High dimensional analysis for 2D material interactions with the immune system

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Deepening our understanding of immune cell behavior is vital for creating safe, effective treatments, particularly as immune cell therapy, also known as cellular immunotherapy or cell-based immunotherapy, represents a groundbreaking approach in the treatment of various diseases, including cancer. Transition metal carbides and nitrides (MXenes)[1], a novel family of 2D nanomaterials, show promise as advanced trackers for immune cells, key for precise diagnostics and therapies.[2–4] Traditional cell labeling methods have stagnated due to limited chemical options, impeding progress in applied medicine. Moreover, these methods are incompatible with single-cell mass cytometry by time-of-flight (CyTOF), a globally adopted technology that improves classical flow cytometry. We propose an innovative solution utilizing MXenes to overcome these challenges. Our method, Label-free sINgle-cell tracKing of 2D matErials by mass cytometry (LINKED), leverages a novel, biocompatible, multiplexed, label-free detection approach via CyTOF and Mass Ion Beam Imaging by Time-of-Flight (MIBI-TOF).[2] Our approach overcomes chemical limitations and integrates seamlessly with CyTOF, allowing for nanomaterial detection and simultaneous measurement of diverse immune cell and tissue features. I will share how the linked approach[2] can be applied to other 2D materials [5] and micro e nanoplastics[6]. Moreover, I will show how our work[2] promises to advance immunological research significantly, offering refined cell labeling and tracking techniques crucial for the advancement of translational medicine (*unpublished data*).

References

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