Lab Purification

Membrane Chromatography Solutions for Rapid Protein and Virus Purification

Simplifying Progress

SARTORIUS

Sartobind® Membrane Adsorbers

Displaying a macroporous structure with pores that are orders of magnitude larger than conventional resin matrices, molecules are transported rapidly to the functionalized surface of Sartobind® membrane adsorbers, by convective flow. These membranes are supplied in ready-to-use Sartobind® Lab and Vivapure® units for fast and easy macromolecule purification.

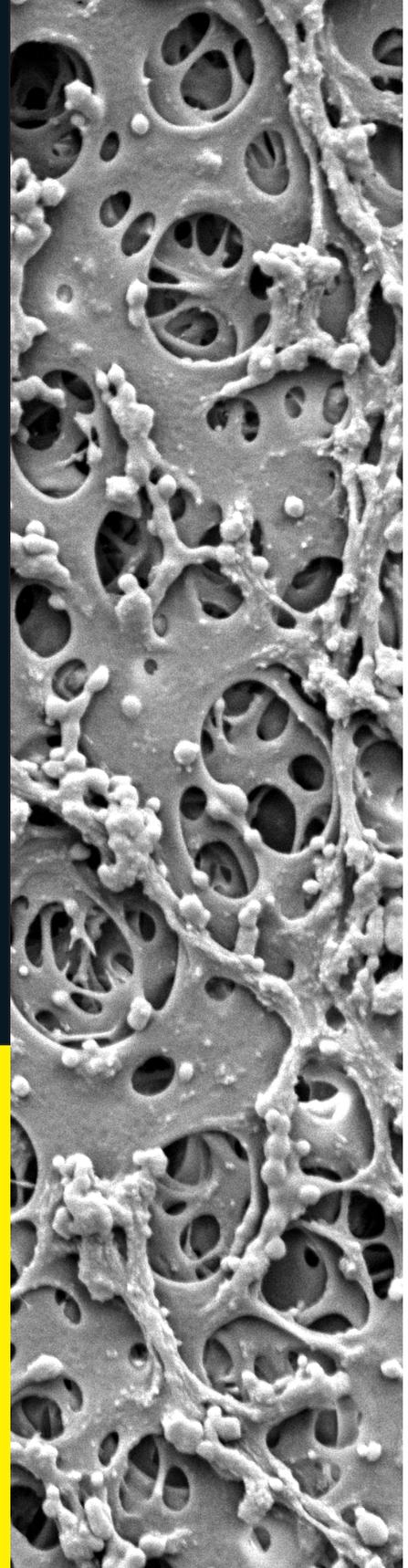
- Purification as simple as filtration
- Rapid separations
- No bed cracking or channelling
- Single use or reusable
- Process-ready platform

For laboratory-scale purification, Sartobind® membrane adsorbers are available with a comprehensive range of anion exchange (Q and D), cation exchange (S), and affinity (IDA and Protein A) ligands.

Typical Applications

Capture | Purification:
- Proteins
- Antibodies
- Nucleic Acids
- Viruses and VLPs

Flowthrough | Polishing:
- DNA
- Host Cell Proteins
- Viruses
- Endotoxins



Minimal CAPEX

With Vivapure® spin columns, your centrifuge just became your FPLC system. Or opt for the syringe filter format of Sartobind® Lab units, which enable purification without the need for specialist equipment.

Maximum Yields

Sartobind® membranes exhibit low non-specific adsorption, limiting target molecule loss. Furthermore, size exclusion effects are avoided, ensuring high capacity for even the largest proteins and viruses.

Process-Ready

For scale up to GMP production, you can rest assured that laboratory units are based on the same platform as the Sartobind® capsules and cassettes, already used to manufacture many clinically approved products.

Concentrated Eluates

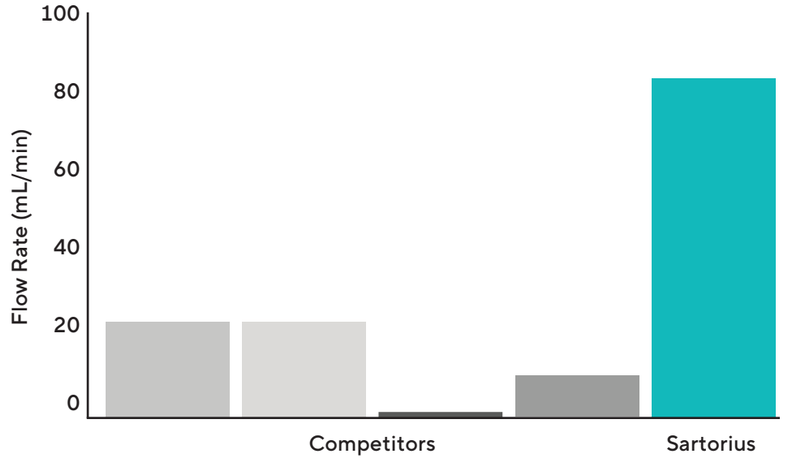
Sartobind® eliminates the dilution effects seen with conventional resins. As a result, the low volume eluates typically don't require further processing before analysis.

