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ExoStep™ Plasma

Exosome FACS analysis for exosomes derived from human plasma

REFERENCE	SIZE	DESCRIPTION
ExoS-25-P81	25 test	Includes CD81 PE as primary detection antibody
ExoX-50-P81	50 test	Includes CD81 PE as primary detection antibody

INTRODUCTION

Exosomes are small extracellular vesicles that are released from cells upon fusion of an intermediate endocytic compartment, the multivesicular body (MVB)¹, with the plasma membrane. They are thought to provide a means of intercellular communication^(2,3) and of transmission of macromolecules between cells allowing the spread of proteins, lipids, mRNA, miRNA and DNA and as contributing factors in the development of several diseases. Exosomes can also modulate cancer microenvironment⁽⁴⁾ and the immune response^(5,6).

PRODUCT DESCRIPTION

The kit is a simple immunobead assay for isolation/detection of exosome, using a bead-bound anti-CD9 capture antibody and a fluorochrome conjugated anti-CD81 detection antibody. The kit provides reproducible results and can be run in parallel to exosome immunophenotyping.

Tested application: Flow Cytometry^(7,8).

Species reactivity: Human

Storage buffer: aqueous buffered solution containing protein stabilizer and 0.09% sodium azide (NaN₃).

Recommended usage: Immunostep's ExoStep, is intended for the immunoisolation (immunomagnetic or FACS) and Flow Cytometry analysis of pre-enriched CD63⁺/CD9⁺ human exosomes from biofluids (plasma, urine) or cell culture media.

Presentation: liquid

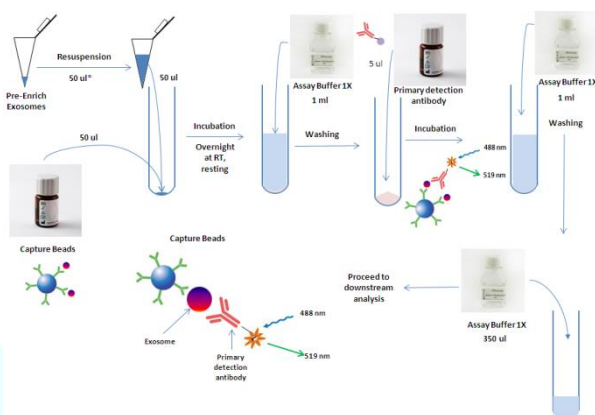


Figure 1: Immunobead assay for isolation/detection of exosome workflow.

REAGENTS PROVIDED

DESCRIPTION	COMPONENTS	AMOUNT	Nº TEST
Superparamagnetic Capture Beads	CD9 capture beads. Polystyrene micro-particles with Mean Diameter (µm) 6.5±0.2 (CV<5%), having discrete fluorescence intensity characteristics	6000 beads/test (50 µl/test)	25/50 test
Primary detection antibody	Anti-CD81 PE (Clone M38)	(5 µl/test)	25/50 test
Assay Buffer 10X	PBS 10% BSA, pH 7,4 – 10X . Do not freeze. Dilute contents of the 10X Assay Buffer to 1X (PBS 1% BSA) in PBS, for use in this assay.	10/15 ml	

APPROPRIATE STORAGE AND HANDLING CONDITIONS

Store in the dark, refrigerated between 2 °C and 8 °C. DO NOT FREEZE. The kit is stable until the expiry date stated on the vial label if kept at 2-8°C. Do not use after the date indicated.

REAGENTS NOT PROVIDED.

- Pre-enriched exosomes by ultra-centrifugation.
- Magnetic Rack; MagneSphere(R) Mag. Sep. Stand 12-hole, 12x75mm (PROMEGA, Ref Z5343).
- 12x75 mm Polystyrene Round Bottom Tubes (cytometer tubes).
- Sterile syringe filter with a 0.45µm pore. (EMD Millipore Millex, Ref: SLHV033RS).
- Syringe of adequate volume.

