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Exoplorer™

Nano-flow Cytometer

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About VDO Biotech

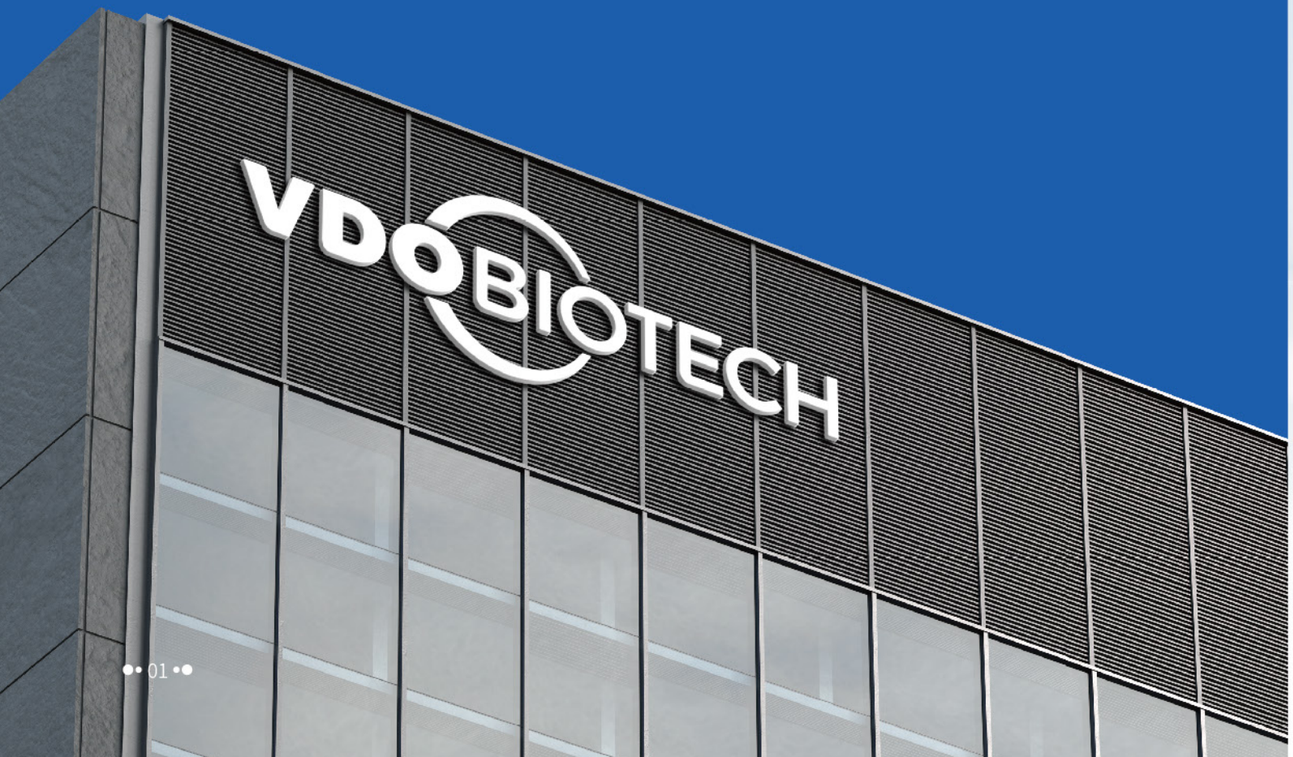
Suzhou VDO Biotech Co., Ltd. is a biotechnology enterprise adhering to the mission of "achieving life and health", specializing in the research and development and industrialization of diagnostic raw materials and life science products centered on microsphere technology. The company was established in 2014, with its headquarters located in C18, Biobay, 218 Xinghu Street, SIP, Suzhou. Up to now, the company has applied for over 100 patents (including overseas layout) and successfully obtained nearly 50 authorizations. It holds more than 30 authorized invention patents both at home and abroad in the core technology field, and has been awarded the certification of a national high-tech enterprise.