Quality Assured

During production, the binding capacity, flow rate and thickness of Sartobind® membranes is checked, to ensure the high quality and consistency your process needs.

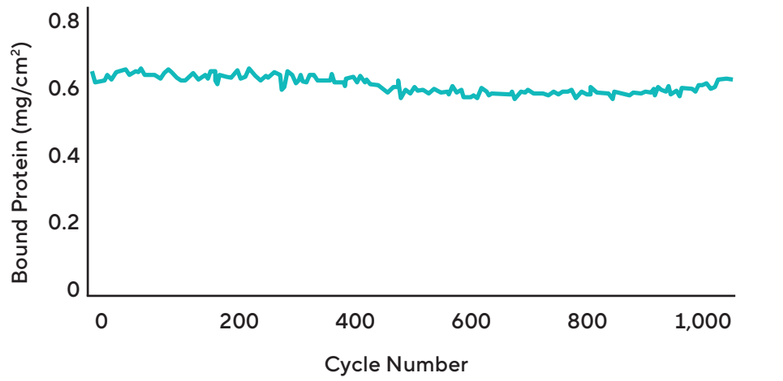
High Speed

Sartobind® Lab units can be operated at flow rates up to 30 MV/min. Even at these incredible speeds, convective flow ensures the entire binding capacity is utilized, while purification cycle times are greatly reduced.



Use Again and Again

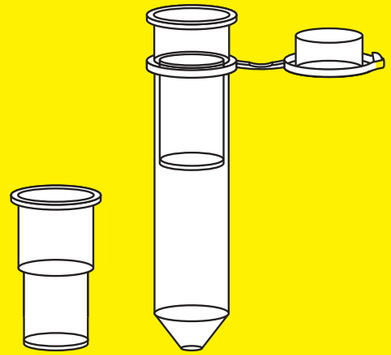
The reusable Sartobind® Lab units maintain their binding capacity for over 1,000 consecutive cycles. This reflects the high ligand stability and maximum cost efficiency.



Vivaclear

Centrifugal microfilters for reliable clarification and particle removal from biological samples.

- Rapid sample clarification in parallel
- High flux PES membrane
- Low hold-up volume



Materials

Housing	Polypropylene (PP)
Membrane	Polyethersulfone (PES)
Filtrate Tube	Polypropylene (PP)

Technical Specifications

Dimensions	43 x 11 mm
Weight	2 g
Pore Size	0.8 µm
Max. Sample Volume	0.5 mL
Recommended RCF	2,000 *g*
Hold-up Volume	< 5 µL

Package Contents

No. Units	100 pc

Equipment Required

Centrifuge with fixed angle (40 - 45°) rotor to fit 2.2 mL (11 mm) conical bottom tubes.

Pipettes (e.g. Picus® or Tacta®) with standard tips.

Complete Your Workflow

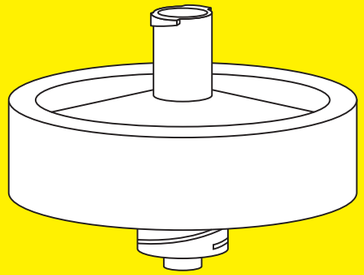
Clarification and particle removal from larger sample volumes with Minisart® and Sartolab®:

- Syringe, vacuum or pressure filters
- Hands-free, parallel filtration
- Centrifuge-free cell removal

Sartobind® Lab IEX

Small-scale laboratory units for high speed ion exchange purifications, which can be re-used hundreds of times.

