

User Guide

Exo-spin™ mini columns

Exosome Purification Kit

For blood sera, cell culture medium
and labelled exosome samples

Cat EX03



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Exo-spin™ mini columns Exosome Purification Kit

Product components

EX03-8 Exo-spin™ mini columns kit (8 columns)

- 8 x Exo-spin™ mini columns with waste collection tubes
- 1 x User Guide

EX03-25 Exo-spin™ mini columns kit (24 columns)

- 24 x Exo-spin™ mini columns with waste collection tubes
- 1 x User Guide

EX03-50 Exo-spin™ mini columns kit (48 columns)

- 48 x Exo-spin™ mini columns with waste collection tubes
- 1 x User Guide

For all kits, large volume (15 ml or 50 ml) centrifuge tubes, PBS, and 1.5 ml microcentrifuge collection tubes are not supplied.

General exosome isolation information

A. Notes on blood samples collection

Sample collection and handling prior to purification may have a significant impact on the quality of purified exosomes (Witwer *et al.*, 2013). Sera can contain many platelet-derived exosomes released after clot formation. Use of heparin-based anticoagulants is discouraged because of possible effects on downstream applications (e.g. PCR).

Platelet-derived exosomes may be released from platelets by the physical forces associated with the blood sampling procedure. Standardization of sampling site, needle gauge (wider may be better), and other variables is recommended. To ensure the sample is not contaminated by skin fibroblasts, it has been suggested that the first few milliliters of drawn blood should be discarded.

Collected blood should be handled gently and processed rapidly (within 30 minutes of drawing).

B. Proteomic analysis

Precipitants can interfere with mass spectrometry analysis and so precipitation should not be used when purifying exosomes if mass spectrometry is to be performed. In such cases, an alternative concentration method should be used instead of precipitation prior to using the Exo-spin™ columns.

Product information

Exo-spin™ technology combines Precipitation and Size Exclusion Chromatography (SEC), making it superior to techniques that rely solely on precipitation which result in co-purification of large amounts of non-exosomal proteins and other material as well as carry over of the precipitant. However, EX03 kit only contains SEC columns as the precipitation step is not required for some applications (e.g. mass spectrometry downstream application and/or ≤ 100 μ l sera samples).

Isolated exosomes may be used in a variety of downstream applications including DNA and RNA studies, as well as in functional *in vitro* and *in vivo* exosome assays.

This kit has been developed to process ≤ 100 μ l sera sample per column. Samples less than 100 μ l in volume should be diluted with PBS to a final volume of 100 μ l.

This protocol is centrifugation-based. As an alternative, Exo-spin™ mini-HD columns (cat EX05) can be used if a gravity-based protocol is preferred. For more information on our exosome isolation range, a selection guide is available page 6.

Exo-spin™ mini columns may be used to clean-up samples which have been purified by other methods, such as precipitation and ultracentrifugation, in order to remove proteins and smaller molecules. Exo-spin™ columns are also very effective for the clean-up of labelled exosome samples.

Table. Exo-spin™ selection guide.

Cell culture medium Saliva Urine Human breast milk* Cerebrospinal fluid* Any low protein biological fluids (1x10 ⁹ particles/ml)		Blood samples (plasma and sera) [†]	
Sample starting volume (per Exo-spin™ column)	Isolation method	Exo-spin™ kit	Sample starting volume (per Exo-spin™ column)
<1 ml to 50 ml	Precipitation + SEC (Centrifugation)	EX01	Sera
<1 ml to 75 ml	Precipitation + SEC (Fractionation by gravity flow)	EX05	≤100 µl SEC (Centrifugation)
75 ml to 500 ml	Precipitation + SEC (Fractionation by gravity flow)	EX04	≤150 µl SEC (Fractionation by gravity flow)
			<100 µl to 500 µl Precipitation + SEC (Centrifugation)
			1 ml SEC (Fractionation by gravity flow)
			EX03
			EX05
			EX02
			EX04
			Plasma
			≤150 µl SEC (Fractionation by gravity flow)
			<100 µl to 250 µl Precipitation + SEC (Centrifugation)
			1 ml SEC (Fractionation by gravity flow)
			EX05
			EX02
			EX04

* For cerebrospinal fluid and human breast milk samples, validated protocols are available for EX01 only.

