Research team achieves first 2-color STED microscopy of living cells

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Researchers are able to achieve extremely high-resolution microscopy through a process known as stimulated emission depletion (STED) microscopy. This cutting-edge imaging system has pushed the performance of microscopes significantly past the classical limit, enabling them to image features that are even smaller than the wavelength of light used to study them. They are able to achieve this extreme vision by using a single-color fluorescent dye that absorbs and releases energy, revealing cells and cellular components (such as proteins) in unprecedented detail.

Current applications of STED microscopy have been limited to single color imaging of living cells and multicolor imaging in "fixed" or preserved cells. However, to study active processes, such as protein interactions, a two-color STED imaging technique is needed in living cells. This was achieved for the first time by a team of researchers from Yale University, as reported in the August issue of the Optical Society's (OSA) open-access journal Biomedical Optics *Express*.

The key to their success was in overcoming the challenges in labeling target proteins in living cells with dyes optimal for two-color STED microscopy. By incorporating fusion proteins, the researchers were able to improve the targeting between the protein and the dye, effectively bridging the gap. This allowed the researchers to achieve resolutions of 78 nanometers and 82 nanometers for 22 sequential two-color scans of two proteins—epidermal growth factor and epidermal growth factor receptor—in living cells.

The researchers expect that using this and other novel approaches will expand live cell STED microscopy to three and more colors, enabling 3-D imaging.

More information: Paper: "Two-color STED microscopy in living cells," *Biomedical Optics Express*, Pellett et al., Volume 2, Issue 8, pp. 2364-2371. www.opticsinfobase.org/boe/abs … cfm?URI=boe-2-8-2364

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