

CHROMATOGRAPHY

Nuvia™ HP-Q Anion Exchange Resin

- Ideal for purification of large biomolecules
- Best-in-class binding capacity and mechanical strength at high flow rates
- Excellent pressure flow properties
- High recovery and reproducibility
- Full regulatory support

High Dynamic Binding Capacity for Efficient Downstream Purification of Large Biomolecules

Introduction

Nuvia HP-Q is a high-performance strong anion exchange resin. It is the latest product in the Nuvia family of high-capacity ion exchange resins and can be used for downstream purification of large molecules such as high molecular weight (HMW) plasma proteins IgA and IgM, viruses, virus-like particles (VLPs), and PEGylated proteins. It is built on the rugged and hydrophilic UNOsphere™ epoxide base bead that provides the fast mass transfer kinetics and low nonspecific binding demanded by today's process manufacturing. The stability of this base bead and its broad chemical compatibility allows repeated uses with a long resin lifetime. Nuvia HP-Q particle size is designed to offer high dynamic binding capacity (DBC) at fast flow rates without excessive backpressure, thereby delivering excellent process economics. Its pore size is optimized for easy accessibility and adsorption of large biomolecules, and the internal spacer length and ligand density facilitate efficient binding of the biomolecules even at high flow rates.

Nuvia HP-Q was designed to overcome the issues faced when purifying large biomolecules with other commercially available resins and help in downstream purification of such biomolecules at fast flow rates without loss in DBC and recovery. IgM obtained from plasma fractionation showed DBC in the range of 20–25 mg/ml with Nuvia HP-Q. Table 1 shows that higher DBC at faster flow rates was obtained with Nuvia HP-Q relative to other resins from different vendors. The technical properties of Nuvia HP-Q Resin are listed in Table 2.

Table 1. Superior DBC of Nuvia HP-Q at a high flow rate relative to other commercially available resins.

Resin	Matrix Material	Particle Size, μm	Pressure, bar	Recommended Flow Rate, cm/hr ¹	DBC (IgM)
Nuvia HP-Q	UNOsphere epoxide	50	<3	300	+++²
Resin 1	Dextran beads	50	<3	30	+++ ²
Resin 2	Agarose	75	<3	300	+ ³
Resin 3	PS/DVB	50	<3	300	+ ²
Resin 4	PMMA	50	<3	300	+ ²

¹ Recommended flow rate for industrial scale column (D > 30 cm).

² DBC data at 10% breakthrough.

³ Data obtained from vendor presentation.



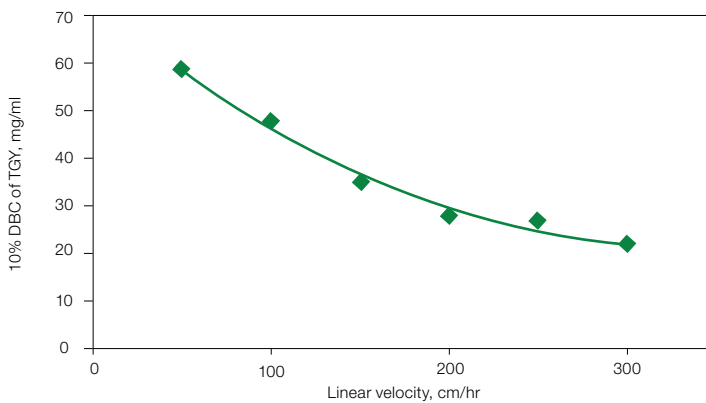
Table 2. Properties of Nuvia HP-Q.

