EXODUS

EXODUS

AUTOMATIC EXOSOME
ISOLATION SYSTEM

Automatic System for Exosome Isolation

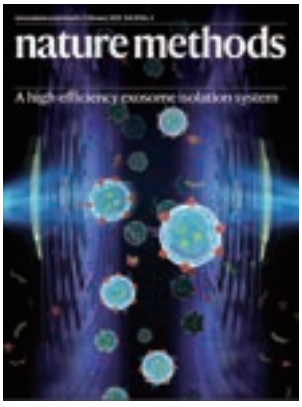
EXODUS

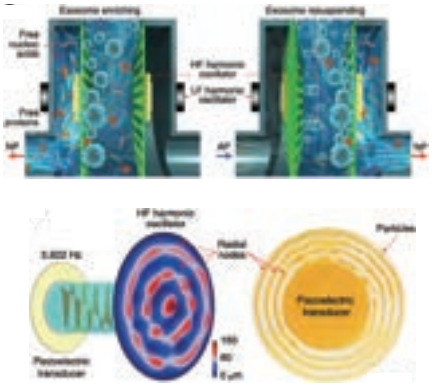
EXODUS is an automatic, label-free, and highly efficient exosome isolation system. With EXODUS, you can easily and quickly isolate high-quality, intact exosomes with excellent yield and purity from a variety of bio-fluids and sample volumes.

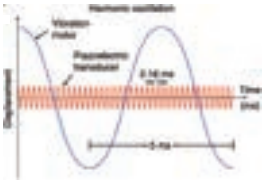
Experience the efficiency of EXODUS for yourself and take your research to the next level.

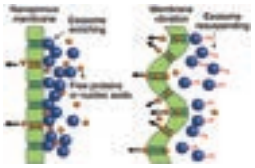
Isolation Principles

EXODUS has been developed using a dual-membrane nanofiltration system that integrates periodic negative pressure oscillation (NPO) and double-coupled ultrasonic harmonic oscillations (HO).









Nature Methods, 2021, 18(2):212-218.

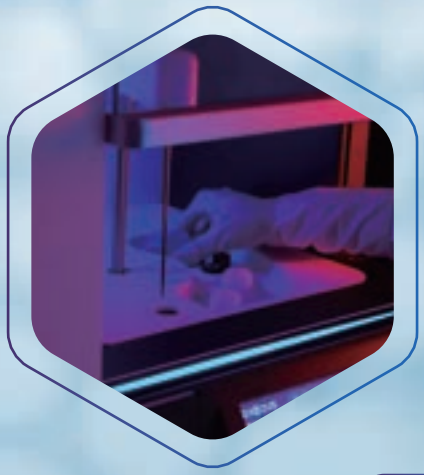
EXODUS can rapidly remove free nucleic acid and protein impurities from the sample, resulting in the efficient purification and enrichment of exosomes. The exosome are precisely intercepted by nanoporous membrane, allowing for a highly targeted isolation process.

EXODUS has great potential to revolutionize exosome isolation and drive new discoveries in biomedical research and translation.

Automatic

EXODUS is designed to automatically isolate high yield and purity exosome from different biofluid sample volumes.

Step 1



Sample loading

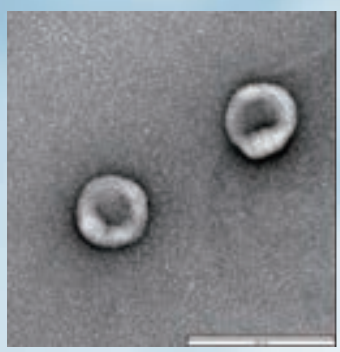
Step 2

Automatic isolation

Step 3

Easy exosome collection

TEM



KEY FEATURES

EXODUS
Key
Features>>

Rapid isolation

Maximum isolation speed: 200 mL/h

High purity and high yield

Purity ~ 99 %; Yield ~ 90 %

Wide application

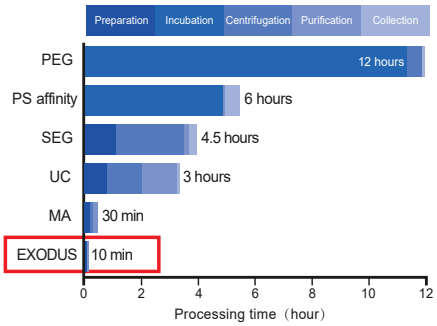
Sample types	Sample volumes	Sample types	Sample volumes
Urine		Plasma	0.01 - 2 mL
Plant		Saliva	0.5 - 10 mL
Cell culture medium	1 - 250 mL	Tears	0.005 - 1 mL
Cell-derived vesicle		Aqueous humor	0.005 - 1 mL
Bacterial culture medium		Cerebrospinal fluid	0.5 - 25 mL

