High-resolution visualization of the architecture of invadopodes in melanoma

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Résumé

Cellular invasion is a complex process requiring the degradation of the extracellular matrix (ECM). In melanoma, as in many other cancers, this ECM degradation is carried out by specialized cellular structures called invadopodia.
Invadopodia are invasive, actin-rich membrane protrusions capable of degrading the ECM. They are highly organized cellular structures involving complex signaling mechanisms comprising various proteins such as actin, cortactin, Tks5, and Pyk2.

In this project, we use two-color 3D dSTORM (Stochastic Optical Reconstruction Microscopy) super-resolution microscopy to reveal the ultrastructural architecture of invadopodia with a lateral resolution of 20-30 nm and an axial resolution of 50-60 nm. The principle of this technique relies on stochastic fluorophore blinking within the sample, allowing the isolation of fluorescence events, the determination of their localization, and the reconstruction of a super-resolved image. A cylindrical lens, generating astigmatism, distorts the point spread function (PSF) along the Z-axis, thereby enabling three-dimensional imaging.
Visualization of the fine structure of invadopodia requires the optimization of several parameters. Resolving such a structure allows for a better understanding of the organization and architecture of invadopodia in relation to the degree of malignancy.

Mots-Clés: invadopodia, melanoma, STORM 3D, architecture

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