Property	Description
Type of ion exchanger	Strong anion
Functional group	-N ⁺ (CH ₃) ₃
Particle size range	38–53 μm
Total ionic capacity	48–88 μeq
Dynamic binding capacity*	>50 mg/ml at 100 cm/hr
Recommended linear flow rate	50–300 cm/hr
Maximum operating pressure	3 bar
Compression factor	~1.2
Long-term pH stability	2–11
Shipping solution	20% ethanol or 2% benzyl alcohol
Regeneration	1–2 M NaCl
Sanitization	1 N NaOH
Storage conditions	20% ethanol or 0.01 N NaOH
Storage temperature	Room temperature
Chemical stability	1 N NaOH (20°C), up to 1 week
Shelf life	5 years

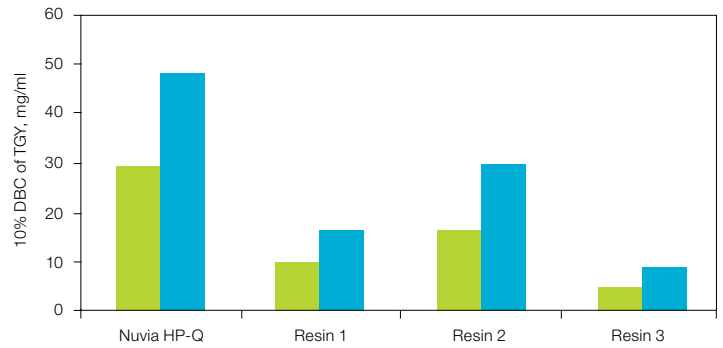
* 10% breakthrough capacity determined with 1.1 mg/ml of thyroglobulin in 20 mM Tris HCl, pH 8.0.

Best-in-Class Binding Capacity

Nuvia HP-Q delivers on the demanding pressure flow requirements of downstream process purification. Its optimized particle size facilitates a high DBC at high flow rates (Figure 1). Parallel runs of thyroglobulin on Nuvia HP-Q and other commercially available resins demonstrate that Nuvia HP-Q overcomes the compromised productivity issue that results from low DBCs at process-scale flow rates (Figure 2).

**Fig. 1. Dynamic binding capacity (DBC) vs. flow velocity of Nuvia HP-Q.**

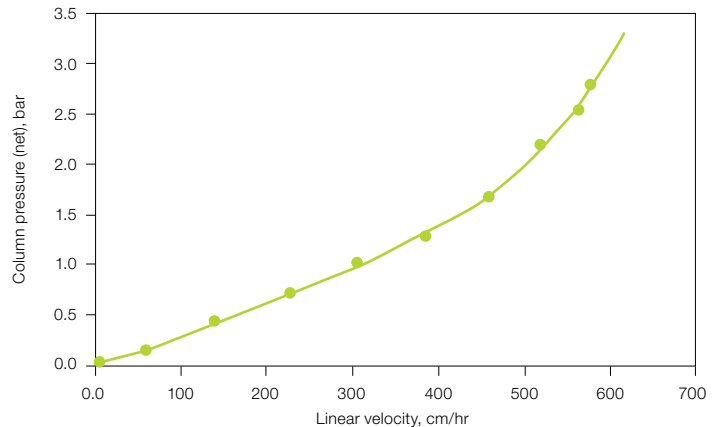
The resin was packed into a 1 ml Bio-Scale™ Mini Column (0.56 x 4 cm). Thyroglobulin (TGY) solution (1.1 mg/ml) in 20 mM Tris Cl, pH 8.0 was loaded onto the column until 10% breakthrough was observed.

**Fig. 2. Dynamic binding capacity (DBC) vs. residence time of Nuvia HP-Q.**

Comparison of DBCs between Nuvia HP-Q and three other commercially available resins at 1.2 and 2.4 min residence times. The resins were packed into 1 ml columns. Thyroglobulin (TGY) solution (1.1 mg/ml) in 20 mM Tris Cl, pH 8.0 was loaded onto the columns until 10% breakthrough was observed. 1.2 min residence (■); 2.4 min residence (■).

Excellent Pressure Flow Properties

Nuvia HP-Q Resin is designed with an optimal bead size to achieve both laboratory- and process-scale purification of large biomolecules at high flow rates without being limited by column pressure. This leads to an increase in productivity during protein purification. The column pressure remains below 1.5 bar at a linear velocity of 350 cm/hr (Figure 3).