EVIDENCE OF DETERIORATION

Reagents should not be used if any evidence of deterioration is observed. For more information, please contact our technical service: tech@immunostep.com

RECOMMENDATIONS AND WARNINGS



- Avoid microbial contamination of the reagent.*
- Microspheres and reagents should be protected from prolonged exposure to light throughout this procedure.*
- The samples should be treated with appropriate handling procedures.*
- Depending on the type of exosomes used, the number of exosomes may vary with respect to the concentration of the protein.*
- Do not use after the expiry date indicated on the vial.*
- Deviations from the recommended procedure could invalidate the analysis results.*
- Before acquiring the samples, it is necessary to make sure that the flow cytometer is calibrated and compensated.*
- The isolation and detection success is dependent on the quality of the sample pre-enrichment process.*

WARRANTY

Warranted only to conform to the quantity and contents stated on the label or in the product labelling at the time of delivery to the customer. Immunostep disclaims hereby other warranties. Immunostep's sole liability is limited to either the replacement of the products or refund of the purchase price.

SAMPLE PREPARATION

Exostep allows the detection of isolated exosomes from differential ultracentrifugation (a) as well as direct detection in the sample without the need for ultracentrifugation, just with simple pretreatment (b).

a. Purification of Exosomes by Differential Ultracentrifugation.

The kit has been validated for pre-enriched human exosomes from cell culture and bodily fluids, such as serum/plasma, and urine, through an ultracentrifugation protocol (Fig. 2)⁹.

The principle for exosome purification is the same for cell culture and bodily fluids, but due to the viscosity of some fluids it is necessary to dilute them with an equal volume of PBS, before centrifugations.

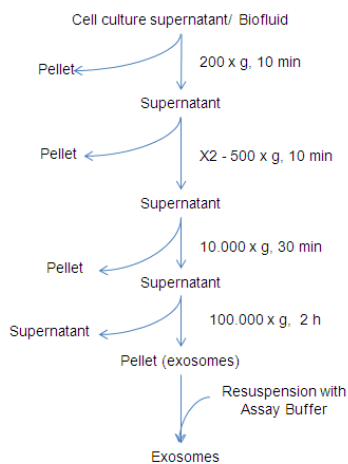


Figure 2: Workflow for the exosome pre-enrichment based on differential ultracentrifugation.

Please, refer to <http://www.immunostep.com/content/34-protocols> for additional technical information.

b. Sample pretreatment for direct exosome detection on plasma.

The sample pretreatment for direct exosome detection from plasma is not recommended for detection of exosomes from any other body fluids or cell culture media.

Specific sample pretreatment protocols are available for urine and cell culture media, each optimized for its specific type of biological sample.

100–1000µL of plasma typically provides enough exosomes for most standard types of analysis.

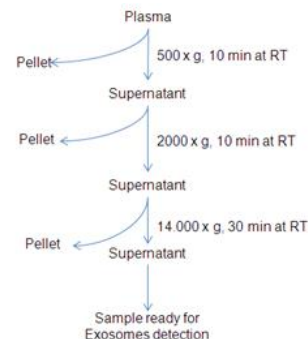


Figure 3: Plasma pretreatment workflow for direct exosome detection.

Please, refer to <http://www.immunostep.com/content/34-protocols> for additional technical information.

PROTOCOL

Isolate CD9⁺ exosomes

1. Resuspend the capture beads by vortex for approximately 20 seconds.
2. Add 50µL of the capture bead to each 12x75 mm Polystyrene Round Bottom tube (cytometer tube).
3. Add between 10-15ug of exosomes isolated by differential ultracentrifugation or until 100ul for direct exosomes. Previously prepared according to "Sample Preparation" to the appropriate tubes. Mix the reactions gently by pipetting up and down several times with a pipette and vortexing for few seconds.
4. Incubate in the dark overnight at room temperature (RT). NO STIRRING.
5. After overnight incubation wash the sample (bead-bound exosomes) by adding 1ml of Assay Buffer 1X.
6. Collect the magnetic beads by placing tubes on a magnetic rack and incubate 5 minutes or by centrifugation at 2500xg for 5 minutes. Remove supernatant from tubes by Hand-decanting in the case of using the magnetic rack (Fig. 4) or by aspiration. Take care not to disturb the microspheres, and make sure not to leave more than 100ul of supernatant in the tube.

