

In limiting life span, study finds booming bacteria innocent

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Aging flies are simply crawling with bacteria—both inside and out—but their microbial infestations don't seem to hasten the insects toward death, according to a new study in the August issue of the journal *Cell Metabolism*, a publication of Cell Press. The findings suggest that the energy the flies expend to fight their burgeoning bugs comes without a longevity trade-off, the researchers said.

"It's a surprise," said John Tower of the University of Southern California. "Even though the flies were accumulating so much bacteria and a robust immune response to that bacteria, it's not limiting how long the flies live. The question is, if it's not bacteria that limit life span, then what is it? We've reduced the number of possibilities."

Tower's interest in the problem stemmed in part from the fact that humans and some bacteria are known to have mutually beneficial relationships. People gain nutrients and energy with the aid of bacteria, and the microbes are provided with a buffered environment, carbohydrates, and other nutrients, the researchers noted. Since immune function is impaired with age, it might be expected that "bacterial load" would increase or be otherwise altered as people grow older. Indeed, studies have found shifts in humans' intestinal bacteria with age and evidence that bacteria may blossom in the prostate and other organs of the elderly.

To explore the consequences of such changes in bacteria with age in greater detail, the researchers looked to flies. *Drosophila* flies are emerging as an ideal model system in which to study most aspects of immunity, including innate immune pathways—which represent the body's first line of defense—cellular immunity, and the metabolic effects of infection, Tower's group said.

The researchers showed that the insects exhibited dramatic increases in many types of bacteria during aging, both inside the body and on the

surface. "It was gradual across their life span," Tower said. "It went from virtually undetectable to a million or more per fly."

Using a scanning electron microscope to examine the insects' outer surfaces, the researchers showed that some of the bacteria were even banding together, forming continuous "biofilms." Yet treatments that reduced the number of bacteria had no effect on life span, they found. That discovery led the researchers to conclude that, at least under optimal laboratory conditions, *Drosophila* can tolerate a significant number of bacteria and mount a strong innate immune response against them without cutting their 65-day lives any shorter.

"There has been some thinking in general that life span is regulated according to trade-offs—that the body has only so much energy to devote to different processes," Tower said. "If you devote a lot [of energy] to controlling bacteria, preventing them from growing to a toxic level, then that energy isn't available to maintain tissues and organs. However, we found no effect on the animals' longevity even when their bacteria are taken from one extreme to the other."

Nevertheless, he added, the bacterial infestations seen in the aged flies "have to be a quality of life issue."

Source: Cell Press

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