- High capacity anion or cation exchange ligands
- Rapid, equipment-free purification by syringe
- Adapters included for use with FPLC systems



Materials

Housing	Polypropylene (PP)
Membrane	Stabilized regenerated cellulose
Ligand	Quaternary ammonium (Q), sulfonic acid (S), or diethylamine (D)

Technical Specifications

	IEX 15	IEX 75	IEX 100
Dimensions	25 x 36 mm	28 x 36 mm	31 x 66 mm
Weight	9 g	10 g	35 g
Bed Volume	0.41 mL	2.1 mL	2.8 mL
Recommended FR	2 – 12 mL/min	10 – 63 mL/min	14 – 84 mL/min
Maximum Pressure	0.6 MPa	0.6 MPa	0.6 MPa
Binding Capacity*	12 mg/unit	60 mg/unit	80 mg/unit
Working pH Stability	2-14 (Q | D) 3-14 (S)	2-14 (Q | D) 3-14 (S)	2-14 (Q | D) 3-14 (S)

Package Contents

No. Units	4 pc	2 pc	1 pc
Luer to UNF Adapters	2 pc	2 pc	2 pc
User Guide	1 pc	1 pc	1 pc

Equipment Required

Syringes for equipment-free purification.
Pump or FPLC System for semi- or fully automated purification (optional).

* Dynamic Binding Capacity for BSA on Sartobind® Lab Q units.

Complete Your Workflow

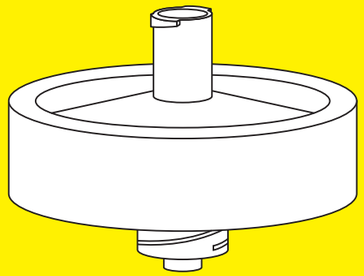
Use Vivaflow® to reduce your sample volume and adjust it to the correct buffer composition for purification:

- Plug and play crossflow cassettes
- Single or multi use formats
- Modular design for volumes up to 5 L

Sartobind® Lab IDA

Membrane adsorber units, ready to charge with the metal ion of your choice, for optimal yield and purity of any his-tagged protein.

- Charge with Ni^{2+}, Co^{2+}, Cu^{2+} or Zn^{2+}
- Faster flow rates than resins
- Use with syringes, pumps or FPLC systems



Materials

Housing	Polypropylene (PP)
Membrane	Stabilized regenerated cellulose
Ligand	Iminodiacetic acid (IDA)

Technical Specifications

Dimensions	28 x 36 mm
Weight	10 g
Bed Volume	2.1 mL
Recommended FR	10 – 63 mL/min
Maximum Pressure	0.6 MPa
Binding Capacity	7.5 mg/unit
Working pH Stability	1-12

Package Contents

No. Units	2 pc
Luer to UNF Adapters	2 pc
User Guide	1 pc

Equipment Required

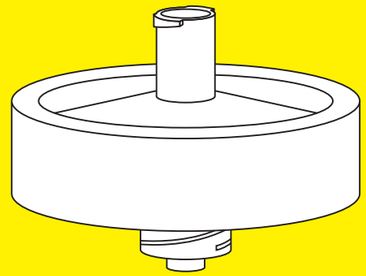
Syringes for equipment-free purification.

Pump or FPLC System for semi- or fully automated purification (optional).

Sartobind® Lab Protein A

Fast, high throughput purification of antibodies, including IgGs and mAbs, in research and development laboratories.

- Purify up to 10 times faster than conventional columns
- Use with standard antibody purification buffer systems
- Flexible operation by syringe, pump or FPLC system



Materials

Housing	Polypropylene (PP)
Membrane	Stabilized regenerated cellulose
Ligand	Recombinant Protein A

Technical Specifications

Dimensions	27 x 36 mm
Weight	10 g
Bed Volume	2 mL
Recommended FR	5 - 10 mL/min
Maximum Pressure	0.6 MPa
Binding Capacity	10 - 15 mg/unit
Working pH Stability	2-10

Package Contents

No. Units	4 pc
Luer to UNF Adapters	2 pc
User Guide	1 pc

Equipment Required

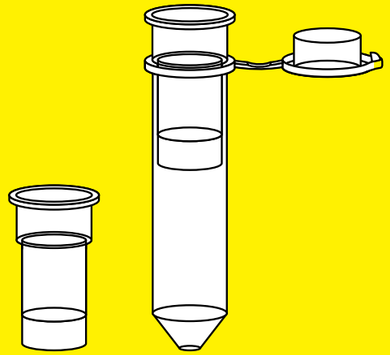
Syringes for equipment-free purification.

Pump or FPLC System for semi- or fully automated purification (optional).

Vivapure® IEX

Membrane adsorbers in a centrifugal filter format, for rapid screening, scouting and optimization of IEX conditions.