Stain exosomes for flow cytometry

7. Add 5ul of the primary detection antibody to the bead-bound exosomes tube. Mix gently by pipetting and/or by tapping. It is advisable to prepare an additional tube with the appropriate isotype control or without exosomes, for background determination.
8. Incubate in the dark 60 minutes at 2-8°C, without stirring.
9. Wash the sample (bead-bound exosomes) by adding 1 ml of Assay Buffer 1X.

- Collect the Magnetic beads by placing tubes on a magnetic rack and incubate 5 minutes or by centrifugation at 2500xg for 5 minutes. Remove supernatant from tubes by hand-decanting in the case of using the magnetic rack (Fig. 4) or by aspiration. Take care not to disturb the microspheres, and make sure not to leave more than 100ul of supernatant in the tube.

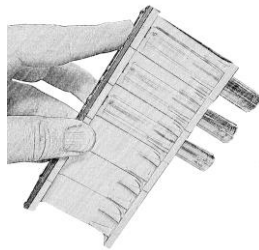


Figure 4: Hand-decanting supernatant using a Magnetic Rack.

- Resuspend the sample in 350µL Assay Buffer 1X and Acquire on a flow cytometer or store in the dark max up to 2 hours at 2-8°C, until the analysis is carried out.

ASSAY ACQUISITION

An adequate gating strategy FSC / SSC and PerCP/APC, PerCP-Cy5/APC or PerCP-Cy5.5/APC, helps to bead population identification and discrimination of doublets on flow cytometer.

- Gate on the single population(s) on a Forward Scatter vs. Side Scatter plot in linear scale. (Fig. 5A).
- Gate on the single population(s) on a PerCP vs. APC channel (bead auto fluorescence) in logarithmic scale (Fig. 5B).
- Using the PE channels, determine whether or not any bead populations tested "positive" for the exosome. Note: A positive bead will produce a fluorescent peak in the PE channel.

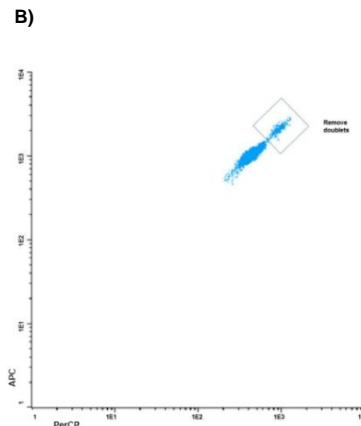
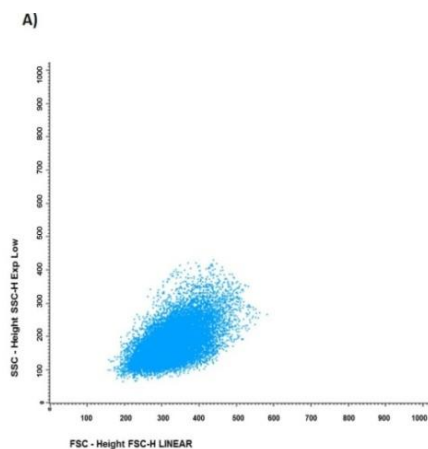


Figure 5: Dot-plot gating strategy for acquisition and analysis. FSC vs SSC (A) and PerCP vs APC (B).

FLOW CYTOMETRY ANALYSIS

ExoStep has been used for detection of exosome derived from different sources.

