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APPLICATION NOTE

AN4008: Rapid Extracellular Vesicles Purification and Analysis

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Extracellular vesicles (EVs) secreted by most cell types, facilitating intercellular communication by carrying proteins, lipids, and various forms of nucleic acids. These vesicles play a critical role in numerous physiological and pathological processes, acting as messengers between cells.

EVs reflect the molecular signature of their parent cells and have garnered significant attention in diagnostics. They hold promise as non-invasive biomarkers for diseases such as cancer, neurodegenerative disorders, and cardiovascular conditions, making them invaluable for early disease detection and monitoring.

However, purifying EVs from raw physiological fluids, as urine, plasma, serum, milk, and cell culture medium, presents significant challenges. This process often requires sample pretreatment, multiple steps, specialized laboratory equipment, and skilled operators, which can result in low yield, reduced purity, and compromised integrity.

The difficulties extend beyond purification to the analysis of exosomes, which often consumes valuable samples. For example, plasma samples are typically limited in quantity and cannot be reproduced. As a result, quantification and characterization methods that consume these scarce resources further strain their availability.

The portable microstructured electrochemical device (PMED) by Acytronix, paired with the DynaPro™ NanoStar™ or ZetaStar™ instrument, provides a complete workflow for EVs capture, release, and non-destructive characterization—all in under 10 minutes.

A demonstration of a complete workflow, using the DynaPro NanoStar, can be found here: link.

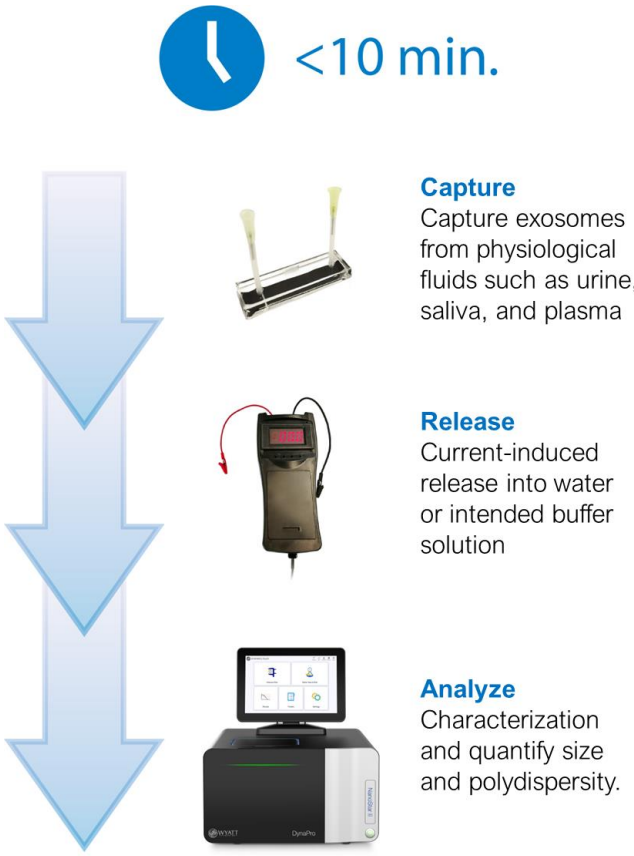

Figure 1. EVs purification and analysis workflow in less than 10 minutes

First, EVs are captured in the PMED separating cartridge by injecting a sample, such as plasma. Following a quick rinse step, the cartridge is connected to the releasing unit, which triggers the release of EVs into the solution. Lastly, the sample can be delivered into a cuvette for non-destructive size and distribution analysis using the Dynapro NanoStar instrument through a combination of dynamic and static light scattering (DLS and SLS) techniques.

Figure 2. The DynaPro NanoStar DLS/SLS instrument features easy, walk-up measurements with touch screen and DYNAMICS™ Touch™ on-board application.

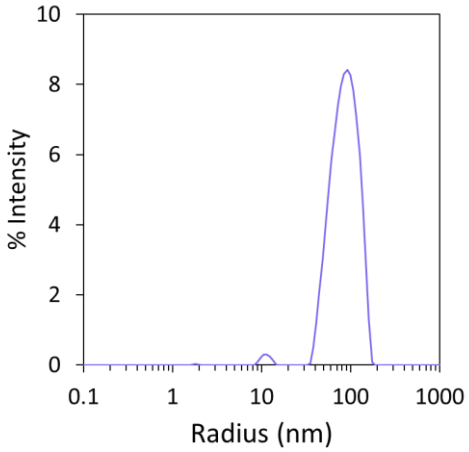

Figure 2. Size distribution of EVs purified from plasma. Data shows that 98% of the scattered light is attributable to EVs, indicating highly purified samples.

The innovative PMED is designed for the rapid and efficient purification of EVs from physiological fluids. It employs targeted purification through specific antibodies: Anti-CD9 for general EVs, Anti-CD63 for exosome-related EVs, and Anti-CD73 for regenerative EVs.

The PMED uses a unique electrical current-induced release mechanism, enabling the simultaneous release of EVs directly into water or the intended buffer, bypassing the need for lengthy buffer exchange steps. This streamlined approach simplifies the process, yielding high-quality EVs with minimal effort.

After purification, the DynaPro NanoStar DLS/SLS instrument delivers non-destructive measurements of size and size distribution in less than 30 seconds. The instrument accommodates various cuvette types, including specially designed quartz
cuvettes for robust, accurate measurements with as little as 2 µL of sample, and proprietary disposable cuvettes offering similar sensitivity with just 4 µL. If needed, the samples can be recovered from the cuvette and used for other assays.

The PMED and DynaPro NanoStar instruments revolutionize EV purification by reducing sample processing times to under 10 minutes and is compatible with a wide range of biofluids. Its versatility and efficiency make it an indispensable tool for biological and medical research.

For more information on the technology and applications of DLS, please visit www.wyatt.com/DLS.

To request more information about DynaPro NanoStar DLS/SLS instrument, please click the button below.

Request information

About

Acytronix

We are a Swiss biotech company, specializing in rapid, high-yield, and selective immuno-purification of extracellular vesicles (EVs). Our mission is to revolutionize EV-based therapeutic and diagnostic applications with our cutting-edge technology. Our flagship product is a portable, versatile device that purifies EVs directly from raw biosamples in under 10 minutes, without requiring bulky or expensive equipment. This solution integrates seamlessly into diverse workflows, ensuring efficiency and convenience. In addition to our device, we offer custom purification services and supply high-quality EVs sourced from various biological materials. We serve biopharmaceutical companies, university research labs, hospitals, veterinary clinics, and scientists in the field of biological nanoparticle research. By leveraging our advanced biopurification technology, we simplify the purification of nanometric entities, making it efficient, accessible, and transformative for researchers worldwide.

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