- Purify multiple samples simultaneously
- Anion or cation exchange ligands
- Small or large-scale options



Materials

Housing and Filtrate Tube	Polypropylene (PP)
Membrane	Stabilized regenerated cellulose
Ligand	Quaternary ammonium (Q), sulfonic acid (S), or diethylamine (D)

Technical Specifications

	Mini	**Maxi**
Dimensions	50 x 11 mm	115 x 30 mm
Weight	2 g	22 g
Max. Sample Volume	0.4 mL	19 mL
Bed Volume	0.24 mL	2.7 mL
Recommended RCF	2,000 *g*	500 *g*
Binding Capacity*	4 mg/unit	60 - 80 mg/unit
pH Stability	2-12 (Q | S) 4-10 (D)	2-12 (Q | S) 4-10 (D)

Package Contents

No. Units	24 pc	8 pc
Centrifuge Tubes	48 pc	16 pc
User Guide	1 pc	1 pc

Equipment Required

Centrifuge with fixed angle (40 - 45°) rotor to fit 2.2 mL (11 mm) conical bottom tubes (Mini units), or fixed angle (≥25°) rotor to fit 50 mL (30 mm) conical bottom tubes (Maxi units).

Pipettes (e.g. Picus® or Tacta®) with standard tips.

*Binding capacity for BSA in 25 mM Tris-HCl, pH 8 (Q, D) or cytochrome c in 25 mM sodium acetate, pH 5.5 (S)

Complete Your Workflow

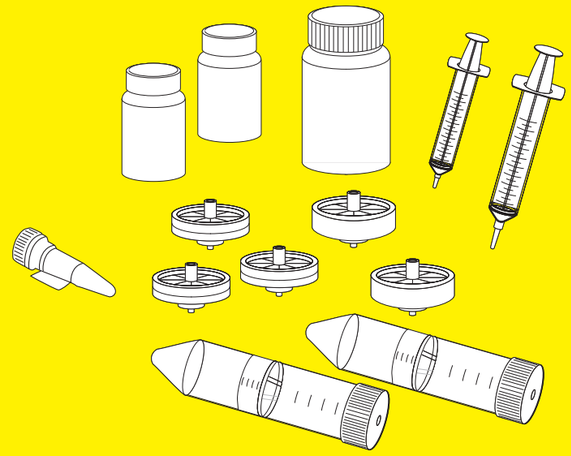
Choose Vivaspin® and Vivacon® for rapid concentration or buffer exchange of your purified samples:

- Unrivalled process flexibility
- Ultimate speed, maximum recovery
- For samples from 0.1 – 100 mL

Vivapure® Adenopack

Complete kits including all filters, Sartobind® units and buffers needed to purify and concentrate Type 5 adenoviral vectors.

- Prepare non-pyrogenic Ad5 samples in just 1-2 hours
- Purify from the entire cell culture without CsCl gradients
- Screen from 20 mL cultures and scale up to 500 mL



Technical Specifications

	Adenopack 20	Adenopack 100	Adenopack 500
Dimensions	6 x 20 mL	2 x 20-60 mL, or 1 x 200 mL	1 x 500 mL
Handling	Centrifuge	Syringe*	Pump
Typical Proces Time	1 hour	2 hours	2 hours
Typical Yield	Up to $1 \times 10^{11\text{-}12}$ VP/mL	Up to 1×10^{13} VP/mL	Up to 3×10^{13} VP/mL
VP | IU	50 – 100	20 – 50	20 – 50
Endotoxin Level	<0.025 EU/mL	<0.025 EU/mL	<0.025 EU/mL

Package Contents

Filter Units	6 pc	4 pc	1 pc
Purification Units	6 pc	2 pc	1 pc
Centrifuge Tubes	6 pc	-	-
Syringes	-	4 pc (20 mL) | 2 pc (10 mL)	1 pc (10 mL)
Tubing Set	-	2 pc	2 pc
Vivaspin® Units	6 pc	4 pc	2 pc
Loading Buffer	25 mL (10X)	25 mL (10X)	60 mL (10X)
Wash Buffer	30 mL (10X)	120 mL (1X)	30 mL (10X)
Elution Buffer	20 mL (1X)	20 mL (1X)	20 mL (1X)
Benzonase**	120 µL	200 µL	500 µL
User Guide	2 pc	2 pc	2 pc

Equipment Required

Centrifuge with swing out rotor to fit 50 mL (30 mm) conical bottom tubes.