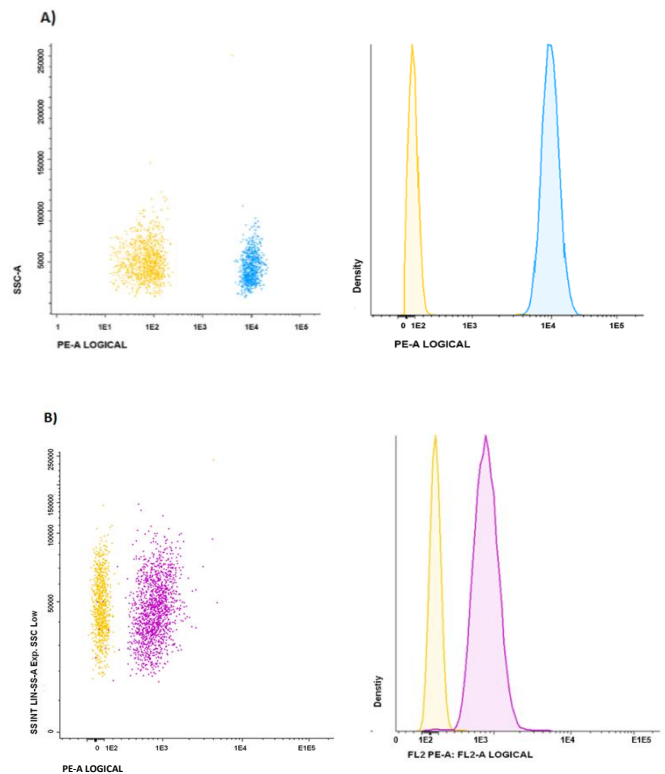


Figure 6: Flow analysis of exosomes bound to ExoStep. Cell culture exosomes, pre-enriched using Total Exosome Isolation from PC3 Cell Culture Media (A) and human plasma (B), were resuspended in PBS and bound to CD63 and CD9-capture beads during an overnight incubation. The following day the bead-bound exosomes were direct stained with primary antibody detection (CD9/CD81-PE) and analyzed by flow cytometry.

REPRODUCIBILITY

Sample: PC3-derived exosomes.
Batch: 3 different batches.
Cytometer: Acquired every day in 2 different cytometers.
Replicate: 4 replicates assayed for 3 days not necessarily consecutive.
Protocol: Bead-Based Flow Cytometric Assays.

Intra assay: was determined calculating the deviation and the CV for each of the samples by batch. Was analyzed the mean of all typical deviations and CVs of 3 days for each lot. Finally was obtained the mean of the standard deviation and the CV of the three lots.

Inter assay: was determined the mean of the 4 repetitions for each day and compare them between each batch taking the standard deviation and the CV. Was calculated the mean deviation thus obtained and the CV of the three days.

	CV (%)
Intra Assay	10%
Inter Assay	11%

PERFORMANCE DATA

Limit of Detection (LOD), dynamic range and linearity of exosome kit was assessed at Immunostep.

LOD is the lowest quantity of exosomes that is distinguished from the absence of analyte (a blank value), and as reference, was determined in $>0,125 \mu\text{g}$ which corresponds with $>1.25 \times 10^9$ vesicles. Whilst the upper limit or saturation level was established in $10 \mu\text{g}$. For both technical specifications were used exosome from PC3 cell culture media (1×10^6 vesicles/ μl). (Fig.7).

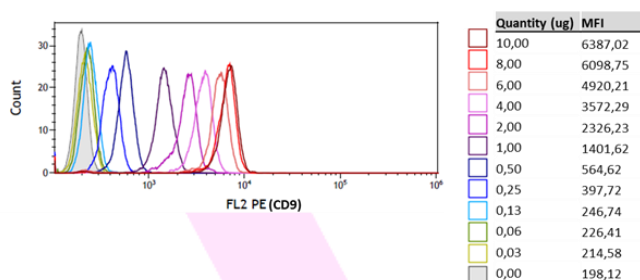


Figure 7: Dynamic range of the assay analyzed by flow cytometry. Relationship between background noise and specific signal at different exosome concentrations.

Several measurements of multiple concentrations of lyophilized exosomes were analyzed across the reportable range of the kit, finding the linearity of the kit in a broad range of concentrations, allowing fluorescence interpolation in the estimation of concentrations.

Please, refer to our website technical support (<http://www.immunostep.com/content/34-protocols>) for further information.

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