The core products include nano-flow cytometers, diagnostic microspheres, chromatography media, homogeneous reagents and services, agarose magnetic beads, transfection reagents, cell sorting and activation magnetic beads, etc. We have always been driven by innovation, constantly promoting technological innovation and product upgrading to adapt to the increasingly changing market demands, and providing customers with cutting-edge and reliable life science tools.

Cumulative Patent Applications
100+

Obtain Authorizations
50+

National High-tech Enterprise



Exoplorer™ Nano-flow Cytometer

Exoplorer™ nano-flow cytometry is specifically designed for the characterization of biological nanoparticles, including extracellular vesicles, viruses, LNPs, bacteria, subcellular structures and other nanoparticles. With its outstanding sensitivity, resolution and throughput, the Exoplorer™ nano-flow cytometer can achieve comprehensive nanoparticle analysis in the range of 5-3000nm, including particle size distribution, particle counting and biochemical property assessment, making it a revolutionary tool for life science and biomedical research.

- Dual lasers（488&405）8 fluorescence channels / 4 scatter channels
- Sizing reference function
- Bead-free absolute counting
- Analysis of biological properties
- Robust system stability
- User friendly design

Instrument Specifications		
Fluidics Station	Dimensions	386*342*425mm(L*D*H)
	Weight (including containers, tubing, and cables)	9.5KG
Flow Cytometer	Dimensions	630*460*460mm(L*D*H)
	Weight	49.5KG
Electrical Parameters	Power Supply Voltage	100-240V
	Frequency	50/60Hz
	Power	300VA
Sampling	Tube Specifications	5ml tube, 1.5 and 2.0ml EP tubes
	Maximum Single Loading Volume	50μl
	Event Processing speed	34,000 events/s

Data Management		
Operating Software	Exoplorer Software	
Language Support	Chinese, English	
FCS Version	FCS 3.1	
Recommended Computer Configuration	Operating System	64-bit Windows 10 Professional and Windows 11 Professional
	Processor	Equivalent to or better than 12th Gen Intel(R) Core(TM) i7-12700
	Memory	32GB
	Storage Space	1TB solid-state drive
	Resolution	1080P(1920*1080)
	USB	2 USB 3.0 ports / 3 UsB 2.0 ports
Quality Control	Tracking and recording of quality control results, with exportable quality control reports	
	Compliance with 21CFR electronic signature requirements	
Safety Standards	IEC 61326-2-6:2020	
	EN 60825-1:2014+A11:2021	
	IEC 60825-1:2014	
	IEC 61010-2-081:2019	
	IEC 61010-1:2010/AMD1:2016	
	EN 61010-1:2010	
	EN 61010-1:2010/A1:2019	
	EN 61010-2-081:2020	
	EN IEC 61326-1:2021	
	EN IEC 61326-2-6:2021	
	EN IEC 61000-3-2:2019+A1:2021	
	EN 61000-3-3:2013/A2:2021 (Except: Risk Management Evaluation)	

Performance of Exoplorer™ Nano-flow Cytometer

As a groundbreaking technology in recent years, nanoflow cytometry not only inherits the advantages of traditional flow cytometry in terms of high throughput and automation but also achieves a qualitative leap in sensitivity and resolution. This technology is capable of precisely analyzing nanoparticles at the single-particle level, providing comprehensive support for nanoparticle concentration calculation, size analysis, and biomarker analysis, thereby significantly enhancing the efficiency and accuracy of nanoparticle research.