Peristaltic pump and pump head accepting L/S 16 tubing (Adenopack 100 (optional) and 500)

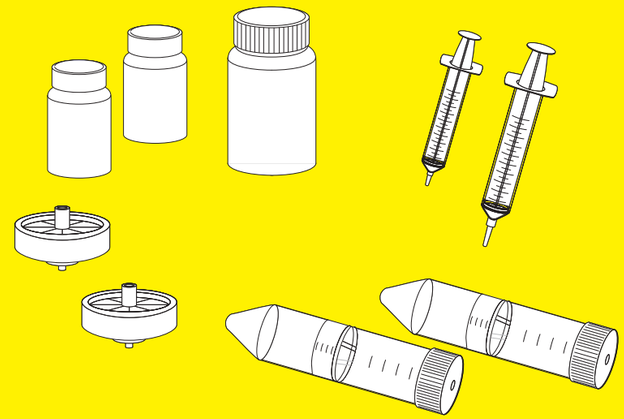
Pipettes (e.g. Picus® or Tacta®) with standard tips.

* With the optional tubing set (VS-AVPA001), Adenopack 100 can be handled with a peristaltic pump.
** For kits with Benzonase, the nuclease vial should be removed from the package upon delivery and stored frozen at -20°C.

Vivapure® Lentiselect

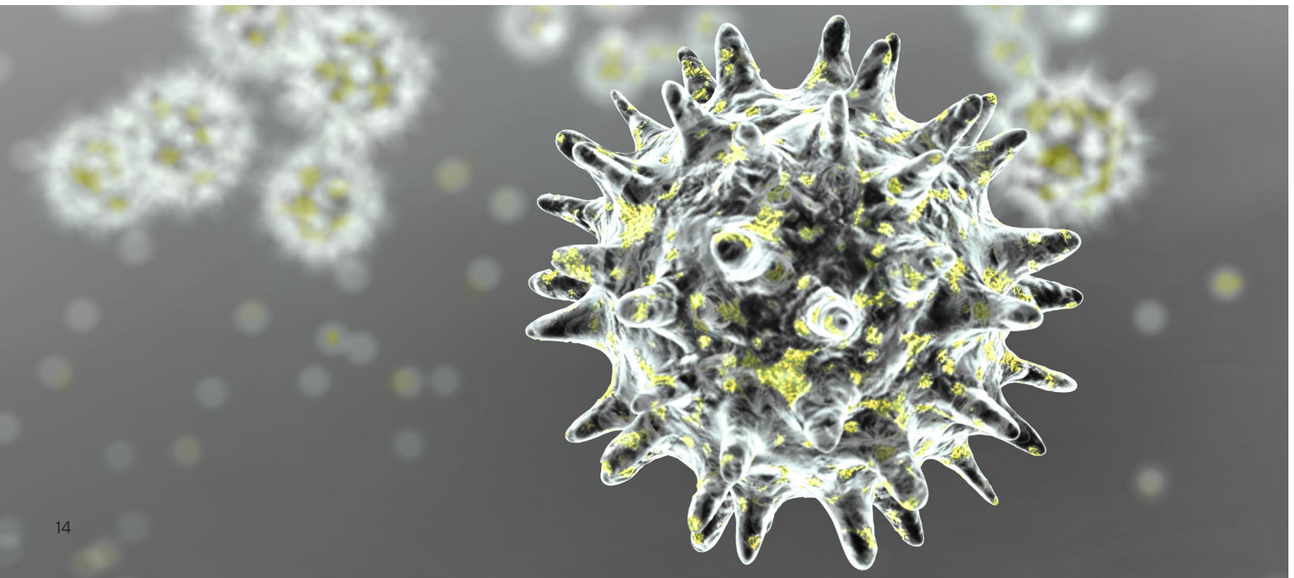
Complete kits containing all filters, Sartobind® units and buffers needed to purify and concentrate VSV-G pseudotyped lentivirus.

- Purify non-pyrogenic lentivirus samples in 1-6 hours
- No need for ultracentrifugation with syringe and pump-driven kits
- Screen from 40 mL cultures and scale up to 1 L



Technical Specifications

	Lentiselect 40	Lentiselect 500	Lentiselect 1000
No. of Purifiations	4 x 40 mL	1 x 500 mL	1 x 1,000 mL
Handling	Syringe	Pump	Pump
Typical Proces Time	45 minutes	3 hours	6 hours
Typical Yield	Up to 8×10^8 IP/mL	2-5 x 10^9 IP/mL	Up to 1×10^{10} IP/mL
Endotoxin Level	<0.025 EU/mL	<0.025 EU/mL	<0.025 EU/mL