Label-free

Only need PBS buffer

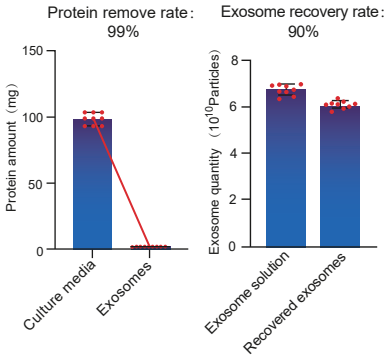
Rapid isolation

10 mL urine



Nature Methods, 2021, 18(2):212-218.

High purity and high yield



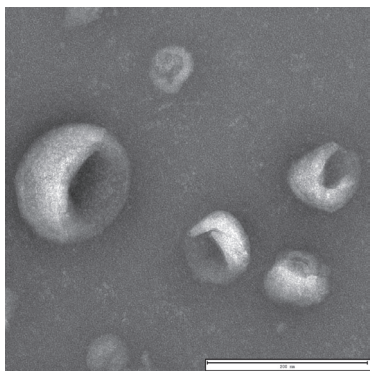
Nature Methods, 2021, 18(2):212-218.

Wide application

Other small amount sample types

Label-free

TEM image of exosome



EXODUS
Application >>

APPLICATION

Various Sample Types

Plasma

Urine

Saliva

Cerebrospinal fluid

Tears

Aqueous humor

Synovial fluid

Tissue

Cell culture medium

Bacterial culture medium

Cell-derived vesicle

Plant

Applications

- Early diagnosis
- Drug delivery
- Exosome therapeutics
- Regenerative medicine

1 Urine EV isolation with EXODUS

Figure 1. Characterization of exosome by transmission electron microscopy (TEM).

TEM of exosome harvested from urine by EXODUS, showing the characteristic cup and plate shape of exosome. Scale bar = 600 nm.

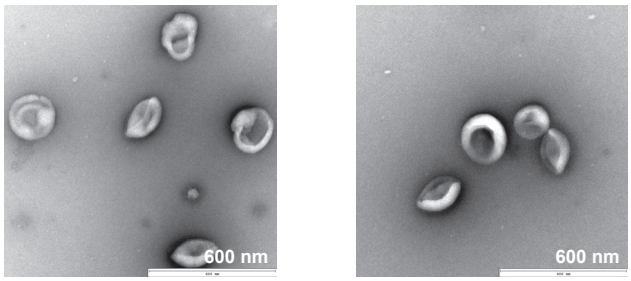
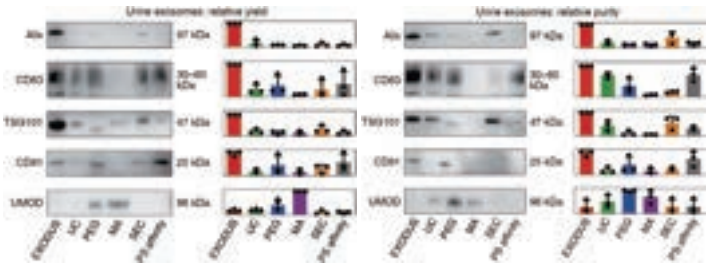


Figure 2. Method comparison for exosome isolation.

Western blot analysis of exosomal markers (Alix, CD63, TSG101, and CD81) and impurity Uromodulin (UMOD) of exosome isolated using methods of EXODUS, Ultracentrifugation (UC), PEG precipitation, Membrane affinity (MA), Size exclusion chromatography (SEC), and Phosphatidylserine (PS) affinity, respectively. Compared to other methods, exosome isolated by EXODUS shows higher relative yield and purity in WB gel graph (left) and bar graph of normalized band intensity (right).