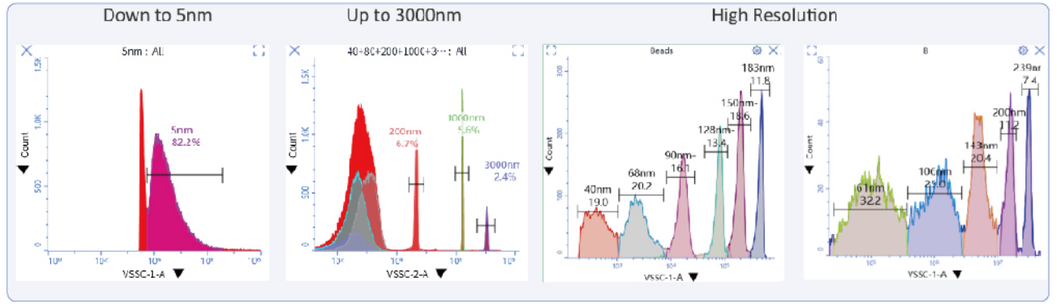
Scattering Channel

The scattering channel performance of nano-flow cytometry directly determines the lower limit of sensitivity and analyzable range for nanoparticle detection, and is a prerequisite for the analysis of particle size, concentration and heterogeneity parameters. The reliable acquisition of scattered signals not only affects the detection ability of nanoparticles, but also relates to the accuracy of subsequent fluorescence labeling quantification and population typing.

4 scatter channels
VSSC-1、VSSC-2、FSC and BSSC

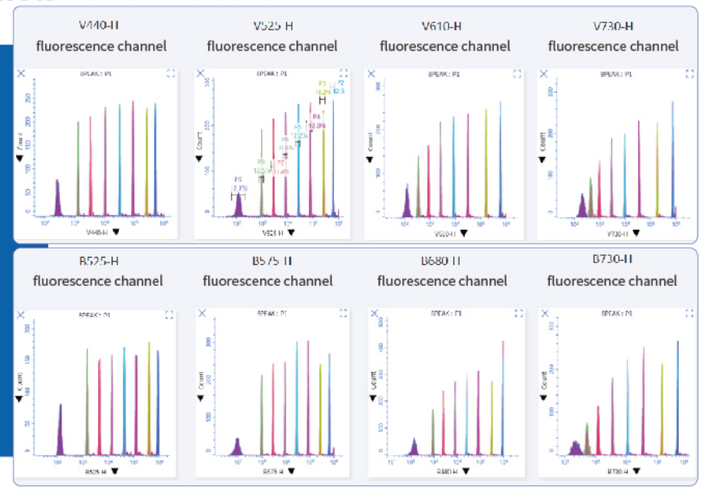
Detectable particle range
5nm-3000nm

Exoplorer™ supports three signal parameters (area, height, and width), effectively distinguishing system background and noise, ensuring accurate optical signal capture.



Fluorescence Channels

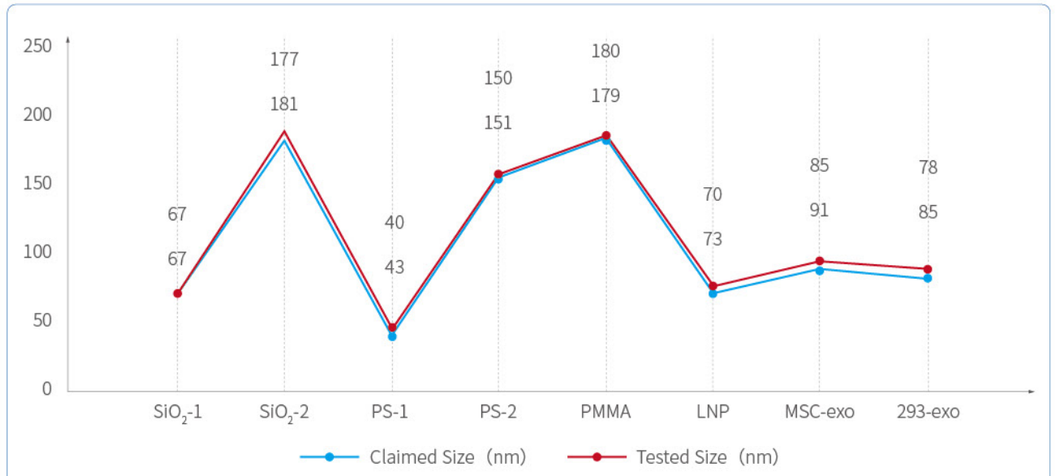
The Exoplorer™ nano-flow cytometer is equipped with 8 highly sensitive fluorescence channels, supporting precise detection at the single-particle level. Whether it is surface protein quantification, nucleic acid labeling recognition, or multimolecular typing, it can achieve high specificity and high resolution analysis in complex samples.

