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Fluorescence lifetime DNA-PAINT for multiplexed super-resolution imaging of cells

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DNA point accumulation for imaging in nanoscale topography (DNA-PAINT)[1] is a powerful super-resolution technique highly suitable for multi-target (multiplexing) bio-imaging. However, multiplexed imaging of cells is still challenging due to the dense and sticky environment inside a cell. Here, we combine fluorescence lifetime imaging microscopy (FLIM) with DNA-PAINT and use the lifetime information as a multiplexing parameter for target identification. In contrast to Exchange-PAINT, fluorescence lifetime PAINT (FL-PAINT)[2] can image multiple targets simultaneously and does not requires any fluid exchange, thus leaving the sample undisturbed and making the use of flow chambers/microfluidic systems unnecessary. We demonstrate the potential of FL-PAINT by simultaneous imaging of up to three targets in a cell using both wide-field FLIM and 3D time-resolved Confocal Laser Scanning Microscopy (CLSM). FL-PAINT can be readily combined with other existing techniques of multiplexed imaging and is therefore a perfect candidate for high-throughput multi-target bio-imaging.

[1] Jungmann, R.; Avendaño, M.S.; Woehrstein, J.B.; Dai, M.; Shih, W.M.; Yin, P., Nat. Methods, 11, 313 (2014).
[2] Oleksiievets, N., Sargsyan, Y., Thiele, J.C. et al. Fluorescence lifetime DNA-PAINT for multiplexed super-resolution imaging of cells. Commun Biol 5, 38 (2022).

Topics

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