Nature Methods, 2021, 18(2):212-218.

2 Cell culture medium EV isolation with EXODUS

Figure 1. Characterization of exosome by TEM.

Electron micrographs of exosome isolated from umbilical cord mesenchymal stem cell supernatants using EXODUS (left) and UC (Right). TEM of exosome obtained from EXODUS shows such typical cupped structure and less distortion of exosome membrane compared to that from UC. Scale bar = 600 nm.

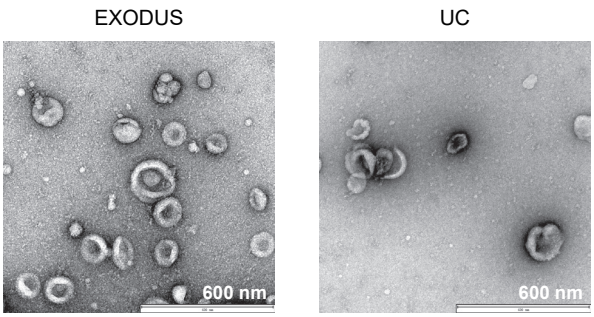
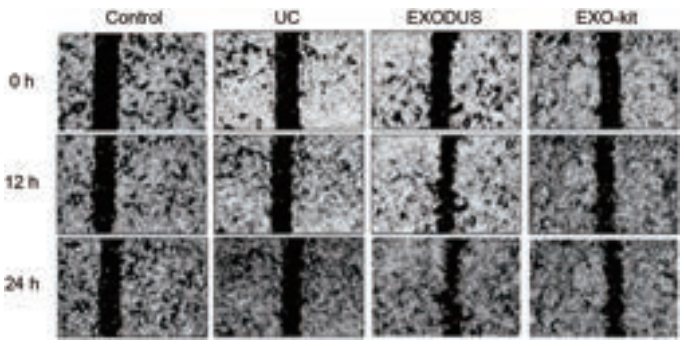


Figure 2. Scratched wound assay for the effects evaluation of exosome on migration capacity of cells.

Cells began to exhibit significantly migration 12 h after treatment with exosome isolated either from EXODUS or EXO-kit compared to that from UC and the control group. After 24 h, enhanced cell migration was observed from the group with the addition of EXODUS-isolated exosome. Scale bar = 40 μm.

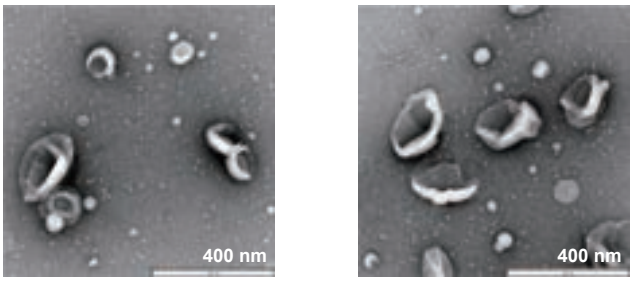


Electrophoresis, 2024, 0173-0835.

3 Plasma EV isolation with EXODUS

Figure 1. Characterization of exosome by TEM.

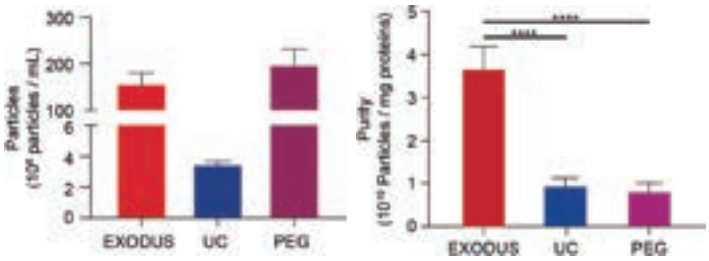
TEM analysis of exosome isolated from the plasma of patients with esophageal squamous cell carcinoma using the EXODUS reveals their distinctive cup-shaped and plate-like morphology. Scale bar = 400 nm.



Technol Cancer Res Treat, 2024, 1533-0338.

Figure 2. The yield and purity analysis of sEVs isolated by methods of EXODUS, UC, and PEG, respectively.

sEVs isolated using EXODUS or PEG from 20 µL of plasma (approximately 2 x 10^{10} particles/mL) showed over a 50-fold increase compared to those isolated using UC. The purity of sEVs isolated using EXODUS was more than three times higher than that achieved with UC or PEG.

