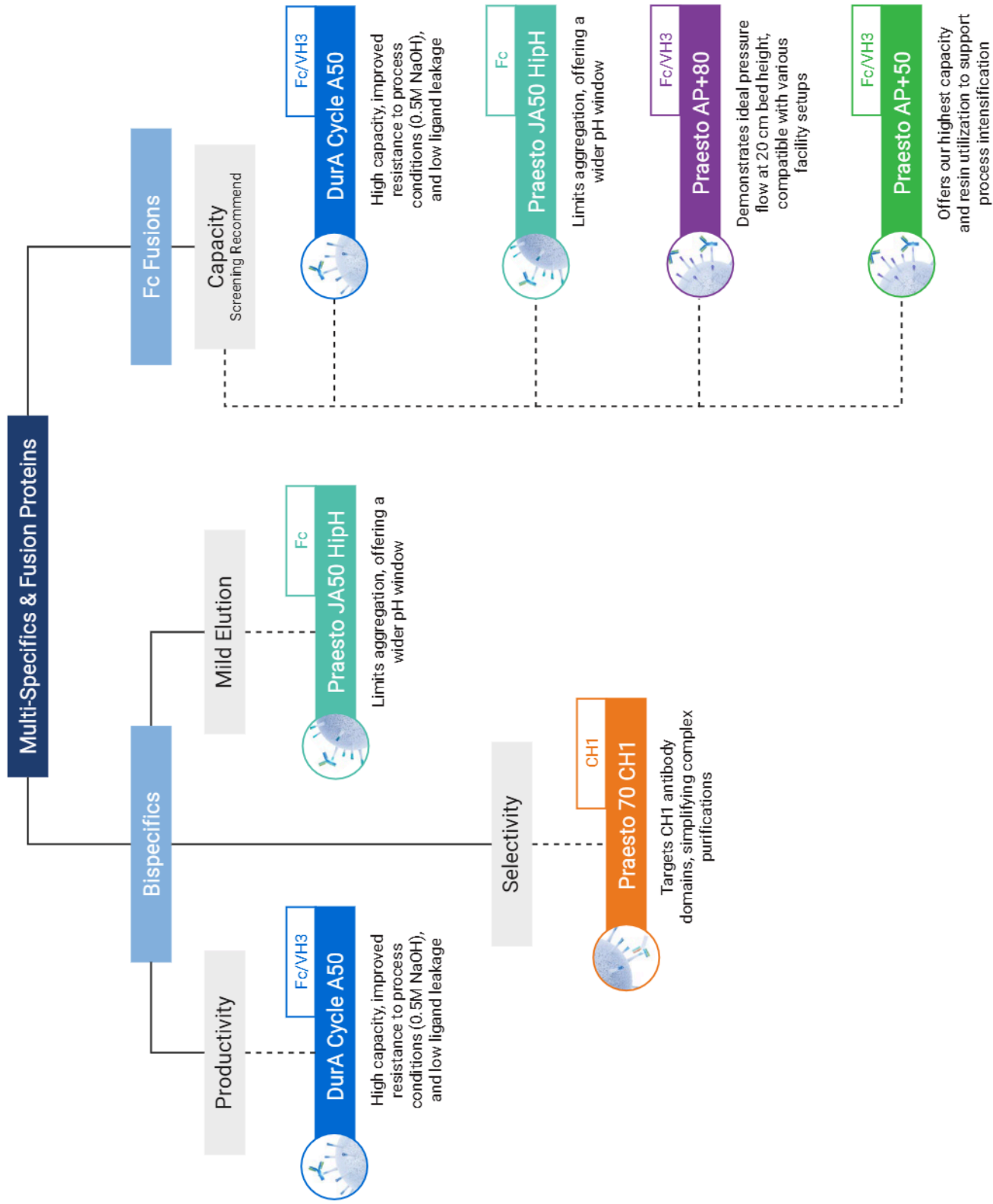


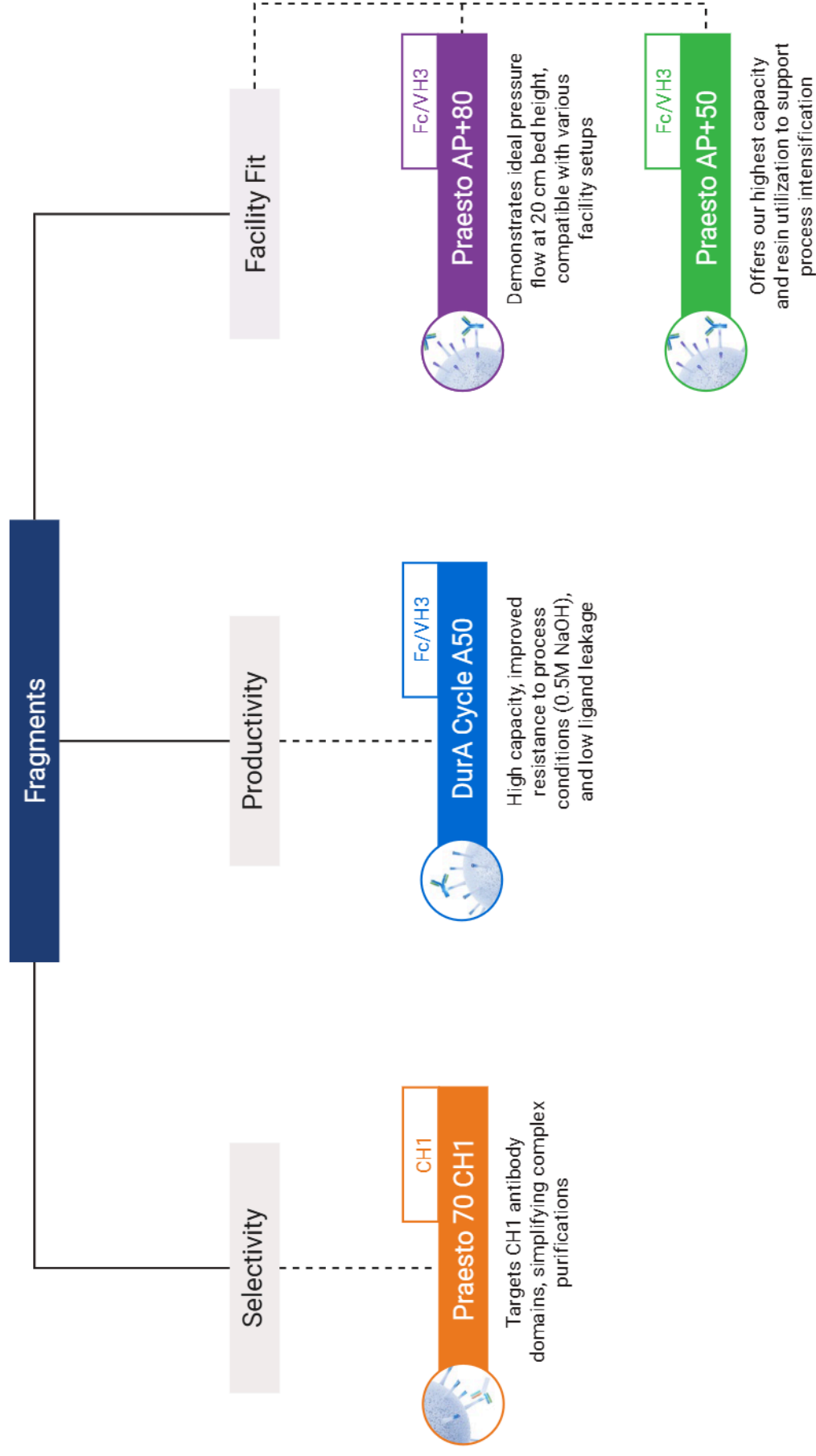
FRAGMENTS

Smaller antibody derivatives that bind to specific antigens while offering reduced size and improved tissue penetration. Fragments are increasingly utilized in the development of therapeutic medicines.









Conclusion

Affinity resins, particularly protein A (prA) resins, are the most common method for performing the capture stage of protein purification across laboratory and commercial-scale manufacturing of antibody-based therapies.

The increasing diversity of molecules used in biotherapeutics has created the need for developers to assess multiple affinity resins, aimed at efficiently capturing the target molecule and simplifying the subsequent polishing steps.

