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EDITORIAL

# Fat is not always lazy—the astonishing dynamics of intracellular lipid droplets

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There would be no life without lipids—it is the self-organization of these amphiphilic molecules into bilayers that allows the formation of separate compartments with distinct and specific physicochemical environments. A second function of lipids is the storage of energy—the energy content per unit mass in lipids is not equalled by that of polysaccharides or proteins. Biomembranes are highly dynamic, and this dynamics has been studied in great detail. Membrane traffic in plant cells has attracted considerable attention during the past decade (see *Protoplasma* special issue "Plant and Fungal Endocytosis", Volume 226, October 2005). In contrast, storage lipids are generally thought to be relatively static, inert, and therefore not so interesting in terms of cell biology. It seems that this view might be inappropriate—intracellular lipid droplets are not as lazy as hitherto assumed. Two contributions in the present issue highlight the astonishing dynamics of intracellular lipids.

The work by Dinis and Coutinho analyzes pollen maturation in a basic angiosperm, *Magnolia* x *soulangeana*, by a combination of classical cytochemistry and electron microscopy. In the center of interest is the vegetative cell that has the biological function to provide energy to the generative cell and therefore is filled with numerous so-called oil bodies that consist of a triacylglycerol matrix surrounded by a single phospholipid layer with integrated coating proteins. During pollen maturation, these oil bodies are progressively accompanied by glyoxysomes, but also protein storage vacuoles and Golgi-derived vesicles. By different approaches, they demonstrate that the oil bodies are in physical contact with these accompanying organelles, suggesting that the mobilization of lipid bodies is likely mediated not only by glyoxysomes and mitochondria but also by other catabolic pathways.

The work by Foissner originally was directed to the staining pattern of the fluorescent dye Bodipy PC in internodal cells of the green algae *Chara corallina* and is part of a broader approach to establish in vivo organelle markers that do not require genetic transformation. Bodipy PC has been used as dye for endocytotic vesicles in other systems, but in *Chara*, it rapidly accumulates in lipid droplets that accompany cortical cisternae of the endoplasmic reticulum and are often mobile. This mobility has been observed for the first time in plant cells and cannot be inhibited by oryzalin or cytochalasin D, indicating a movement that is not based on microtubules or actin filaments. The movement is clearly not Brownian movement, because the droplets travelled unidirectionally over long distances. Nor do the droplets "hitchhike" passively on peristaltically changing endoplasmic reticulum, because they can also move along stagnant cisternae. The origin of these lipid droplets is not clear—from analogy with mammalian cells, it is expected that the droplets form in the endoplasmic reticulum within the hydrophobic core of the bilayer. The biological function of lipid motility is not clear, but there are indications that it might be related to the maturation of lipid droplets while they travel along biochemically distinct subdomains of the endoplasmic reticulum.

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