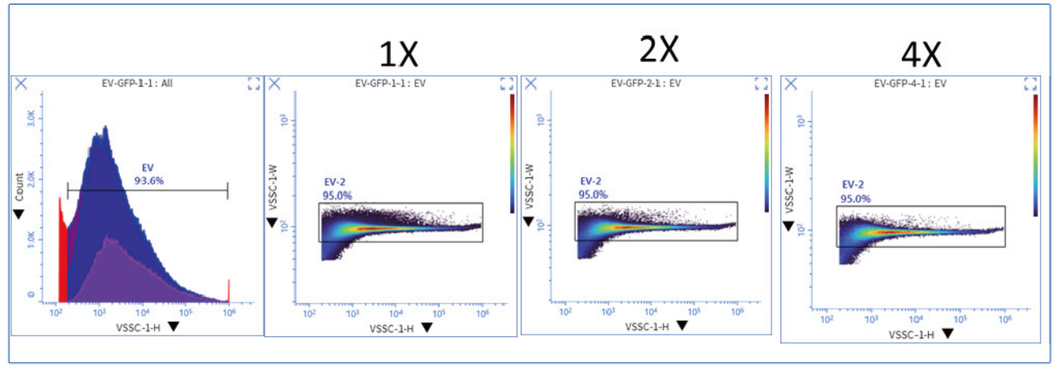


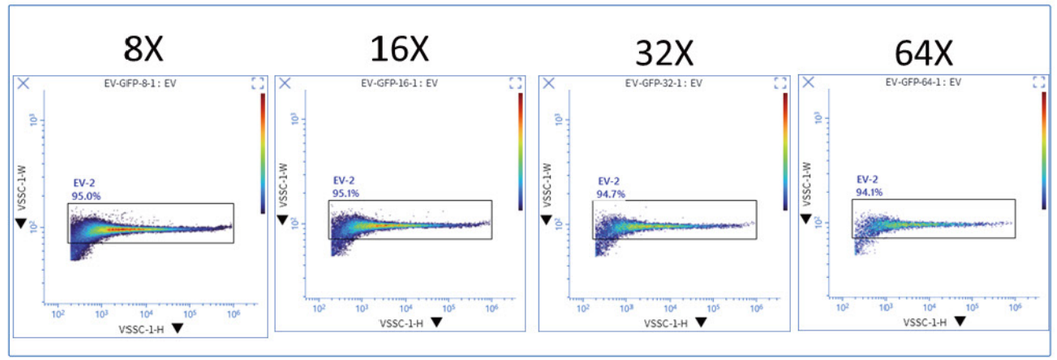
Particle Size Analysis

The particle size of nanoparticles determines their physical properties, biological behaviors and application functions, and it is a core parameter for studying the stability, distribution patterns and functional mechanisms of nanoparticles. The Exoplorer™ nano-flow cytometer is equipped with advanced particle size analysis functions. Through intelligent algorithms and refractive index correction, it achieves precise particle size measurement at the nanometer level, ensuring the authenticity and reliability of scientific research data.