Ecolab offers a toolbox of resins — manufactured using patented Jetted Technology — to meet specific purification challenges or fit distinctive purification procedures. Whether you need a wider elution window, enhanced alkaline stability, or binding selectivity, Ecolab's Affinity Resin Toolbox offers a solution.

References

1. Development of therapeutic antibodies for the treatment of diseases | Journal of Biomedical Science | Full Text ([biomedcentral.com](https://www.biomedcentral.com))

Ordering Information

Purolite Dura Cycle A50

Product Description	Previous Material Number	Current Material Number
DurA Cycle A50 – 25ml	PR00555-166	6602076
DurA Cycle A50 – 100ml	PR00555-164	6602071
DurA Cycle A50 – 500ml	PR00555-165	6602073
DurA Cycle A50 – 1L	PR00555-310	6602102
DurA Cycle A50 – 5L	PR00555-311	6602106
DurA Cycle A50 – 10L	PR00555-312	6602110
DurA Cycle A50 (1ml) MiniChrom Columns	PR00555-175	6602081
DurA Cycle A50 (5ml) MiniChrom Columns	PR00555-176	6602082
DurA Cycle A50 (200uL) RoboColumn Column	PR00555-174	6602078
DurA Cycle A50 (600uL) RoboColumn Column	PR00555-279	6602100
DurA Cycle A50 (1ml) HT Column	PR00555-275	6602093
DurA Cycle A50 (5ml) HT Column	PR00555-276	6602097

Purolite Praesto AP+80

Product Description	Previous Material Number	Current Material Number
Praesto AP+80 – 25ml	PR00370-166	6601393
Praesto AP+80 – 100ml	PR00370-164	6601386
Praesto AP+80 – 500ml	PR00370-165	6601389
Praesto AP+80 – 1L	PR00370-310	6601396
Praesto AP+80 – 5L	PR00370-311	6601399
Praesto AP+80 – 10L	PR00370-312	6601402
Praesto AP+80 (1ml) MiniChrom Columns	PR00370-175	6601203
Praesto AP+80 (5ml) MiniChrom Columns	PR00370-176	6601204
Praesto AP+80 (200uL) RoboColumn Column	PR00370-174	6601202
Praesto AP+80 (600uL) RoboColumn Column	PR00370-279	6601207
Praesto AP+80 (1ml) HT Column	PR00370-275	6601205
Praesto AP+80 (5ml) HT Column	PR00370-276	6601206

Purolite Praesto AP+50

Product Description	Material Number
Praesto AP+50 – 25ml	6603776
Praesto AP+50 – 100ml	6603777
Praesto AP+50 – 500ml	6603778
Praesto AP+50 – 1L	6603779
Praesto AP+50 – 5L	6603780
Praesto AP+50 – 10L	6603781
Praesto AP+50 (1ml) MiniChrom Columns	6603782
Praesto AP+50 (5ml) MiniChrom Columns	6603783
Praesto AP+50 (200uL) RoboColumn Column	6603784
Praesto AP+50 (600uL) RoboColumn Column	6603785
Praesto AP+50 (1ml) HT Column	6603786
Praesto AP+50 (5ml) HT Column	6603787

Purolite Praesto Jetted A50 HipH

Product Description	Previous Material Number	Current Material Number
Praesto Jetted A50 HipH – 25ml	PR00530-166	6601333
Praesto Jetted A50 HipH – 100ml	PR00530-164	6601331
Praesto Jetted A50 HipH – 500ml	PR00530-165	6601332
Praesto Jetted A50 HipH – 1L	PR00530-310	6601334
Praesto Jetted A50 HipH – 5L	PR00530-311	6601335
Praesto Jetted A50 HipH – 10L	PR00530-312	6601336
Praesto Jetted A50 HipH (1ml) MiniChrom	PR00530-175	6601173
Praesto Jetted A50 HipH (5ml) MiniChrom	PR00530-176	6601174
Praesto Jetted A50 HipH (200µl) Robocolumn	PR00530-174	6601172
Praesto Jetted A50 HipH (600µl) Robocolumn	PR00530-279	6601177
Praesto Jetted A50 HipH (1ml) HT Column	PR00530-275	6601175
Praesto Jetted A50 HipH (5ml) HT Column	PR00530-276	6601176