**Fig. 3. Pressure/flow performance of Nuvia HP-Q Resin.** Nuvia HP-Q slurry prepared in 1x PBS, pH 7.5 was packed into a 20 x 20 cm column by axial compression with a compression factor of 1.2.

Robust Performance and Recovery

Nuvia HP-Q Resin is produced by a validated manufacturing process that ensures batch-to-batch reproducibility. The chemical stability of Nuvia HP-Q allows the resin to perform consistently with minimal changes to DBC or recovery even after prolonged exposure to NaOH (Figure 4).

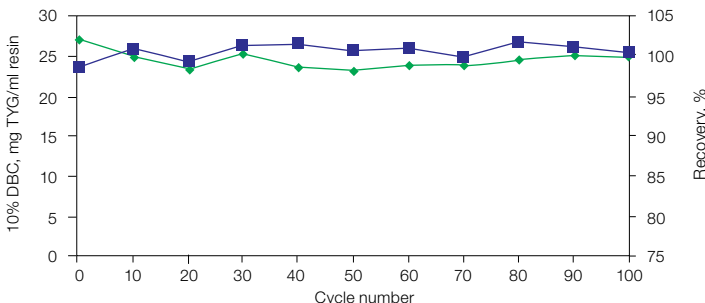


Fig. 4. Stability, reusability, and recovery with Nuvia HP-Q Resin. Thyroglobulin (TYG) solution (1.1 mg/ml) in equilibration buffer (20 mM Tris Cl, pH 8.0) was loaded onto a 1 ml Bio-Scale Mini Column (0.56 x 4 cm) packed with Nuvia HP-Q to a compression factor of 1.2. The column was operated at 300 cm/hr. The protein was eluted in 5 CV of elution buffer (20 mM Tris Cl, 1 M NaCl, pH 8.0) at 300 cm/hr. Cleaning in place (CIP) was performed on the column with 3 CV of 0.5 N NaOH at 300 cm/hr followed by a 40 min hold. The 10% DBC at linear velocity of 300 cm/hr was determined after every 10 cycles. DBC (◆); recovery (■).

Easy Scalability from Laboratory to Bioprocess Manufacturing

Nuvia HP-Q Resin is specifically designed for easy scalability to meet manufacturing demands. It is available in multiple user-friendly formats, including prepacked Foresight™ Columns and Plates for purification condition screening and bulk bottles for pilot- to manufacturing-scale purifications. It is backed by our regulatory support documentation and security of supply commitment.

Technical Assistance

A regulatory support file is available upon request. Bio-Rad Laboratories, Inc. is an ISO 9001 registered corporation. Visit bio-rad.com/web/NuviaHPQ for details about this resin. Visit bio-rad.com/web/ProcessResins for more information on Bio-Rad's complete line of process chromatography supports. For additional information and technical assistance, contact your local Bio-Rad office or email our process specialists at process@bio-rad.com. In the U.S. and Canada, call 1-800-4BIORAD.

Screen this resin for your application today. Visit bio-rad.com/web/ResinSample to request a sample.

Ordering Information

Catalog #	Description
12006693	Nuvia HP-Q Media , 25 ml
12006691	Nuvia HP-Q Media , 100 ml
12006660	Nuvia HP-Q Media , 500 ml
12006659	Nuvia HP-Q Media , 5 L
12007023	Nuvia HP-Q Media , 10 L
12007022	Nuvia HP-Q Media , B.A., 25 ml
12007018	Nuvia HP-Q Media , B.A., 100 ml
12007019	Nuvia HP-Q Media , B.A., 500 ml
12007033	Nuvia HP-Q Media , B.A., 5 L
12006994	Nuvia HP-Q Media , B.A., 10 L
12007020	Foresight Nuvia HP-Q Column , 1 ml
12007021	Foresight Nuvia HP-Q Column , 5 ml
12007013	Foresight Nuvia HP-Q RoboColumn Unit , 200 µl
12007014	Foresight Nuvia HP-Q RoboColumn Unit , 600 µl
12006908	Foresight Nuvia HP-Q Plates , 20 µl



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