Claimed and Tested Size Difference



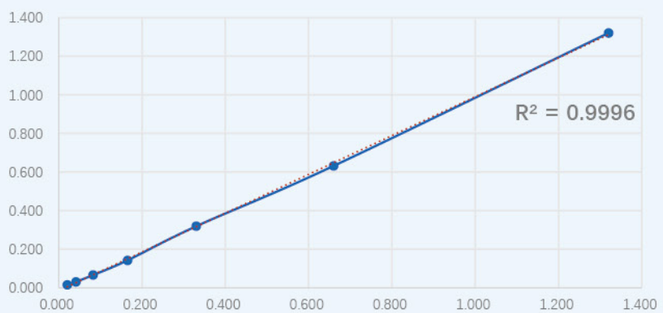




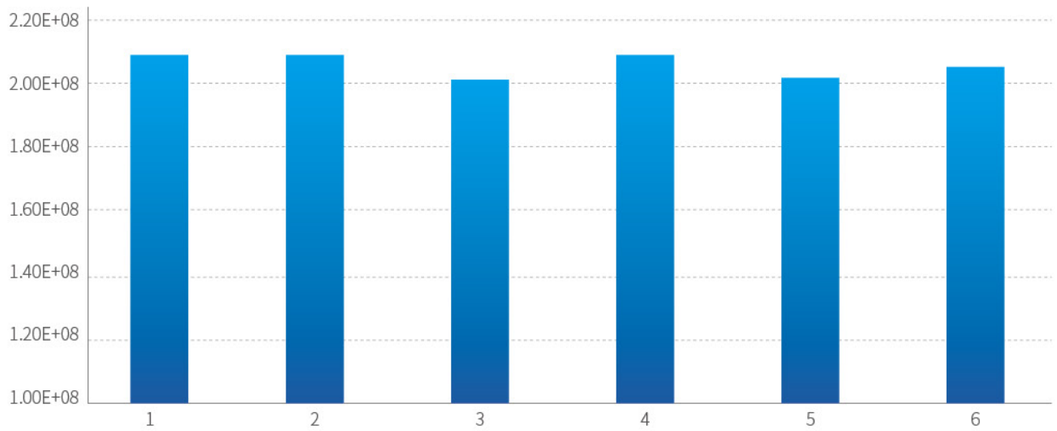
Concentration Calculation

The concentration of nanoparticles is a core parameter for evaluating the quantitative characteristics of samples, controlling experimental dosages, optimizing preparation processes, and analyzing functional effects. It is indispensable for both scientific research and applications. The Exoplorer™ nano-flow cytometer is equipped with a high-precision plunger pump, enabling absolute counting of samples without microspheres, with a counting accuracy of up to 95% and a repeatability CV controlled within 5%. The outstanding performance leading the industry provides a solid guarantee for the in-depth research of nanoparticles.

