Uzlabota no vēža iegūto ārpus šūnu vezikulu izdalīšana, izmantojot PDMS nesaturošu mikrofluidikas ierīci

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Ārpus šūnu vezikulas (EV) ir daudzsološi biomarķieri, vēzim, neirodeģeneratīvām un asinsvadu slimībām. Tomēr ātra un efektīva, no vēža iegūto, EV izolēšana ir problemātiska bioloģisko paraugos, EV zemās koncentrācijas un plašā izmēra sadalījuma dēļ.
Šis pētījums risina šos izaicinājumus, izstrādājot mikrofluidikas ierīci, izmantojot mērogojamus materiālus, kā ciklisku olefīna kopolimēru, Tādējādi, izvairoties no lipofilu molekulu absorbcija, kas ir tipiska polidimetilsiloksāna (PDMS) iekārtām.

Darbā tika demonstrēta mikrofluidikas ierīce, izmantojot ar antivielām pārklātas magnētiskās daļiņas un ārpusšūnu vezikulas. Ierīce sastāvēja no sajaukšanas un magnētiskās atdalīšanas moduļa, kas ļāva 15 minūtēs satvert 67% no CD9 pozitīvajiem proteīniem EV paraugā. Turpretim standartizētā laboratorijas protokolā tika saķerti 75% no CD9 pozitīvajiem proteīniem 50 minūtēs. Lielākā daļa šo proteīnu tika identificēti kā EV virsmas proteīni, ko apstiprināja Western blot analīze, izmantojot CD9 un CD63 antivielas. Šis pētījums paver ceļu turpmākam darbam EV analizēšanai.

Enhanced isolation of cancer-derived extracellular vesicles using PDMS-free microfluidic device

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Extracellular vesicles (EVs) hold promise as biomarkers for diseases such as cancer, neurodegenerative, and cardiovascular disorders. However, isolating cancer-derived EVs quickly and efficiently poses challenges due to their low concentrations and varied size distribution in biological samples.

This study overcomes these hurdles by developing a microfluidic device using scalable materials like cyclic olefin copolymer, circumventing the limitations of polydimethylsiloxane (PDMS), known for absorbing lipophilic molecules.

A proof-of-principle microfluidics device was demonstrated using antibody-coated magnetic particles and extracellular vesicles. The device consisted of a mixing and magnetic separation module and allowed 67% capture of CD9 positive-protein EVs in 15 minutes, compared to a standardized lab protocol of 75% and 50 min. The majority of these proteins were identified as surface proteins of EVs, as confirmed by Western blot analysis using CD9 and CD63 antibodies. This study paves the way for future work in downstream analysis of specific EVs.

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