Purolite Praesto 70 CH1

Product Description	Previous Material Number	Current Material Number
Praesto 70 CH1 – 25ml	PR00670-166	6601710
Praesto 70 CH1 – 100ml	PR00670-164	6601708
Praesto 70 CH1 – 500ml	PR00670-165	6601709
Praesto 70 CH1 – 1L	PR00670-310	6601711
Praesto 70 CH1 – 5L	PR00670-311	6601712
Praesto 70 CH1 – 10L	PR00670-312	6601713
Praesto 70 CH1 (1ml) MiniChrom Columns	PR00670-175	6601672
Praesto 70 CH1 (5ml) MiniChrom Columns	PR00670-176	6601673
Praesto 70 CH1 (200uL) RoboColumn Column	PR00670-174	6601671
Praesto 70 CH1 (600uL) RoboColumn Column	PR00670-279	6601676
Praesto 70 CH1 (1ml) HT Column	PR00670-275	6601675
Praesto 70 CH1 (5ml) HT Column	PR00670-276	6601674

Purolite Praesto Jetted A50

Product Description	Previous Material Number	Current Material Number
Praesto Jetted A50 – 25ml	PR00550-166	6601353
Praesto Jetted A50 – 100ml	PR00550-164	6601349
Praesto Jetted A50 – 500ml	PR00550-165	6601351
Praesto Jetted A50 – 1L	PR00550-310	6601355
Praesto Jetted A50 – 5L	PR00550-311	6601357
Praesto Jetted A50 – 10L	PR00550-312	6601359
Praesto Jetted A50 (1ml) MiniChrom Columns	PR00550-175	6601185
Praesto Jetted A50 (5ml) MiniChrom Columns	PR00550-176	6601186
Praesto Jetted A50 (200uL) RoboColumn Column	PR00550-174	6601184
Praesto Jetted A50 (600uL) RoboColumn Column	PR00550-279	6601189
Praesto Jetted A50 (1ml) HT Column	PR00550-275	6601187
Praesto Jetted A50 (5ml) HT Column	PR00550-276	6601188

Purolite Praesto AP+ (Emulsified)

Product Description	Previous Material Number	Current Material Number
Praesto AP+ – 25ml	PR00330-166	6601295
Praesto AP+ – 100ml	PR00330-164	6601291
Praesto AP+ – 500ml	PR00330-165	6601293
Praesto AP+ – 1L	PR00330-310	6601297
Praesto AP+ – 5L	PR00330-311	6601299
Praesto AP+ – 10L	PR00330-312	6601301
Praesto AP+ (1ml) MiniChrom	PR00330-175	6601143
Praesto AP+ (5ml) MiniChrom	PR00330-176	6601144
Praesto AP+ (200uL) RoboColumn	PR00330-174	6601142
Praesto AP+ (600uL) RoboColumn	PR00330-279	6601147
Praesto AP+ (1ml) HT Column	PR00330-275	6601145
Praesto AP+ (5ml) HT Column	PR00330-276	6601146

Purolite Praesto APc+ (Emulsified)

Product Description	Previous Material Number	Current Material Number
Praesto APc+ – 25ml	PR00340-166	6601305
Praesto APc+ – 100ml	PR00340-164	6601303
Praesto APc+ – 500ml	PR00340-165	6601304
Praesto APc+ – 1L	PR00340-310	6601306
Praesto APc+ – 5L	PR00340-311	6601307
Praesto APc+ – 10L	PR00340-312	6601308
Praesto APc+ (1ml) MiniChrom Columns	PR00340-175	6601149
Praesto APc+ (5ml) MiniChrom Columns	PR00340-176	6601150
Praesto APc+ (200uL) RoboColumn Column	PR00340-174	6601148
Praesto APc+ (600uL) RoboColumn Column	PR00340-279	6601153
Praesto APc+ (1ml) HT Column	PR00340-275	6601151
Praesto APc+ (5ml) HT Column	PR00340-276	6601152

