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LS-3-O-2791 Tracking drug pathway in living cells by superresolution microscopy

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We present the application of superresolution microscopy to analyze the uptake behavior of pharmaceuticals by adherent living cells.
By a combination of Structured Illumination Microscopy (SIM) and Spectral Position Determination Microscopy (SPDM)[1] in one setup[2] we have obtained the density distribution of labelled pharmaceuticals within the cell at a substantially enhanced resolution.

High light intensities in the order of 10 kW/cm² as necessary for SPDM is hazardous to living cells which is why we imaged the cells using SIM for which about a 100 fold lower light intensity suffices. By that approach we were able to image the cell and the drug density distribution inside and outside of the cell at an approximately two-fold resolution improvement when compared to the conventional Abbé limit.
As the drug distribution can be studied by both SIM and SPDM, accepting the cell apoptosis, we ultimately determined the location of the individual drug molecules inside the cell from an SPDM snapshot with accuracy about 10 fold better than the conventional diffraction limit.

As an application example, we used transiently transfected human retinal pigment epithelium cells where GFP (green fluorescent protein) was targeted against the nucleus and RFP (red fluorescent protein) against the plasma membrane. As an antibody we used Bevacizumab labeled with 6s-IDCC[3] which is used to treat age related macular degeneration[4].

References

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