† Highly concentrated exosome samples (e.g. 1x10¹² particles/ml) other than blood can also be used.

Protocol for purification of intact exosomes using Exo-spin™ mini columns

Supplied Exo-spin™ columns are pre-equilibrated with ultra-pure water containing 20% ethanol. The column matrix should be re-equilibrated with PBS prior to use.

A maximum sample volume of 100 µl sera may be used per column. For larger sample volumes, use multiple columns per sample.

For typical samples containing cells, such as sera, an additional step must firstly be performed to remove cells and cell debris, prior to purification of exosomes. **This step may be omitted for clean-up of secondary samples which do not contain cells.**

All centrifugation steps can be performed at room temperature or 4°C, unless otherwise specified.

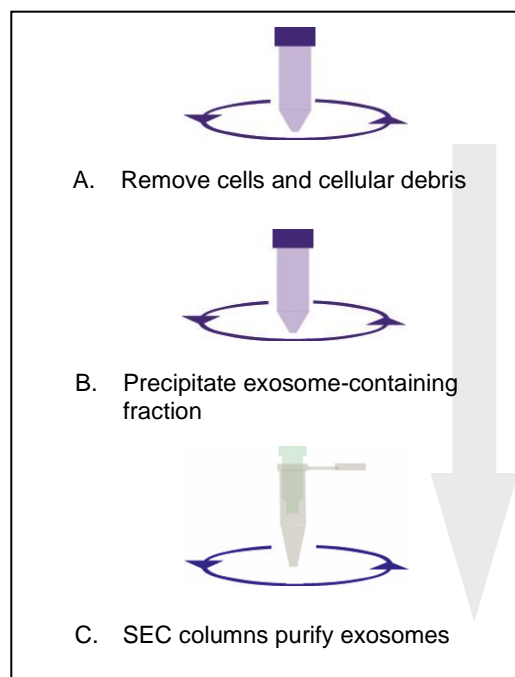


Figure. Protocol overview.

A. Remove cells and cell debris

1. Transfer 100 µl of starting sample to a microcentrifuge (not supplied with kit) tube and spin at 300 x g for 10 minutes to remove cells.
2. Transfer supernatant to a new microcentrifuge tube and spin at 16,000 x g for 30 minutes to remove any remaining cell debris.
3. Transfer supernatant to a new microcentrifuge tube and add PBS if required so the sample has a total volume of 100 µl.

B. Exo-spin™ mini column preparation

4. Prepare the Exo-spin™ column prior to application of your sample.
 - a. Equilibrate the column at room temperature for 15 minutes before use.

b. **Remove the outlet plug before the screw cap** and place the Exo-spin™ column into the waste collection tube provided.

c. Using a micropipette, aspirate and discard the preservative buffer from the top of the column. To prevent drying of the column bed, proceed to the next step immediately.

d. Equilibrate the column by adding 250 µl of PBS and centrifuge at 50 x g for 10 seconds.* If any PBS remains above the top filter, repeat spin at the same speed for 5 seconds and repeat as many times as is necessary. Do not spin at excessive speed or for too long as this may desiccate or compress the resin. **An example of a suitable centrifuge is the CappRondo microcentrifuge (Capp®, CR-68X).*

e. Repeat step 4d once before proceeding to the next step.

C. Purification of exosomes

5. Carefully apply the 100 µl exosome-containing supernatant from step 3 to the top of the column and place the column into the waste tube

6. Centrifuge at 50 x g for 60 seconds. Discard the flow-through.

7. Place the column into a 1.5 ml microcentrifuge collection tube. Apply 200 µl of PBS to the top of the column.

8. Centrifuge at 50 x g for 60 seconds to elute the purified exosomes.

Storage

Upon receipt, store Exo-spin™ mini columns at 4°C.

Correctly stored components are stable for at least 6 months following purchase.