Package Contents

Filter Units	-	1 pc	1 pc
Purification Units	4 pc	1 pc	2 pc
Syringes	4 pc (50 mL) | 4 pc (10 mL)	1 pc (50 mL)	1 pc (50 mL)
Tubing Set	4 pc	1 pc	1 pc
Vivaspin® Units	8 pc	2 pc	2 pc
Loading Buffer	30 mL (10X)	30 mL (10X)	30 mL (10X)
Wash Buffer	150 mL (1X)	170 mL (1X)	170 mL (1X)
Elution Buffer	20 mL (1X)	30 mL (1X)	60 mL (1X)
User Guide	2 pc	2 pc	2 pc

Equipment Required

Centrifuge with swing out rotor to fit 50 mL (30 mm) conical bottom tubes.

Peristaltic pump and pump head accepting L/S 16 tubing (Lentiselect 500 and 1000 only).

Pipettes (e.g. Picus® or Tacta®) with standard tips.

Protein and Antibody Capture and Polishing

Pure, recombinant proteins are critical tools to understanding protein structure and function, forming the basis for developing novel drugs and biologics.

Therefore, when working with a new protein target, screening to identify the optimum purification process should be a priority. This may involve testing different chromatography modalities or chemistries, buffer formulations, flow rates, and washing and elution conditions.

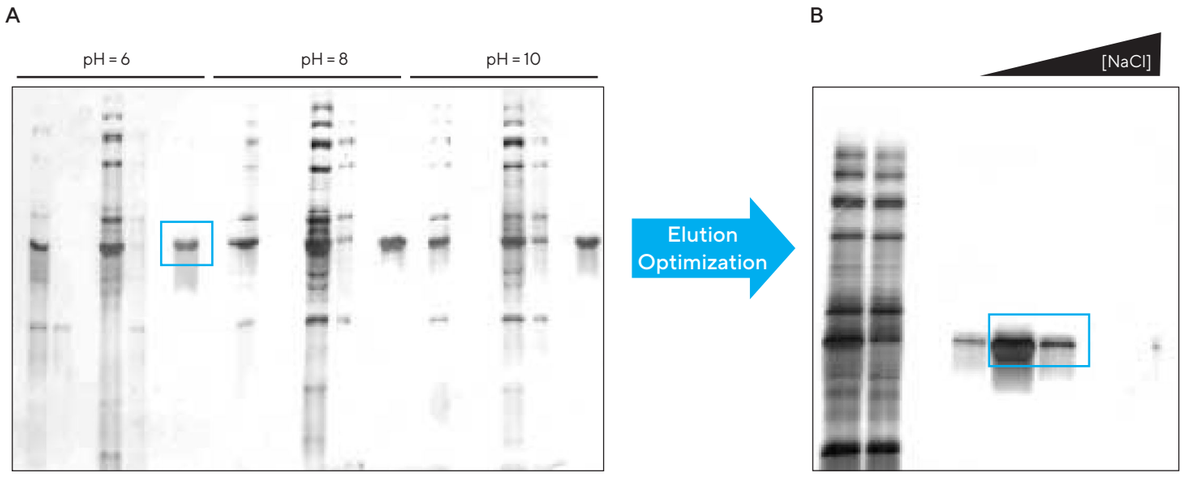
Sartobind® Lab and Vivapure® units have been designed with flexibility in mind, to support your screening experiments:
- Broad choice of ion exchange or affinity modalities and chemistries
- Options for manual, semi- or fully automated handling
- Rapid flow rates and parallel screening capabilities

Application Spotlight: Optimizing Protein Purification

Conditions for the purification of SH2 domain were determined using Vivapure® Mini spin columns. Anion and cation exchange were tested with several different loading buffers.

Optimum purity and yield were achieved when using Vivapure® Mini S with a potassium phosphate (pH 6) binding buffer (figure 1a) and elution with 400-600 mM NaCl (figure 1b).

Figure 1:



Virus Purification or Clearance

Viruses, virus-like particles and viral vectors are important for research of emerging pathogens and the development of novel vaccines and disease treatments.

Just as with proteins, viral targets also demand efficient purification techniques. Ion exchange chromatography offers several advantages over conventional density gradient-based ultracentrifugation techniques, including increased sample capacities, higher virus yields, purity and infectivity, and significantly shorter process times.