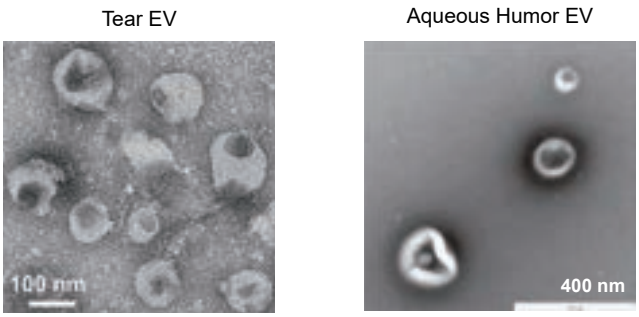


Biosensors and Bioelectronics: X, 2021, 10.

4 Trace sample EV isolation with EXODUS

Figure 1. Characterization of tear EVs and aqueous humor EVs by TEM.

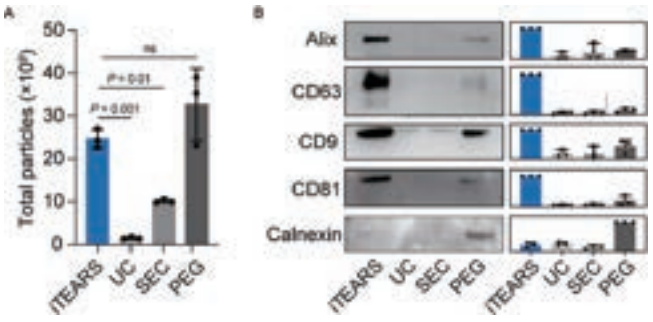
TEM images of exosome derived from two trace samples of 50 µL tear fluid (left, scale bar = 100 nm) and 150 µL aqueous humor (right, scale bar = 400 nm) using the EXODUS, reveals their characteristic cup-shaped and plate-like morphological features.



ACS Nano, 2022, 16(8): e11720.

Figure 2. The yield and purity analysis of tear exosome isolated by methods of EXODUS, UC, SEC, and PEG.

A. Total particles of exosome isolated using EXODUS or PEG from 50 µL of tear (approximately 2 x 10^{10} particles/mL) showed over a 20-fold and 2-fold increase compared to those isolated from UC and SEC, respectively.
B. Equal-protein-mass (3 µg) western blot analysis of the exosomal markers (Alix, CD63, CD9, and CD81) and negative marker (Calnexin) of tear exosome prepared by iTEARS EXODUS and other methods.



ACS Nano, 2022, 16(8): e11720.

5 Bacterial EV isolation using with EXODUS

Figure 1. Characterization of bacterial EVs by TEM.

TEM images of EVs derived from *Helicobacter pylori, Escherichia coli, Mycobacterium avium,* and Gut microbiota isolated by EXODUS. The EXODUS is capable of isolating EVs from a variety of bacterial sources, including both Gram-positive and Gram-negative bacteria.

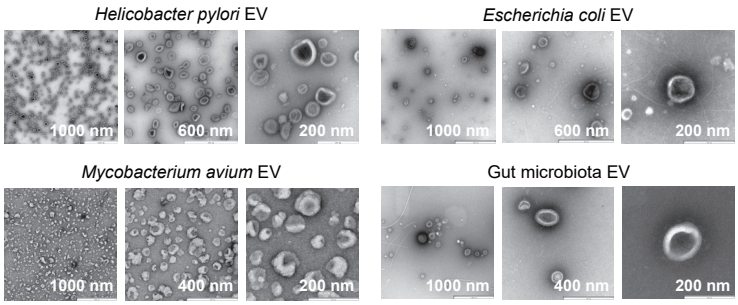
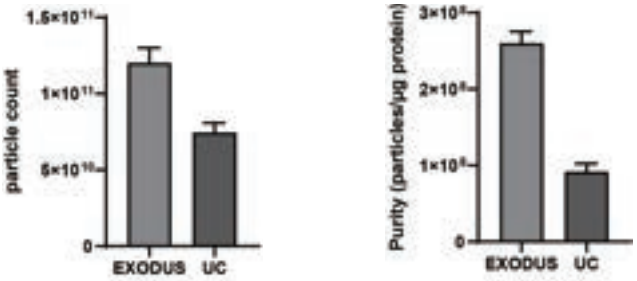


Figure 2. Comparison of yield and purity by using EXODUS and UC.

