SARTORIUS

Simplifying Progress

Laboratory Ultrafiltration
How to Choose the Optimal Ultrafilter

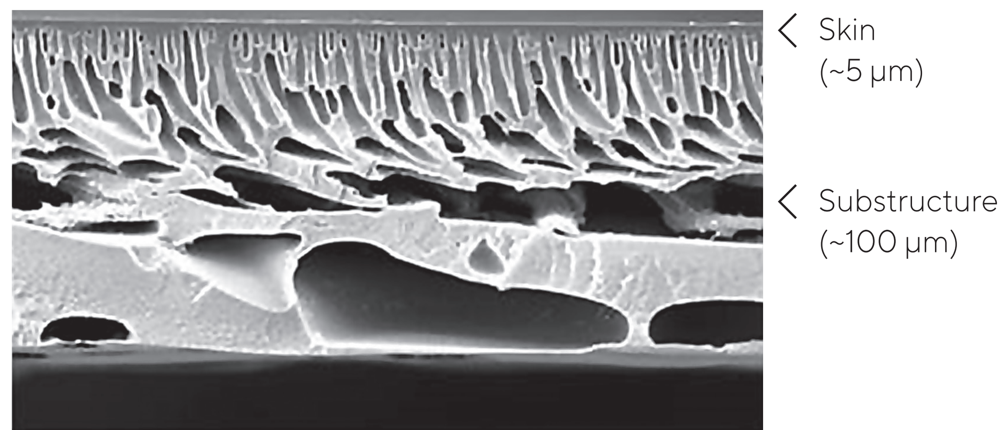
A Selection Guide for Proteins, Viruses, Nucleic Acids, Exosomes, Nanoparticles, Polymers and More

1. Consider Your Sample Properties

Molecule shape	Linear molecules concentrate best at lower relative centrifugal forces
pH and salt conditions	Buffer composition should prevent aggregation and degradation
Temperature	Lower processing temperatures reduce the rate of ultrafiltration
Sample fractionation	Can only be achieved with a 10-fold difference in molecular weight
Molecule conformation	Aggregation or unfolding will affect size distribution of the target molecule
Non-specific binding	Test multiple membrane materials for each target molecule, to maximize recovery

SEM cross section of UF membrane
Showing the dense skin layer and thicker, more open substructure

Membrane Options:
1. Cellulose triacetate (CTA)
2. Polyethersulfone (PES)
3. Regenerated cellulose (RC)



2. Choose Your Capacity and Method

Vivaspin® Filtrate
0.1 – 2.5 mL
Counterflow UF, good for protein removal from low MW analytes

Vivaspin® 500, 6 and 20
0.1 – 20 mL
High membrane areas,unique options for positive pressure UF and continuous DF with Vivaspin® 20, good for core applications

Vivaspin® 2
0.4 – 3 mL
Reverse spin enabled, good for low concentrations

Vivaspin® Turbo
2 – 15 mL
Fastest concentrations, angular dead-stops, good for recovery

Vivaspin® 100
20 – 100 mL
Centrifuge or pressure driven, good for mid range volumes

Vivaflow®
100 – 5,000 mL
Plug and play TFF cassettes, good for intuitive, effortless and efficient UF | DF of larger volumes

Vivacon®
0.1 - 2 mL
PCR grade options, reverse spin enabled, good for linear targets

3. Select Your Molecular Weight Cut-Off (MWCO)

- MWCO should be ⅓ to ½ the target MW or size for maximum recovery of most macromolecules
- Lower MWCOs may increase recovery, but reduce ultrafiltration speed and retain low MW contaminants
- Higher MWCOs have larger pore sizes and higher surface areas, which may result in more non-specific binding and passage
- Use reverse spin enabled ultrafilters for pipette-free retentate collection

MWCO	Protein MW	Molecule Diameter	dsDNA Length	ssDNA Length	Estimated Pore Size
1,000 kDa	>2,000 kDa	>300 nm	>5,000 bp	>9,000 nt	100 nm
300 kDa	600 - 2,000 kDa	90 – 300 nm	>1,500 bp	>2,900 nt	30 nm
100 kDa	200 – 800 kDa	30 – 90 nm	>600 bp	>900 nt	10 nm
50 kDa	100 – 300 kDa	15 – 30 nm	>300 bp	>475 nt	7 nm
30 kDa	60 – 180 kDa	9 – 15 nm	>50 bp	>275 nt	4 nm
10 kDa	20 – 90 kDa	5 – 9 nm	>30 bp	>90 nt	2.5 nm
5 kDa	10 – 30 kDa	3 – 5 nm	>20 bp	>50 nt	1.5 nm
3 kDa	6- 18 kDa	2.5 – 3.6 nm	>15 bp	>30 nt	1.2 nm
2 kDa	2 – 12 kDa	2 – 3 nm	>10 bp	>10 nt	1 nm

4. Control and Optimize Your Process

- Membrane stabilizers (e.g., glycerin) may be removed by pre-washing (but don't allow the membranes to dry out!)
- To prevent sample contamination, sanitize or sterilize ultrafilters using 70% ethanol or EO treatment
- For low feed concentrations, use passivation to minimize losses from non-specific adsorption
- Pre-define final retentate volumes by filling the permeate tubes with water or buffer before your process
- For efficient buffer exchange, use DF cups and reservoirs for continuous diafiltration
- When handling sensitive targets, use pressure cells as a low-shear alternative to centrifugal ultrafilters
- To collect the entire retentate easily, use the correct pipette tips and ultrafilters with angular dead-stops
- Maximize recovery by rinsing membranes with a few drops of buffer or by flushing TFF cassettes after UF | DF

Did You Know?

- Sartorius offers free Vivaspin® and Vivacon® samples to help you always find your optimum ultrafilter
- Most ultrafilters are intended for single use to prevent carryover and ensure optimal performance

Find further details of all tips, tricks, applications and products by contacting your local Sartorius representative.

sartorius.com

Specifications subject to change without notice.
©Sartorius Lab Instruments GmbH & Co. KG.

Status: 05 | 2024