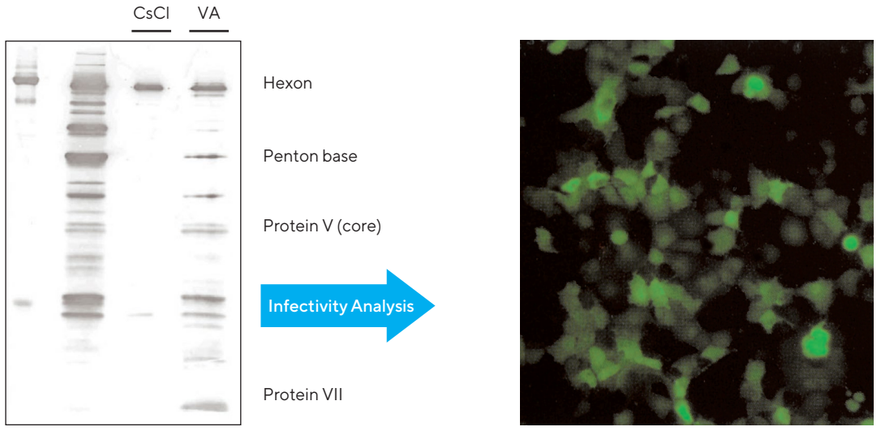
Sartobind® membrane adsorber technology provides further benefits for the purification of large viruses:
- Large pore sizes ensure higher binding capacities than resins
- Convective flow enables rapid capture and elution
- Complete kits for adenoviral and lentiviral vector purification

Application Spotlight: Adenovirus Purification

Adenovirus expressing green fluorescent protein (Ad-GFP) was purified from a HEK 293 culture on a CsCl density gradient or with a Vivapure® Adenopack 100 kit.

Vivapure® Adenopack (VA) yielded more viral particles than the CsCl gradient (figure 2a) and, although both preparations had equivalent infectivity (5 x 10^{10} IU, figure 2b), the Adenopack protocol cut processing time from 32 to 2 hours.

Figure 2:



Host Cell Protein, DNA and Endotoxin Removal

Following expression, most proteins of interest are typically isolated in complex mixtures, containing numerous contaminating substances.

Whereas microfiltration is effective for the removal of cells and debris, smaller molecules such as host cell proteins, DNA and endotoxins must be removed by other means to avoid interfering with downstream analytics. Chromatography is a powerful technique for removing these contaminants, ensuring high target protein purity and reliable results.

Sartobind® membrane adsorbers have been proven for effective removal of various contaminants:
- Capture nucleic acids on an anion exchange unit
- Eliminate pyrogens using capture or flow through modes
- Apply multiple modalities or chemistries for HCP removal

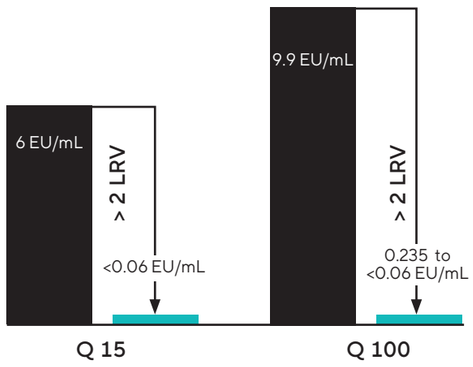
Application Spotlight: Sample Depyrogenation

To demonstrate their efficiency in endotoxin clearance, two different protein samples spiked with up to 100 EU/mL were applied to Sartobind® Lab Q or S units.

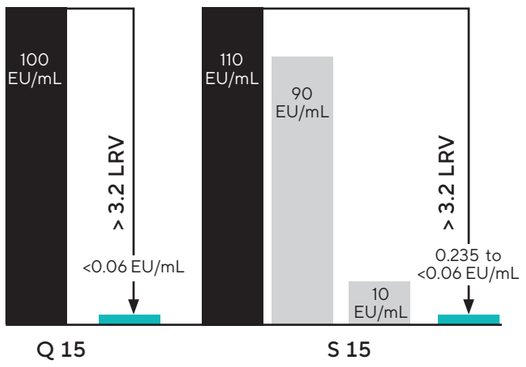
The Q or S ligands were used for endotoxin capture or flow through, respectively. LAL tests showed up to 3.2 log reduction values (LRV), resulting in <0.06 EU/mL in the final samples of BSA (figure 3A) and a mAb (figure 3B).

