

ACTIVE TRANSPORT OF LIPID DROPLETS IN LIVE CELLS STUDIED WITH CARS MICROSCOPY

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Lipid droplets (LD) are structures formed mainly by triglycerides (TG) and cholesterol esters (CE) in cells, in a diameter of 100 nm to several μms [1]. Many proteins such as caveolins[2] and Parkinson disease protein α -synuclein[3] were identified on the surface of LDs, indicating a sophisticated role of LDs in cells.

There is little dynamic information about how LDs take part in cellular processes, due to the lack of live cell dye labels for LDs. Coherent anti-Stokes Raman scattering (CARS) microscopy[4] takes advantage of vibrational contrast and does not need labels. It is ideal for imaging LDs because LDs have a high density of C-H bonds that can give very strong CARS signals. We have recently shown that CARS microscopy could be used to monitor the dynamical changes of LDs in differentiating 3T3-L1 cells[5].

In the present study CARS microscopy is used to follow the movements of LDs in steroidogenic mouse adrenal cortex (Y-1) cells. While the majority of LDs undergo sub-diffusion, some of them undergo active transport. Biochemical studies show that the active transport of LDs is along microtubules instead of F-actin. By visualizing LDs with CARS and mitochondria with two photon fluorescence microscopy simultaneously, LDs are seen to move across and make frequent contacts with the network of mitochondria. This observation suggests that active transport of LDs could be responsible for transporting cholesterol from LDs to mitochondria for steroid synthesis in Y-1 cells.

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