EXODUS achieves higher particle yield and EV purity compared to UC of *E.coli* EVs.



6 Virus and virus-like particles isolation with EXODUS

Figure 1. TEM characterization of virus and virus-like particles.

Using EXODUS, high-resolution TEM images were obtained to highlight typical morphology of bacteriophages, phage protein self-assembly particles and Rift Valley fever virus. Gentle isolation of EXODUS is able to preserves the viral or particle integrity, which is crucial for accurate structural analysis. Scale bar = 100 nm.

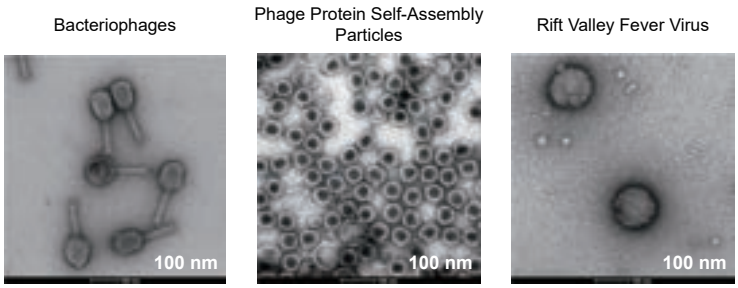
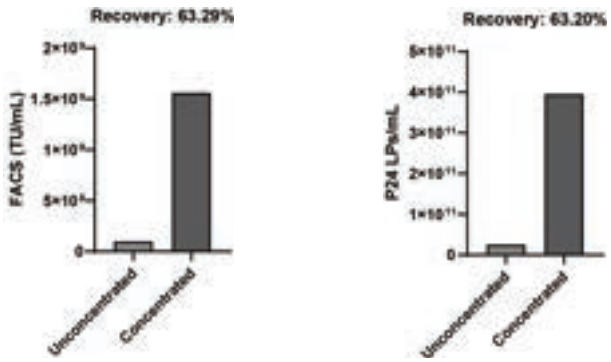


Figure 2. Lentiviral titer recovery rate results.

