
An Alternative Cell Labeling System Based on the New Two-Dimensional Nanomaterials MXenes

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Abstract

Gaining deeper insights into immune cell functions is crucial for developing safe and effective therapeutic applications, especially due to the increasing use of immune cells to treat conditions like autoimmune diseases and cancer. Transition metal carbides and nitrides (MXenes), [1] a novel family of 2D nanomaterials, rapidly growing as multimodal nanoplateforms in biomedicine, [2–4] hold immense potential for tracking immune cells, a crucial aspect in precise diagnosis and treatment. Traditional cell labeling strategies have remained the same over two decades due to a lack of chemical versatility, limiting advancements in translational medicine. Furthermore, current cell labeling tools are incompatible with single-cell mass cytometry by time-of-flight (CyTOF), a globally adopted technology replacing flow cytometry. We propose a groundbreaking approach using MXenes as a model to address these limitations. Our strategy, Label-free sINgle-cell trackiNG of 2D matERials by mass cytometry (LINKED) introduces a versatile, multiplexed label-free single-cell detection method based on CyTOF and ion beam imaging by time-of-flight (MIBI-TOF). [3] This technique overcomes chemical limitations and integrates seamlessly with CyTOF, allowing for nanomaterial detection and simultaneous measurement of diverse immune cell and tissue features. [3] This work holds immense potential to propel immunological research, enabling precise cell labeling and tracking for applications in translational medicine.

References

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