Caloric restriction in combination with low-fat diet helps protect aging mouse brains

12 March 2018

Credit: CC0 Public Domain

A low-fat diet in combination with limited caloric consumption prevents activation of the brain's immune cells—called microglia—in aging mice, shows research published today in *Frontiers in Molecular Neuroscience*. The study also finds that exercise is significantly less effective than caloric restriction in preventing these age-related changes.

"Obesity and aging are both prevalent and increasing in societies worldwide, but the consequences for the central nervous system are not well understood," says Bart Eggen, lead author of the study and a researcher at the University Medical Center Groningen, The Netherlands. "We determined if a high- or low-fat diet, in combination with exercise and food restriction, impacted microglia during aging in mice."

Microglia are brain cells that help maintain the integrity and normal functioning of brain tissue. Dysfunction of these cells, as may occur in disease, is linked to neurodevelopmental disorders and neurodegenerative conditions. Aging is also associated with inflammation driven by microglia in specific regions of the brain, but it is unclear whether diet or lifestyle can influence this process.

Eggen and his collaborators investigated the impact of high- and low-fat diets on inflammation and microglial markers in a specific brain region—the hypothalamus—of 6-month-old mice. They further looked at the effect of low- or high-fat diets on the microglia of 2-year-old mice, which were also given a lifelong exercise regime (voluntary running wheel) or lifelong restricted diets (a 40% reduction in calories).

"Aging-induced inflammatory activation of microglia could only be prevented when mice were fed a low-fat diet in combination with limited caloric intake," says Eggen. "A low-fat diet per se was not sufficient to prevent these changes."

The researchers also found that exercise was significantly less effective than caloric restriction at preventing these changes, although work by others has shown that exercise is associated with reducing the risk of other diseases.

Eggen is careful to point out that there is still much more work needed to understand the meaning of these findings. In their study, mice were only given one type of diet throughout their lives. It remains unclear how changing between diets would alter these results—for example whether switching to a low-fat diet could undo the negative consequences of a high-fat, unrestricted diet. Further studies are also needed to determine how these changes correspond to the cognitive performance of the mice.

"Nevertheless, these data do show that, in mice, the fat content of a diet is an important parameter in terms of the detrimental effects of aging on the brain, as well as caloric intake," says Eggen. "Only when fat content and caloric intake are limited, can aging-induced changes in microglia be prevented."

More information: *Frontiers in Molecular Neuroscience*, DOI: 10.3389/fnmol.2018.00065