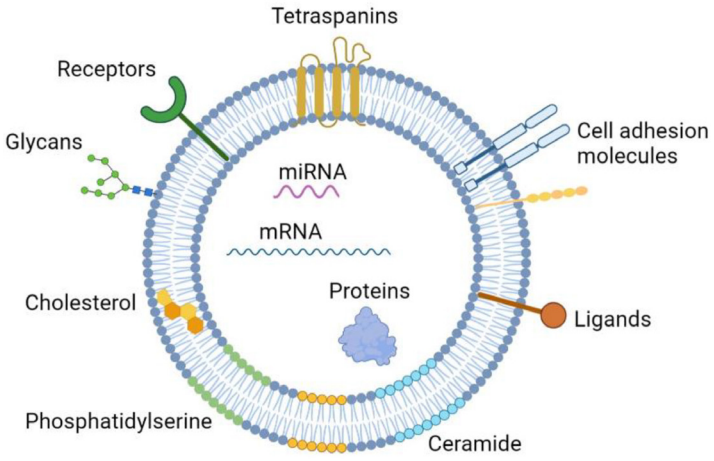
spINSIGHTS

from the lab

In this issue: EL*EV*ATING EV Characterization with Analytical Ultracentrifugation (AUC)



de Almeida Fuzeta, et al. Bioengineering. DOI: 10.3390/bioengineering9110675,

Why use analytical ultracentrifugation (AUC) to characterize extracellular vesicles (EVs)?

EVs are an exciting area of research, given their tremendous promise as diagnostic biomarkers for disease, and their potential use in novel therapeutics. Nonetheless, characterizing EVs remains a challenge due to their inherent heterogeneity.

It is crucial to assess attributes such as purity, size distribution, shape, and cargo packaging for these heterogeneous nanoparticles. AUC stands out as an excellent option for characterization, as it **enables the measurement of these parameters in a single experiment**.

ACCELERATING *answers*

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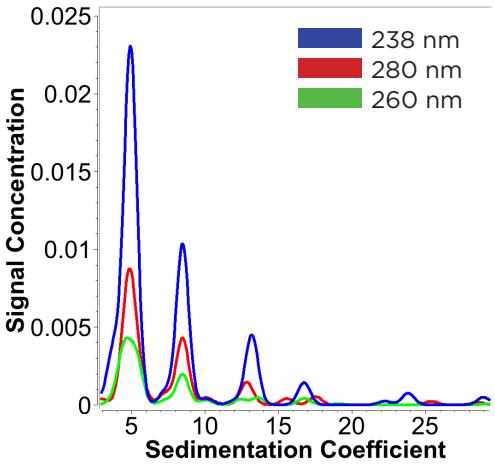
Unique advantages of AUC analysis of EVs

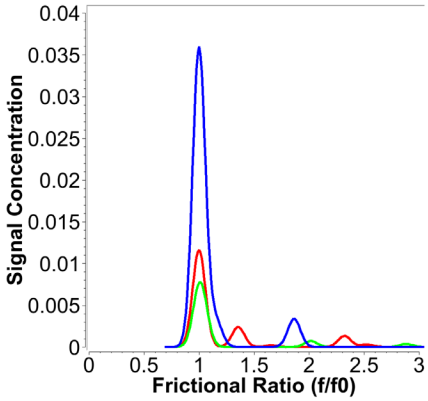
AUC enables analysis of samples in their native state:

- No substrate or matrix interactions
- No calibration standards required

It offers an extremely large dynamic range, and can characterize anything from peptides to intact viruses. This extensive range can provide an **in-depth understanding of the different EV populations** in solution, as well as **identification of contaminants and aggregates**.

For example, AUC facilitated in the determination that an umbilical EV sample contained 4 prominent species, with the smallest (5 S species) being the most abundant.





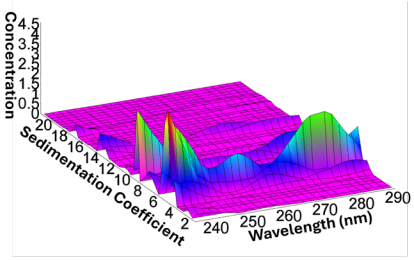
Understanding the shape of EVs

Using AUC, we can begin to understand the shape of our analytes in solution. This is done using the frictional ratio (f/f0), which is calculated based on the diffusion coefficient measured by AUC. The f/f0 describes the anisotropy (or relative shape) of analytes in solution.

A frictional ratio of 1, as seen for the majority of the particles here, indicates a sphere, while larger f/f0 indicate a more extended or linear structure.

Characterizing biomolecules that make up EVs

If the sample is measured with multiple wavelengths via AUC, insights into the molecular content of the EV sample can start to be developed. Multiwavelength AUC lets us identify and quantify proteins, nucleic acids, lipids, and other biomolecules based on their absorption profiles.



In summary: The Optima AUC analytical ultracentrifuge enables you to quantitatively identify different populations in EV preparations, and provides **crucial insights into their molecular content and shape**. It also provides valuable information on **sample purity**, and can be used for **batch-to-batch comparability and stability testing**.

Such comprehensive characterization can greatly enhance our understanding of EVs and their potential applications in various fields such as medicine, biology and biotechnology.

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