

# Microbes prevent malnutrition in fruit flies—and maybe humans, too

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Drosophila. Credit: Wikipedia

Microbes, small and ancient life forms, play a key role in maintaining life on Earth. As has often been pointed out, without microbes, we'd die—without us, most microbes would get along just fine.

Now, a study by scientists from the Florida campus of The Scripps Research Institute (TSRI) sheds significant new light on a surprising and

critical role that [microbes](#) may play in nutritional disorders such as protein malnutrition.

Using fruit flies—*Drosophila melanogaster*—as a simple and easily studied stand-in for humans, these new findings advance our understanding of the fundamental mechanisms underlying microbial contributions to metabolism and may point to long-term strategies to treat and prevent malnutrition in general.

In the study, published February 12 in the journal *Cell Reports*, a team led by TSRI biologist William Ja showed that *Issatchenkia orientalis*, a fungal microbe isolated from field-caught fruit flies, promotes nutritional harvest that rescues the health and longevity of undernourished flies.

## Surprising Protein Harvest

Using a range of radioisotope-labeled dietary components such as amino acids (the components of proteins and the basic building blocks of the body) and sucrose (sugar) to measure the transfer of nutrients from food to microbe to fly, the study shows that the microbes first harvest amino acids directly from the fly's food sources and then transfer that protein to the fly—by being eaten.

"Flies in the wild carry microbes to every surface they touch," said Research Associate Ryuichi Yamada, who spearheaded the study in the Ja lab. "As flies land on low-protein fruit, they deposit microbes, which take up and concentrate the available [amino acids](#). By eating the microbes, flies gain a much needed source of dietary protein."

In flies that are fed nutrient-poor diets, this chain of events restores body mass and protein levels, essentially returning them to the pre-malnutrition profile of well-fed flies.

"Ryuichi and colleagues did a lot of painstaking work to carefully show that the simplest explanation for what was happening was correct," Ja said. "The direct influence of microbes on fly nutrition is often overlooked and may be relevant in numerous studies of host-microbe interactions."

## Natural Symbiosis

This relationship appears to be particularly beneficial for flies. Devouring the protein-plumped microbes extends fly lifespan during periods when nutrients are scarce. "In fact, the *I. orientalis* microbe is commonly found in field-trapped [fruit flies](#)," said Yamada. "That suggests a natural symbiosis."

Ja believes the study also offers a larger lesson on the partnership that can occur between microorganisms and their hosts, in addition to providing information on nutrient harvesting and the potential of *Drosophila* as a platform for studies of host-microbe relationships.

"While everyone keeps looking for that single magic microbial metabolite or species, what has been increasingly ignored is the bulk effect that microbes have on primary metabolism," he said. "Our study suggests that diverse [microbial] species could each benefit their hosts and that their quantity, rather than quality, may be of fundamental importance."

**More information:** "Microbes Promote Amino Acid Harvest to Rescue Undernutrition in *Drosophila*," *Cell Reports*, 2015.

Provided by The Scripps Research Institute

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