

Unveiling the role of single-molecule force in cancer metastasis

The mechanical interplay between integrins and the extracellular matrix (ECM) has been identified as a critical determinant in diseases such as cancer and neurodegenerative disorders. However, comprehensive quantification of fluctuations in integrin tension has been challenging, primarily due to the lack of measurement tools with single-molecule precision. To address this significant limitation, we have engineered a pioneering DNA-based single-molecule force probe, designated as the Tension Gauge Tether (TGT) and its derivatives. By integrating the TGT assay with advanced micro- and nanofabrication techniques, we investigate the spatiotemporal variations in integrin tension at a single-molecule resolution, particularly in the context of cancer metastasis. This seminar will begin with an introduction to the operational principles of the single-molecule force probe technique, followed by a presentation of our novel findings from the application of the TGT assay.