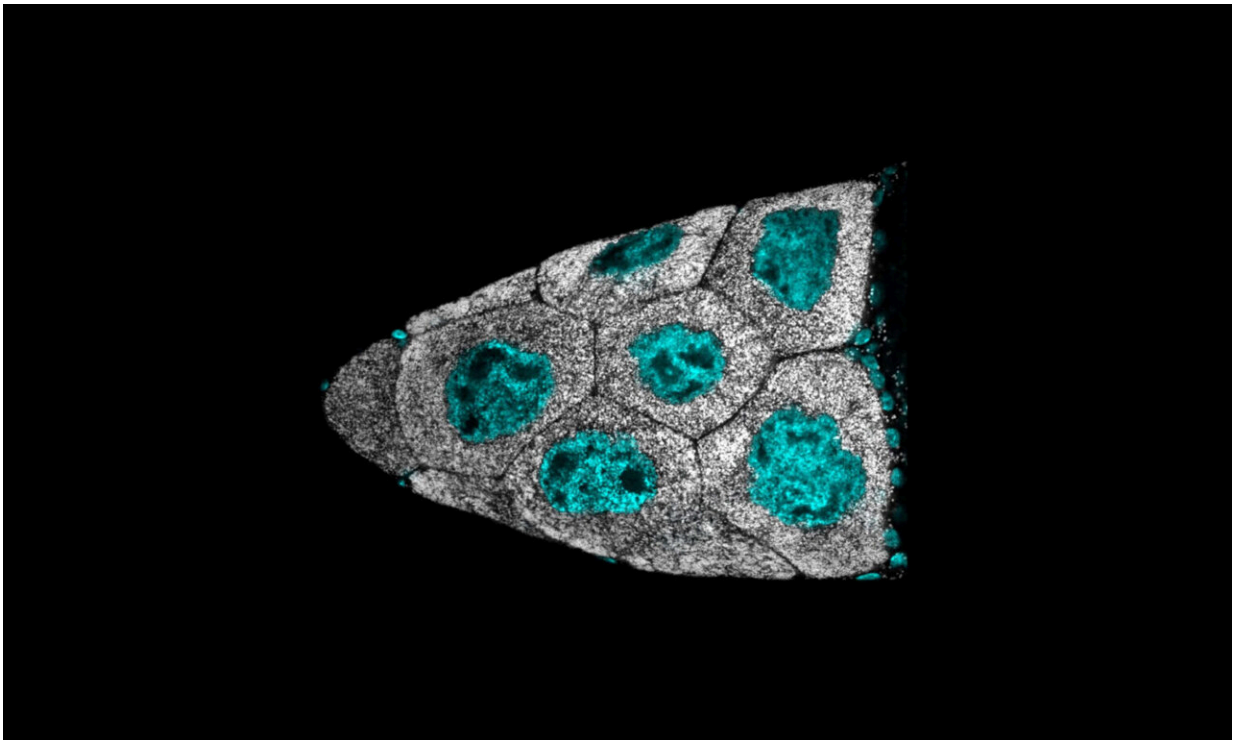


The hidden role of lipid droplets in fertility and beyond

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A microscope image of lipid droplets (in white) on a follicle, the structure that makes eggs, of a fruit fly. The aqua are cell nuclei. Researchers at the University of Rochester found that lipid droplets, once thought of merely as fat storages, provide a signal that triggers cellular changes necessary for the growth of the egg. Credit: University of Rochester / Jonathon Thomalla

Once thought of merely as fat storages, lipid droplets are now believed

to play important roles in human health and fertility.

Within our cells are structures called lipid droplets that serve as storage units for energy in the form of lipids or fats. Because fat is an important energy source for cells and organisms, scientists had long assumed that lipid droplets had a straightforward role during [egg production](#), as energy providers for the developing embryo.

In the past few years, however, scientists have found that lipid droplets play additional roles. Researchers at the University of Rochester and the University of Iowa recently discovered that lipid droplets play a vital role during the development of eggs in fruit flies. In a paper published in the journal *Development*, the researchers report that lipid droplets provide a signal that triggers cellular changes necessary for the growth of the egg—and could affect fertility in myriad organisms.

"We suspect this function is widespread and may also contribute to fertility in humans," says Michael Welte, a professor in the Department of Biology, who led the Rochester group.

The researchers found that during egg production, a signal is generated by an enzyme on the surface of the lipid droplets. The enzyme releases a specific type of lipid called arachidonic acid. The [arachidonic acid](#) is then converted into signaling molecules called prostaglandins. Prostaglandins stimulate the cell to rearrange its internal structure and prepare for the next stage of egg development.

When the [enzyme](#) on the lipid droplets is absent, prostaglandin production is affected, leading to defects in cell structure and impaired egg maturation.

Previous research has shown that prostaglandins have various other significant roles in [human health](#), including regulating fever, pain, and

inflammation.

"Many of us frequently use medication to suppress prostaglandin production, such as aspirin and ibuprofen," Welte says. In certain cells of the human immune system, there is a connection between lipid droplets and prostaglandin production.

But Welte's research shows that the connection between lipid droplets and prostaglandin production is not limited to [immune cells](#). The research suggests lipid droplets may be instrumental for prostaglandin production in other tissues as well, making them key players in multiple [biological processes](#).

"Lipid droplets support a critical step in producing an egg," he says, "and we now speculate that [lipid droplets](#) may influence even more processes in animal development by modulating prostaglandin signals."

More information: Michelle S. Giedt et al, Adipose triglyceride lipase promotes prostaglandin-dependent actin remodeling by regulating substrate release from lipid droplets, *Development* (2023). [DOI: 10.1242/dev.201516](#)

Provided by University of Rochester

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