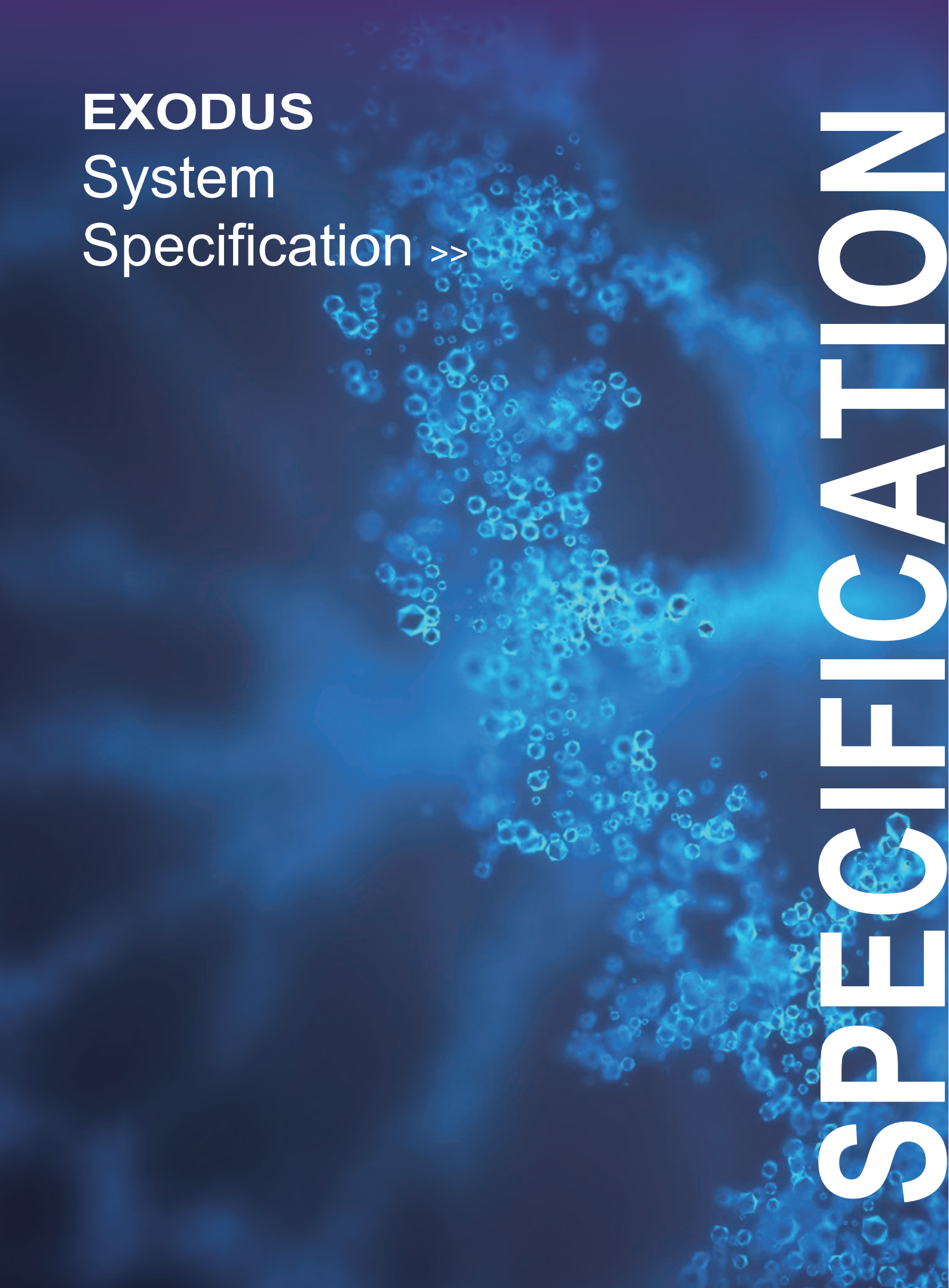
After purification with the EXODUS, the titer of lentiviral infection increased from 9.86 x 10^7 to 1.56 x 10^9, with a recovery rate of 63.29%, and the physical titer increased from 2.5 x 10^{10} to 3.95 x 10^{11}, with a recovery rate of 63.20%.



