EV Concentration the Other Way: Reverse Ultrafiltration over V-Shaped Filters

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Introduction

In extracellular vesicle (EV) research, V-shaped centrifuge filters are preferred in versatile manner. Apart from size-based EV separation, a critical use case is concentrating pre-isolated EVs, an important step for precise dosing of EVs for in-vitro or in-vivo assays. Yet, their main problem is the accumulation of filtered particles over time, reducing the particle recovery and resulting in clogging.

EV-Spinner, on the other hand, is a reverse ultrafilter to enhance extracellular vesicle (EV) recovery during the concentration or separation step. The ultrafiltration works in the opposite direction to the centrifugal force, providing higher particle recovery. The low protein binding membrane (PES) reduces the EV loss and the reverse design of the EV-Spinner ensures that the filter does not clog.

In this tech note, we evaluated the advantages of EV-Spinner over commonly-used V-shaped filters in terms of particle recovery and reusability.

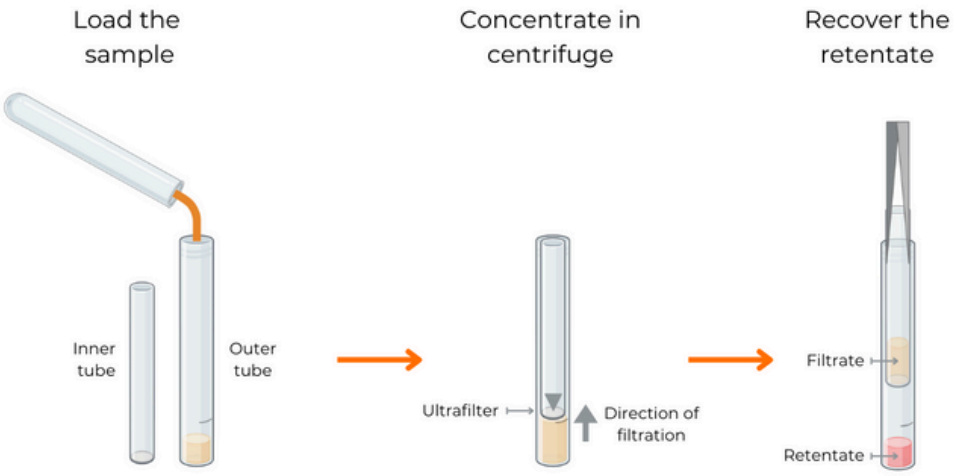

Figure 1: Workflow of EV-Spinner

Workflow

For evaluation of particle recovery performance, both EV-Spinner and V-shaped filter was tested with pre-isolated EVs from three different cell lines: LnCAP, COLO1, and HCT116. After concentrating the starting material, the concentrated EV sample was diluted back to the initial volume with PBS and then the particle loss was evaluated with NTA measurements. By repeating the same protocol 5 times with each filter, the reusability performances were also compared.

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Results

Particle Recovery

Particle Recovery						
Cell Line	LnCAP		COLO 1		HCT116	
Metric	No. particles	%	No. particles	%	No. particles	%
Input	8.25E+09	100	2.18E+10	100	3.10E+11	100
EV-spinner	8.1E+09	98	1.53E+10	70	2.51E+11	81
V-MWCO	6E+09	73	1.19E+10	55	1.99E+11	64

Table 1: Particle recovery with EV-Spinner and V-MWCO filter from different cell lines

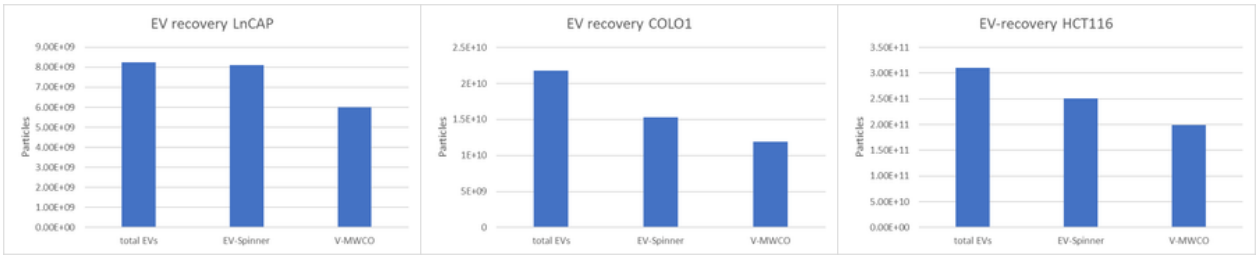

Figure 2: Recovery rate comparison between EV-Spinner and V-MWCO filter from different cell lines

Filter Reusability

- EV-Spinner does not clo up to 5 times of use.
- EV-Spinner promotes roughly 20% higher particle recovery.

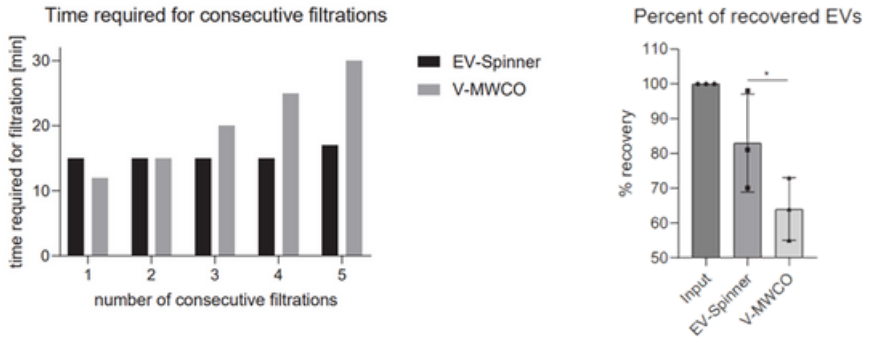

Figure 3: Comparison between EV-Spinner and V-MWCO filters during 5 times of use

Conclusion

EV-Spinner is an effective tool that offers several benefits over V-Shape concentrators:

- 20% higher particle recovery,
- Reusability up to five times,
- Suitability for multiple washing steps,
- Applicability for EV dialysis,
- Versatility for both purified EVs and raw media.

These features make EV-Spinner a valuable option for EV separation and concentration.

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