HEK293 Gradient Dilution Results



Repeated Testing of the Same Sample Concentration

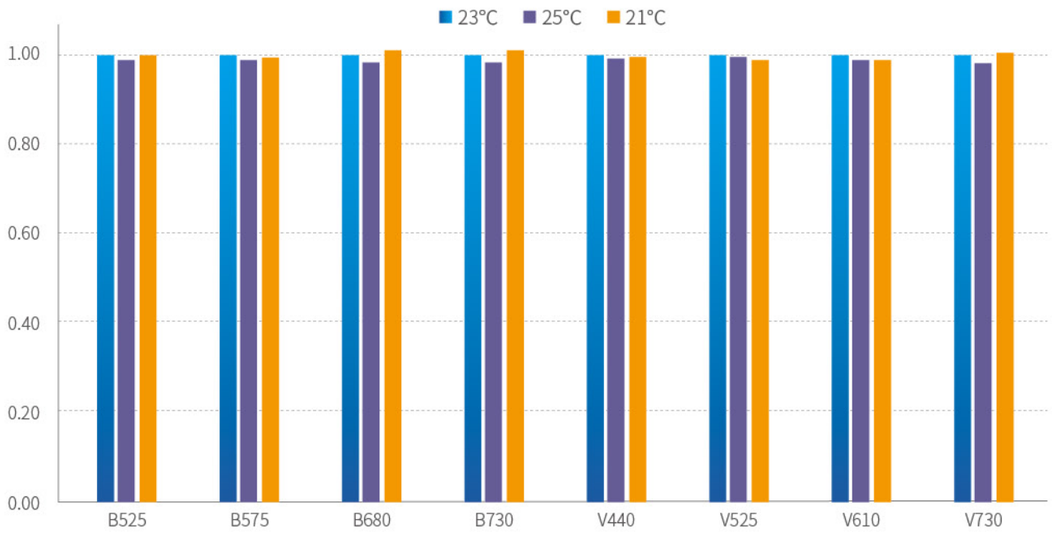


Performance of Exoplorer™ Nano-flow Cytometer

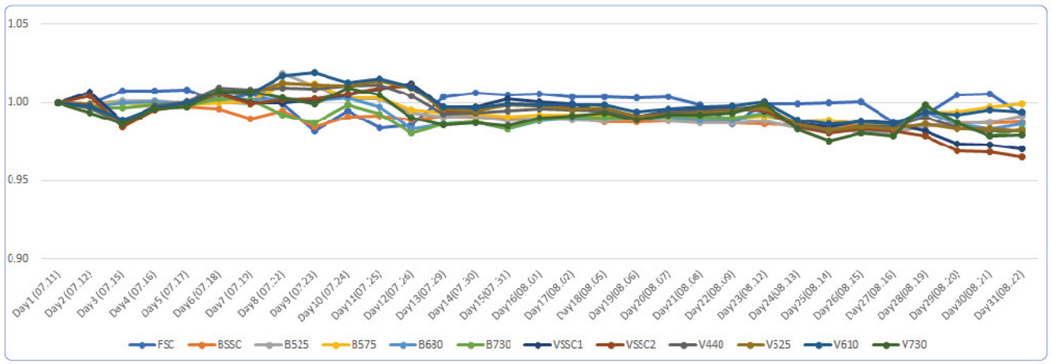
System Reliability

The outstanding system stability of the instrument is the core guarantee for researchers to obtain continuous, reliable and repeatable experimental results. The Exoplorer™ nano-flow cytometer has been strictly optimized and comprehensively tested to ensure that it continuously provides researchers with high-quality and reliable data over long-term use.

Exoplorer™ maintains the same working environment requirements as traditional flow cytometry: it can operate within an ambient temperature range of 15-28℃ and is compatible with temperature fluctuations of ±2℃. Exoplorer™ nano-flow cytometer has undergone a continuous 30-day average fluorescence intensity fluctuation test, with the fluorescence intensity drift remaining within ±5%, demonstrating an excellent stability level.

