Unravelling the Interaction of MXenes with Extracellular Vesicles

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Transition metal carbides, nitrides, and carbonitrides (MXenes) are emerging 2D materials with versatile chemistry, garnering significant interest in diagnostic and biomedicine[1]. Recent studies have revealed safe interactions of MXenes at tissue and cellular level[2], highlighting their potential for biomedical applications, such as encapsulation within extracellular vesicles (EVs) for future therapeutics. EVs are nanosized, membrane-bound particles that transfer biomolecules such as proteins, lipids, RNAs, DNA and nanomaterials into target cells [3]. Accumulating evidence shows that EVs have a role in intracellular communication, influencing processes like immune response and cancer progression[3,4]. Understanding whether MXenes are integrated into EVs, their chemistry and the intracellular communication between MXene, EVs and target cells may open new avenues to revolutionize targeted drug delivery. In this study, MXene-encapsulated EVs are extracted from immune cells of THP-1 cells by mechanical extrusion and chemical blebbing protocols. The obtained changes in hydrodynamic diameter and surface charges shed light on the dynamics of the interaction of MXene with EVs at different incubation time points. Scanning electron microscopy showed morphological changes induced by MXene encapsulated EVs on the cell membrane surface. Additionally, flow cytometric analysis is performed to gain deeper insight for the presence of specific extracellular and intracellular EVs surface markers. Future studies aim to delve into the potential use of MXene encapsulated EVs, extracted from THP-1 immune cells, for transfection of biomolecules and therapeutic tagging for biomedical purposes.

References

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