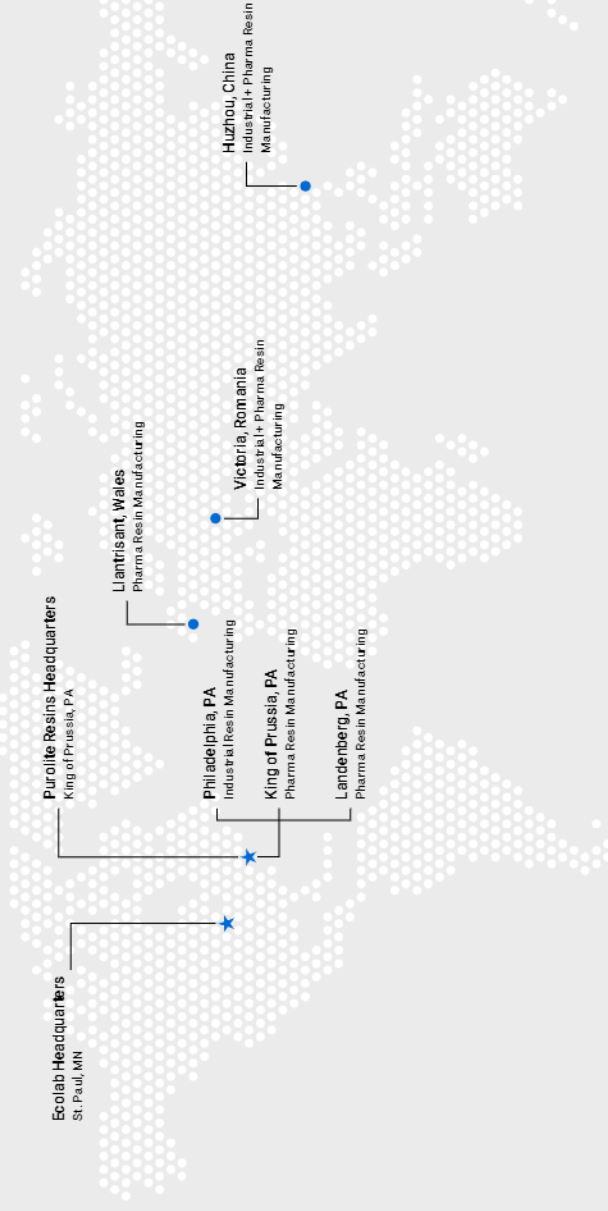
Purolite Praesto Apc+ (Emulsified)

Product Description	Previous Material Number	Current Material Number
Praesto Apc+ – 25ml	PR00360-166	6601418
Praesto Apc+ – 100ml	PR00360-164	6601414
Praesto Apc+ – 500ml	PR00360-165	6601416
Praesto Apc+ – 1L	PR00360-310	6601419
Praesto Apc+ – 5L	PR00360-311	6601421
Praesto Apc+ – 10L	PR00360-312	6601423
Praesto Apc+ (1ml) MiniChrom Columns	PR00360-175	6601215
Praesto Apc+ (5ml) MiniChrom Columns	PR00360-176	6601216
Praesto Apc+ (200uL) RoboColumn Column	PR00360-174	6601214
Praesto Apc+ (600uL) RoboColumn Column	PR00360-279	6601219
Praesto Apc+ (1ml) HT Column	PR00360-275	6601217
Praesto Apc+ (5ml) HT Column	PR00360-276	6601218

Ecolab is a global developer, manufacturer, and supplier of Purolite™ Resins including ion exchange, catalyst adsorbent and advanced polymers that make the world cleaner and healthier.



PuroriteResins.com



We're ready to solve your process challenges.

For further information on products and services, visit PuroriteResins.com or complete a Contact Us form via PuroriteResins.com/contact-us or use the QR code.

Contact Us Form:



The statements, technical information and recommendations contained herein are believed to be accurate as of the date thereof. Since the conditions and methods of use of the product and of the information referred to herein are beyond our control, Purolite expressly disclaims any and all liability as to any results obtained or arising from any use of the product or reliance on such information; NO WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE, WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, IS MADE CONCERNING THE GOODS DESCRIBED OR THE INFORMATION PROVIDED HEREIN. The information provided herein relates only to the specific product designated and may not be applicable when such product is used in combination with other materials or in any process. Nothing contained herein constitutes a license to practice under any patent and it should not be construed as an inducement to infringe any patent and the user is advised to take appropriate steps to be sure that any proposed use of the product will not result in patent infringement.



©2025 Purolite
All rights reserved.
P-000160-100PP-0725-ENG-R2-BP