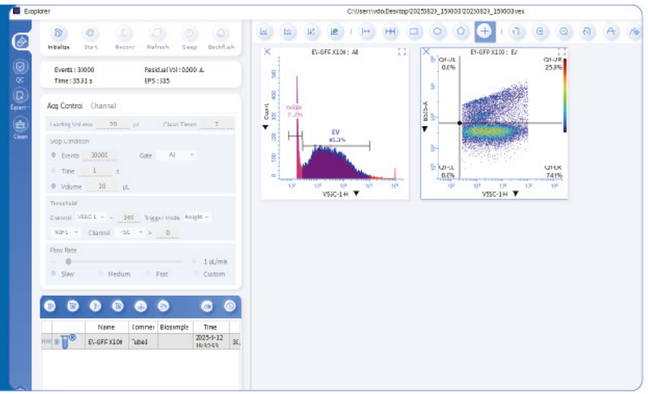


Fluorescence Intensity Monitoring Results for 30 Consecutive Days



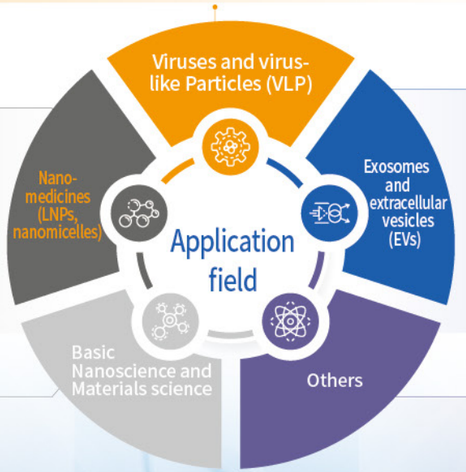
User-friendly Software Design

The intuitive and user-friendly interface and optimized process not only enhance experimental efficiency but also effectively reduce operational errors and ensure data reliability, enabling researchers to focus more on their research itself. The Exoplorer™ nano-flow cytometer software is designed to meet the special requirements of nano particle analysis while retaining the operational habits of traditional flow cytometry software, minimizing the learning cost for operators to the greatest extent.



Application Field

- Vaccine development: Quantitative expression of virus or antigen
- Gene vector development: Analysis of virus particle size and titer



- Analysis of particle size, concentration and surface modification of drug carriers
- Loading efficiency and process optimization

- Particle size, concentration and subgroup analysis
- Multiplex labeling analysis of surface proteins
- Screening of disease biomarkers

- Analysis of particle size and concentration of nanoparticles and evaluation of surface modification

- Bacterial analysis, organelle research, etc

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Detection of Positive Rate of Nucleic acid Carried by LNPs

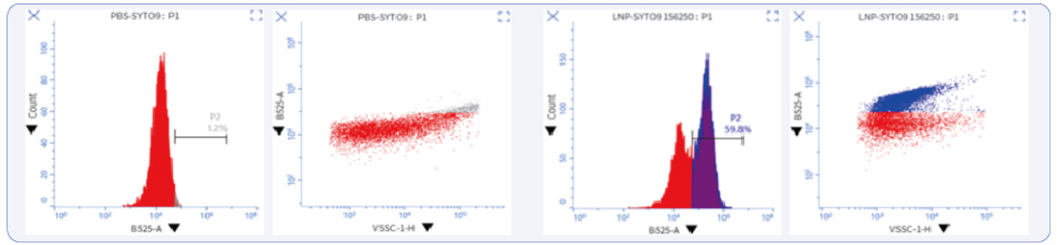
Lipid nanoparticles (LNPs) are the core delivery system of current mRNA vaccines. However, empty LNPs and mRNA-loaded LNPs are highly similar in particle size, morphology and electron density, making it difficult for traditional characterization methods (such as TEM) to distinguish their drug loading states and formulation heterogeneity.

Nano-flow cytometry can conduct multi-parameter analysis on single-particle LNPs, achieving high-resolution measurement of particle size distribution, single-particle quantification of mRNA encapsulation rate, and sensitive detection of surface-modified molecules. It provides key information that is difficult to obtain through traditional methods for the research and development and quality control of mRNA vaccines, and offers strong support for the optimization of delivery systems, quality consistency evaluation, and regulatory compliance.

Experimental procedures:

Step 1	Step 2	Step 3	Step 4
Take PBS of the same reaction volume as the sample and add an appropriate amount of SYTO9 dye as the blank control.	Take an appropriate volume of the sample, add SYTO9 dye, and incubate for 15 minutes.	Dilute the reacted sample to an appropriate concentration and test it on the machine. The percentage of the blue particle population in the figure is the positive rate.	Collect LNPs samples with different dilution factors, open the software's statistics function, and calculate the sample concentration and size.

