

Good diets fight bad Alzheimer's genes

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Scientists today agree that there are five molecules that are known to affect or cause Alzheimer's disease, which plagues an estimated five million Americans. The potency of these molecules is linked to environmental factors such as diet and lifestyle.

Prof. Daniel Michaelson of Tel Aviv University's Department of Neurobiology at the George S. Wise Faculty of Life Sciences has illuminating news about one of these five molecules — APOE, created by the apolipoprotein E. gene found in all of our bodies.

Prof. Michaelson says APOE comes in two forms, a "good" APOE gene and a "bad" APOE gene, called APOE4. He has developed animal models to investigate the effects of diet and environment on carriers of APOE4, the presence of which is a known risk factor for Alzheimer's. It appears in 50% of all Alzheimer's patients, and in 15% of the general population which due to APOE4 is the population which is at risk of getting the disease.

The good news? In preliminary results, the researchers are exhilarated to find that a diet high in Omega 3 oils and low in cholesterol appears to significantly reduce the negative effects of the APOE4 gene in mouse models.

Exercise is not enough — and may be worse

In differentiating between the good and bad variants of the APOE gene, Prof. Michaelson and his team studied many variables. They determined

that while a rich and stimulating environment is good for carriers of "good" APOE, the same environment has a negative effect on those at risk for Alzheimer's because they carry the APOE4 gene. While this environment stimulated the formation of new neuronal connections in the "good APOE" mice, it caused the death of brain neurons in the "bad APOE" mice. The stimulating environment included running wheels and tubes for hiding and sliding, as well as ropes and other toys for the mice to play on, replaced and updated with new toys weekly. Those in a non-stimulating environment had access to no toys at all.

"Conditions that are generally considered good can be harmful if the mouse is a carrier of the APOE4 gene. Extrapolating this to the human population, individuals with the bad APOE4 gene are more susceptible to stress caused by an environment that stimulates their brain," says Prof. Michaelson.

Recently he expanded his original findings, first published in the *Journal of Neuroscience* in 2008, with a new element: diet.

APOE is a lipoprotein and known to be influenced by the good oil found in fish. Prof. Michaelson and his European colleagues, under a joint European Commission grant called LIPIDIDIET, constructed an experiment. In a standardized environment, they introduced three different kinds of diet: a normal diet, a "bad" diet high in cholesterol, and a "good" [diet](#) high in fish oil.

When it's good, it's good

"The main take-away message here is that good diets can alleviate the effects of bad [genes](#). Of course nutritionists have had this general idea for a while, but it's nice to be able to show that this approach can be applied to specifically counteract the negative effects of Alzheimer's disease-related genes," says Prof. Michaelson.

The results with more details will be presented at an international conference in Barcelona, Spain this March.

Provided by Tel Aviv University

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