COPI complex is a regulator of lipid homeostasis

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Magazine articles describing ways to burn fat, lose weight, etc. are omnipresent in Western culture, but science's understanding of the way fat is stored in the cells of the human body is rather slimmer.

In this week's issue of *PLoS Biology*, a new paper by Dr. Mathias Beller, Carole Sztalryd, and colleagues investigates some of the mysteries surrounding how our bodies store and release fat. Understanding lipid storage and use is important in tackling obesity and other metabolic disorders, and the authors identify a cellular pathway that regulates lipid storage, and show that interrupting it can reduce the amount of fat sequestered by our cells.

Fat is a major source of energy, and humans must consume a certain amount daily to remain healthy. Excess fat is stored in the cells of the body by converting the fatty acids found in food into droplets. These droplets then sit within a cell until the energy contained is required. The processes that create droplets and break them down again have previously been poorly understood. New work, led by Dr. Brian Oliver, of the National Institute of Diabetes and Digestive and Kidney Diseases in the USA, has identified some of the proteins that regulate the process, using first fruitflies and then mice, and have also identified chemicals that can perturb the pathway.

One protein family already know to be essential to lipid storage are the PAT proteins, which sit on the outside of the lipid droplet. Dr. Oliver and colleagues have identified another, somewhat surprising, key player

– COPI (Coat Protein Complex I) transport complex, - already known to have a separate role in trafficking cellular components. The new study shows that PAT proteins are regulated by COPI; COPI acts to change the composition of the lipid droplet surface, attracting an enzyme called ATGL, which causes the droplet to be broken down. Therefore, COPI reduces the amount of lipid stored in a cell, releasing energy for movement and other activities. COPI acts to reduce the amount of PAT at the lipid droplet surface. An absence of some of the PAT proteins in mice or flies lead to lean animals, whereas greater than average expression of these proteins led to obese animals.

The authors found that COPI and PAT proteins have the same roles in energy storage in the fruit fly, Drosophila melanogaster, and in mammals such as mice and humans. This study hopes to open up further study of lipids and exploration of therapeutic possibilities for treating obesity and other metabolic disorders.

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