Related products

Related products	Product description	Product code
Exosome detection	Exosome antigen antibodies	EX201, EX202, EX204, EX203
	TRIFic™ detection assay	EX101, EX102, EX103
Exosome tracking	ExoFLARE™ tracking assay	EX301, EX302, EX303, EX304, EX305, EX306
Nanoparticle Tracking Analysis (NTA) size profiling service	ZetaView NTA Particle Analysis Service	ZV-1 and ZV-12

TRIFic™ detection assay

The TRIFic™ exosome assay is similar to an ELISA, however, there are some significant differences. Unlike an ELISA, there is no enzymatic reaction. Rather, the target is directly detected with a Europium label. TRIFic™ exosome assays deliver clear, consistent, and quantitative data from purified or unpurified samples, including direct measurement of exosomes from plasma in a convenient 96-well format. TRIFic™ exosome assays are available for widely-used markers of exosomes, the tetraspanin proteins CD9, CD63 and CD81.

ExoFLARE™ tracking assay

ExoFLARE™ utilizes a combination of a FLARE (FLuorescence Activating Response Element) protein tag together with a pro-fluorophore dye. Neither the protein nor dye exhibit fluorescence in isolation. However, when the protein binds to the dye, it causes a change in structure which results in fluorescence. The dye and protein form an unstable bond with a continuous turnover of the dye, resulting in sustained fluorescence without the levels of photo-bleaching associated with fluorescent proteins (i.e. GFP). This enables ExoFLARE™ to be monitored for extensive periods to allow tracking of dye movement.

NTA size profiling service

Exosome characterization service for analysis of particle size and particle concentration using the ZetaView instrument from Particle Metrix.

Troubleshooting

My sample does not elute from the column.

- Ensure that the outlet plug has been removed from the base of the column. The outlet plug must be removed before the screw cap.
- If the column has been centrifuged at excessive speed, it will be compromised and subsequently not function correctly. Be aware that some centrifuges cannot provide the low speed required.

My sample contains a lower amount of exosomes than expected.

- Ensure that the column does not dry out during the procedure. Any column that is spun for too long or at excessively high speed may dry out. Centrifuging the column at high speed may also compress the resin in the column, making the column inefficient.
- Adhere to the volumes indicated for sample addition to the column. If the sample volume is too small, the exosomes will be retained within the column.
- Exosome yield is dependent on a variety of factors, particularly the type of biological fluid used as starting material.

My sample has no measurable exosomes.

- This is most likely caused by complete drying out of the column causing loss of functionality. Ensure the columns are kept hydrated at all times.

Can I increase the elution volume?

- It is not recommended as it will result in co-elution of ribonucleoprotein particles.
- As an alternative, the EX05 Exo-spin™ mini-HD kit can be used. The protocol will be performed under gravity and at least two fractions of 200 µl can be collected for further downstream analysis.

I do not have a high-speed centrifuge.

- Increase the time of centrifugation by calculating the ratio of the recommended speed to the speed of your centrifuge. For example, if the protocol recommends to spin at 16,000 x g for 30 minutes, for a centrifuge with a maximum speed of 9,500 x g: $16000/9500=1.68$ and $1.68*30 \text{ mins} = 50.4 \text{ minutes}$.

I do not have a low-speed centrifuge.

- It is important to spin at 50 x g as the resin can easily get compressed at even 100 x g. An example of a low-speed centrifuge is CappRondo microcentrifuge (Capp®, CR-68X).
- As an alternative, the EX05 Exo-spin™ mini-HD kit can be used. The protocol will be performed under gravity and at least two fractions of 200 µl can be collected for further downstream analysis.

Reference

- Witwer KW *et al.* J Extracell Vesicles 2013;2:10.3402/jev.v2i0.20360

Purchaser Notification

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Cell Guidance Systems' reagents and services enable control, manipulation and monitoring of the cell, both *in vitro* and *in vivo*

Growth Factors

- Recombinant
- Sustained Release

Exosomes

- Purification
- Detection
- Tracking
- NTA Service

Small Molecules

Cell Counting Reagent

Matrix Proteins

Cell Culture Media

- Pluripotent Stem Cells
- Photostable
- *In Vitro* Blastocyst Culture
- ETS-embryo Culture
- Custom Manufacturing Service

Gene Knock-Up System

Cytogenetics Analysis



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