Publications

NO.	Title	Journal	Five-year average IF
01	Exosome Detection via the Ultrafast-Isolation System: EXODUS	Nature Methods	45.6
02	UPCARE: Urinary Extracellular Vesicles-Derived Prostate Cancer Assessment for Risk Evaluation	Journal of Extracellular Vesicles	19.6
03	Discovering the Secret of Diseases by Integrated Tear Exosomes Analysis via Rapid-isolation System: ITEARS	ACS Nano	16.2
04	Robust Acute Pancreatitis Identification and Diagnosis: RAPIDx	ACS Nano	16.2
05	Interaction Network of Extracellular Vesicles Building Universal Analysis via Eye Tears: TNEBULA	Science Advances	13.7
06	Sensitive Small Extracellular Vesicles Associated CircRNAs Analysis Combined with Machine Learning for Precision Identification of Gastric Cancer	Chemical Engineering Journal	13.2
07	Quantitative Metabolic Analysis of Plasma Extracellular Vesicles for the Diagnosis of Severe Acute Pancreatitis	Journal of Nanobiotechnology	11.4
08	Lipidomic Identification of Urinary Extracellular Vesicles for Non-Alcoholic Steatohepatitis Diagnosis	Journal of Nanobiotechnology	11.4
09	Metabolomic Investigation of Urinary Extracellular Vesicles for Early Detection and Screening of Lung Cancer	Journal of Nanobiotechnology	11.4
10	The Genetic Source Tracking of Human Urinary Exosomes	PNAS	10.8
11	Identification and Detection of Plasma Extracellular Vesicles-derived Biomarkers for Esophageal Squamous Cell Carcinoma Diagnosis	Biosensors & Bioelectronics	9.9
12	Audible Acoustic Wave Promotes EV Formation and Secretion from Adherent Cancer Cells via Mechanical Stimulation	ACS Applied Materials & Interfaces	8.7
13	Identification of Circulating Extracellular Vesicle Long RNAs as Diagnostic Biomarkers for Patients with Severe Acute Pancreatitis	Clinical and Translational Medicine	8.0
14	Prediction of Response to Chemoradiotherapy by Dynamic Changes of Circulating Exosome Levels in Patients with Esophageal Squamous Cell Carcinoma	International Journal of Nanomedicine	7.5
15	Investigating The Proliferative Inhibition of HepG2 Cells by Exosome-like Nanovesicles Derived from Centella Asiatica Extract Through Metabolomics	Biomedicine & Pharmacotherapy	6.8
16	Gut Subdoligranulum Variabile Ameliorates Rheumatoid Arthritis by Promoting TSG-6 Synthesis from Joint Cells	Frontiers in Immunology	6.8
17	Metabolomic Analysis of Exosomal-Markers in Esophageal Squamous Cell Carcinoma	Nanoscale	6.1
18	Metabolic Signatures of Tear Extracellular Vesicles Caused by Herpes Simplex Keratitis	Ocular Surface	5.9
19	Sensitive Electrochemical Biosensor for Rapid Detection of sEV-MiRNA Based Turbo-Like Localized Catalytic Hairpin Assembly	Analytica Chimica Acta	5.5
20	Isolation of Exosome Nanoparticles from Human Cerebrospinal Fluid for Proteomic Analysis	ACS Applied Nano Materials	5.4
21	Human Umbilical Cord Mesenchymal Stem Cells Inhibit Liver Fibrosis via The MicroRNA-148a-5p/SLIT3 Axis	International Immunopharmacology	5.0
22	Patient-derived Induced Pluripotent Stem Cells with a MERTK Mutation Exhibit Cell Junction Abnormalities and Aberrant Cellular Differentiation Potential	World Journal of Stem Cells	4.2
23	Assessing Alzheimer's Disease via Plasma Extracellular Vesicle–Derived mRNA	Alzheimer's & Dementia: Diagnosis, Assessment & Disease Monitoring	4.0
24	Efficient Preparation of High-purity and Intact Mesenchymal Stem Cell–derived Extracellular Vesicles	Analytical and Bioanalytical Chemistry	3.8
25	Plasma-derived Exosomal miR-25-3p and miR-23b-3p as Predictors of Response to Chemoradiotherapy in Esophageal Squamous Cell Carcinoma	Technology in Cancer Research & Treatment	2.8
26	Comparative Investigation of Exosome Extraction from rat bone Marrow Mesenchymal Stem Cells Using Three Different Methodologies	Electrorhoresis	2.8
27	Isolation of Small Extracellular Vesicles from a Drop of Plasma via EXODUS and Their Fingerprint Proteomics Profiling by MALDI-TOF MS	Biosensors & Bioelectronics: X	/
28	Application of EXODUS System Combined with Allosteric DNA Nanoswitches in the Detection of miR-107 Among Plasma Exosomes of Parkinson's Disease Patients	Chinese Journal of Preventive Medicine	/

EXODUS
System Specification >>



Model	EXODUS H-300	EXODUS H-600
Isolation principles	Combination of the negative pressure oscillations (NPO) and double coupled harmonic oscillations (HO) on nanoporous membrane	
Sample types	Plasma, urine, saliva, cerebrospinal fluid, tears, aqueous humor, synovial fluid, tissue, cell culture medium, bacterial culture medium, cell-derived vesicle, plant, etc.	
Isolation device size	S/M	S/M/L
Temperature of sample reservoir	2 - 8 °C	
Sample volumes	10 µL - 50 mL	10 µL - 250 mL
Processing speed	Max speed 50 mL/h	Max speed 200 mL/h
Isolation data saving	2000	20000
Exosome recovery volumes	100 - 400 µL	100 - 1000 µL
Ultraviolet sterilization	Internal UV lamp, turn off automatically after 30 min	
Display	10.4 inch touch screen, real time display with sample type, time, processing information etc. Supporting the operation without computer	
Dimension	535 x 510 x 475 mm (H x W x D)	
Net weight	40 kg (88 lbs)	
System interfaces	4 USB ports, 1 network port, 1 serial port	

EXODUS

Product specifications may change without notice,
based on the latest technical data and test results.

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