SUPERRESOLUTION MAPPING OF GLUTAMATE RECEPTORS IN INTACT C. ELEGANS BY COMBINING PALM WITH CONFOCAL MICROSCOPY

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Photoactivated localization microscopy (PALM) is a super-resolution fluorescence microscopy technique based on the detection of single molecules [1, 2]. Because of this, it is a powerful tool in resolving structures and possibly interactions of bio-molecules with single molecule resolution. However, its limited imaging depth restricts PALM mostly to samples with low three-dimensional complexity like cell cultures, leaving imaging deep inside whole animals difficult. We have implemented PALM for imaging in intact Caenorhabditis elegans, a commonly used nematode model organism. By strict regulation of the expression and localization of fluorescently labeled proteins, we sufficiently reduced the background fluorescence for detection of single molecules. We were able to visualize the localization of glutamate receptors in intact C. elegans with a precision of up to 20 nm, deep inside the organism, which revealed subdiffractive information on receptor clustering. Furthermore, by combining PALM with confocal microscopy, we mapped the distribution of glutamate receptors to specific neurons, giving us high quality context information on the superresolution data.