Figure 3:

A



B



Find Your Ultimate Membrane Adsorber

Choose between Sartobind® Lab and Vivapure® units, to suit your requirements:

- Purification by anion | cation exchange (AEX | CEX), or affinity (AC)
- Small-scale screening or preparative purification
- The available equipment in your laboratory
- Your preference for single or multi use consumables

			Sartobind® Lab			Vivapure®	
			15	75	100	Mini	Maxi
Chemistry							
	AEX	Quaternary ammonium (Q)	■	■	■	■	■
		Diethylamine (D)		■		■	■
	CEX	Sulfonic acid (S)	■	■	■	■	■
	AC	Iminodiacetic acid (IDA)		■			
		Protein A		■			
Application							
	Screening		■	■	■	■■■	■■■
	Optimization		■■	■■	■■	■■	■■
	Purification		■■■	■■■	■■■	■	■
Handling							
	Centrifuge					■	■
	Syringe		■	■	■		
	Pump		■	■	■		
	FPLC		■	■	■		
Usability							
	Single Use					■	■
	Multi Use		■	■	■		

Membrane Technical Specifications

	Q	D	S	IDA	Protein A
Pore Size	3-5 µm	3-5 µm	3-5 µm	3-5 µm	0.45 µm
Ligand	Quaternary ammonium	Diethylamine	Sulfonic acid	Iminodiacetic acid	Recombinant protein A
Type	Strong anion exchanger	Weak anion exchanger	Strong cation exchanger	Metal chelator affinity	Antibody affinity
Formula	$R\text{-}CH_2\text{-}N^+(CH_3)_3$	$R\text{-}CH_2\text{-}N^+(C_2H_5)_2$	$R\text{-}CH_2\text{-}SO_3^-$	$R\text{-}N(CH_2COOH)_2$	
Typical Density	178 µEq/mL	146 µEq/mL	178 µEq/mL	178 µEq/mL	1.5 mg/mL
Binding Capacity	29 mg/mL BSA	29 mg/mL BSA	25 mg/mL Lysozyme	3.6 mg/mL His_6-protein	5-7.5 mg/mL Polyclonal IgG

Ordering Information

Vivaclear®	Description	Order No.
	0.8 µm PES, 100 pc	VK01P042

Sartobind® Lab	Description	Order No.
	Sartobind® Lab IEX, Q 15, 4 pc	93IEXQ42GB-12--A
	Sartobind® Lab IEX, Q 75, 2 pc	93IEXQ42DB-12--V
	Sartobind® Lab IEX, Q 100, 1 pc	93IEXQ42BC-12
	Sartobind® Lab IEX, D 75, 2 pc	93IEXD42DB-12--V
	Sartobind® Lab IEX, S 15, 4 pc	93IEXS42GB-12--A
	Sartobind® Lab IEX, S 75, 2 pc	93IEXS42DB-12--V
	Sartobind® Lab IEX, S 100, 1 pc	93IEXS42BC-12
	Sartobind® Lab Affinity, IDA 75, 2 pc	93IDA-42DB-12--V
	Sartobind® Lab Affinity, Protein A, 4 pc	93PRAP06HB-12--A
	Luer female adapter to UNF 10-32 female, 2 pc	1ZA---0005

Vivapure®	Description	Order No.
	Vivapure® IEX, Mini Q, 24 pc	VS-IX01QH24
	Vivapure® IEX, Maxi Q, 8 pc	VS-IX20QH08
	Vivapure® IEX, Mini D, 24 pc	VS-IX01DH24
	Vivapure® IEX, Maxi D, 8 pc	VS-IX20DH08
	Vivapure® IEX, Mini S, 24 pc	VS-IX01SH24
	Vivapure® IEX, Maxi S, 8 pc	VS-IX20SH08
	Vivapure® Adenopack 20, with Benzonase	VS-AVPQ020
	Vivapure® Adenopack 20, without Benzonase	VS-AVPQ022
	Vivapure® Adenopack 100, with Benzonase	VS-AVPQ101
	Vivapure® Adenopack 100, without Benzonase	VS-AVPQ102
	Vivapure® Adenopack 100 tubing kit	VS-AVPA001
	Vivapure® Adenopack 500, with Benzonase	VS-AVPQ501
	Vivapure® Adenopack 500, without Benzonase	VS-AVPQ502
	Vivapure® Lentiselect 40	VS-LVPQ040
	Vivapure® Lentiselect 500	VS-LVPQ500
	Vivapure® Lentiselect 1000	VS-LVPQ1000

Germany
Sartorius Lab Instruments GmbH & Co. KG
Otto-Brenner-Strasse 20
37079 Goettingen
Phone +49 551 308 0

USA
Sartorius Corporation
565 Johnson Avenue
Bohemia, NY 11716
Phone +1 631 254 4249
Toll-free +1 800 635 2906

For further contacts, visit
www.sartorius.com

Status: 02| 2023