PBS+SYTO9（Blank） LNPs taining 15min 59.8% Positive



Sample	Dilution Factor	Detection Concentration (Particles/ml)	Original Concentration (Particles/ml)	RSD	Sizing (Median)
LNPs	160000	2.866E+08	4.585E+13	2%	63.3
	640000	7.352E+07	4.705E+13		62.7
	2560000	1.836E+07	4.700E+13		62.5

Test result: The positive rate of nucleic acids carried by LNPs was 59.8%. Meanwhile, the results of different dilution ratios of LNPs were detected, and there was excellent repeatability in both particle size and concentration.

Summary: The above experimental results indicate that the Exoplorer™ nano-flow cytometer has outstanding performance in detecting the positive proportion of nucleic acids loaded on lipid nanoparticles. Breaking through the characteristics that are difficult to distinguish in traditional methodologies, it provides effective assessment of key information such as system optimization and quality evaluation for drug delivery systems.

EVs Purity Detection Based on Membrane Ratio

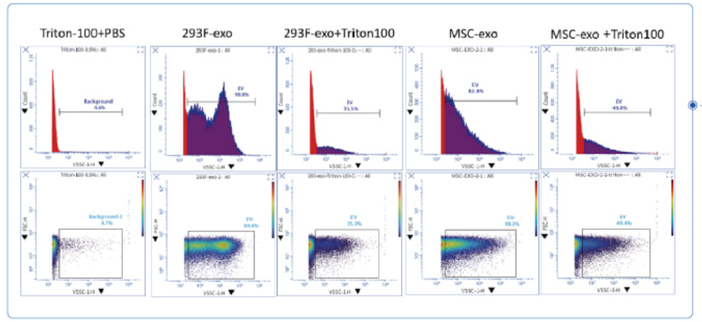
The purity of extracellular vesicles (EVs) can be assessed by calculating the membrane ratio. EVs exhibit heterogeneity, and their purity assessment impacts the reliability of basic research and the safety of clinical applications. With technological advancements and the establishment of standardization systems, the purity assessment will become more precise and standardized. The robust multiparametric analysis capability of nano-flow cytometry is key to deciphering this heterogeneity, thereby enabling quantitative studies on the purity of extracellular vesicles.

The membrane ratio formula is as follows:

$$\text{Membrane ratio} = \frac{\text{Particles before lysis} - \text{Particles after lysis}}{\text{Particles before lysis} - \text{background Particles}}$$

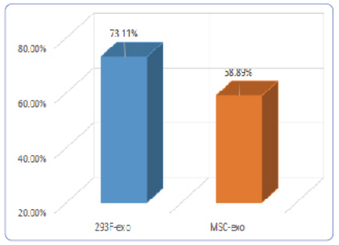
Experimental procedures:

Step 1	Step 2	Step 3	Step 4
Take the sample reaction volume of PBS, add an appropriate amount of Triton-100 lysis buffer as a blank control, and count its particles to set as the background particles.	Take an equal volume of EVs sample from the blank control PBS, and count the number of particles as the particles before lysis.	Add an equal volume of Triton-100 lysis buffer as a blank control to the EV sample for lysis, and set the counted particle number as the particles after lysis.	Turn on the software's statistical function to count and analyze the number of particles at each step.



Samples	Triton-100+PBS (background particles)	EV (Particles before lysis)	Triton-100+EV (particles after lysis)	Membrane ratio
293F-exo	710	38607	10901	73.11%
MSC-exo	710	35220	14897	58.89%

The Membrane Ratio Determined by Exoplorer™



Note: According to the description of Echo Biotech, 293F-exo is a high-purity sample, while the purity of MSC-exo is relatively low.

Test result: 293F-exo has a higher membrane ratio than MSC-exo, and the former has a higher purity.

Summary: The above experimental results indicate that the Exoplorer™ nano-flow cytometer has outstanding performance in the assessment of EVs purity. Its high precision and high reliability make it an indispensable and important tool in EVs research. By providing accurate quantitative results, this instrument can significantly enhance the quality control level of EVs, ensuring that related research achievements and subsequent therapeutic applications are based on high-quality materials.