The sweet smell of aging

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What does the smell of a good meal mean to you? It may mean more than you think. Specific odors that represent food or indicate danger are capable of altering an animal's lifespan and physiological profile by activating a small number of highly specialized sensory neurons, researchers at the University of Michigan, University of Houston, and Baylor College of Medicine have shown in a study publishing next week in the online, open-access journal *PLoS Biology*.

Recent research in model organisms and in humans has shown that sensory experiences can impact a wide range of health-related characteristics including athletic performance, type II diabetes, and aging. Nematode worms and fruit flies that were robbed of their ability to smell or taste, for example, lived substantially longer. However, the specific odors and sensory receptors that control this effect on aging were unknown.

Using molecular genetics in combination with behavioral and environmental manipulations, a collaboration between the laboratories of Scott Pletcher and Gregg Roman has succeeded in identifying carbon dioxide (CO_2) as the first well-defined odorant capable of altering physiology and affecting aging. Flies incapable of smelling CO_2 live longer than flies with normal olfactory capabilities. They are also resistant to stress and have increased body fat. To many insects, including fruit flies, CO_2 represents an ecologically important odor cue that indicates the presence of food (e.g. rotting fruit or animal blood) or neighbors in distress (it has been implicated as a stress pheromone). Indeed, this group of researchers previously showed that merely sensing

one's normal food source is capable of reversing the health and longevity benefits that are associated with a low calorie diet. They now establish that CO2 is responsible for this effect.

"We are working hard to understand how sensory perception affects health, and our new result really narrows the playing field. Somehow these 50 or so neurons, whose primary job it is to sense CO2, are capable of instigating changes that accelerate aging throughout the organism," says Scott Pletcher.

Sensory perception has been shown to impact aging in species that are separated by millions of years of evolution, suggesting that similar effects may be seen in humans. "For us, it may not be the smell of yeast, for example, or the sensing of CO2 that affects how long we live, but it may be the perception of food or danger," says Pletcher. If so, a clever program of controlled perceptual experience might form the basis of a simple yet powerful program of disease prevention and healthy aging.

More information: Poon PC, Kuo T-H, Linford NJ, Roman G, Pletcher SD (2010) Carbon Dioxide Sensing Modulates Lifespan and Physiology in Drosophila. PLoS Biol 8(4): e1000356. doi:10.1371/journal.pbio.1000356

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