

# Polyphenols and polyunsaturated fatty acids boost the birth of new neurons

November 24 2009

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Universitat Autònoma de Barcelona (UAB, Spain) researchers have confirmed that a diet rich in polyphenols and polyunsaturated fatty acids, patented as an LMN diet, helps boost the production of the brain's stem cells -neurogenesis- and strengthens their differentiation in different types of neuron cells.

The research revealed that mice fed an LMN diet, when compared to those fed a control diet, have more cell proliferation in the two areas of the brain where neurogenesis is produced, the olfactory bulb and the hippocampus, both of which are greatly damaged in patients with [Alzheimer's disease](#). These results give support to the hypothesis that a diet made up of foods rich in these antioxidant substances could delay the onset of this disease or even slow down its evolution.

The study will be published in the December issue of the *Journal of Alzheimer's Disease* and was directed by Mercedes Unzeta, professor of the UAB Department of Biochemistry and Molecular Biology.

Participating in the study were researchers from this department and from the departments of Cell Biology, Physiology and Immunology, and of Psychiatry and Legal Medicine, all of which are affiliated centres of the Institute of Neuroscience of Universitat Autònoma de Barcelona.

The company La Morella Nuts from Reus and the ACE Foundation of the Catalan Institute of Applied Neurosciences also collaborated in the study.

Polyphenols can be found in tea, beer, grapes, wine, olive oil, cocoa, nuts

and other fruits and vegetables. Polyunsaturated fatty acids can be found in blue fish and vegetables such as corn, soya beans, sunflowers and pumpkins. The LMN cream used in this study was composed of a mixture of natural products: dried fruits and nuts, coconut, vegetable oils rich in polyunsaturated fat and flour rich in soluble fiber. These creams were created and patented by the company La Morella Nuts, located in Reus near Tarragona. Previous studies had verified their effects on regulating cholesterol levels and hypertension, two risk factors commonly associated with heart disease and Alzheimer's disease.

During the development of the brain, stem cells generate different neural cells ([neurons](#), astrocytes and oligodendrocytes) which end up forming the adult brain. Until the 1960s it was thought that the amount of neurons in adult mammals decreased with age and that the body was not able to renew these cells. Now it is known that new neurons are formed in the adult brain. This generative capacity of the cells however is limited to two areas of the brain: the olfactory bulb and the hippocampus (area related to the memory and to cognitive processes). Although the rhythm of cell proliferation decreases with age and with neurodegenerative diseases, it is known that exercise and personal well being can combat this process.

The main objective of this research was to study the effect of an LMN cream-enriched diet on the neurogenesis of the brain of an adult mouse. Scientists used two groups of mice for the study. One group was given a normal diet and the other was given the same diet enriched with LMN cream. Both groups were fed during 40 days (approximately five years in humans). The analyses carried out in different brain regions demonstrated that those fed with LMN cream had a significantly higher amount of stem cells, as well as new differentiated cells, in the olfactory bulb and hippocampus.

The second objective was to verify if the LMN cream could prevent

damage caused by oxidation or neural death in cell cultures. Cultures of the hippocampal and cortical cells were pretreated with LMN cream. After causing oxidative damage with hydrogen peroxide, which killed 40% of the cells, scientists observed that a pretreatment with LMN cream was capable of diminishing, and in some cases completely preventing, oxidative damage. The hippocampal and cortical cells were also damaged using amyloid beta (anomalous deposits of this protein are related to Alzheimer's disease). The results obtained were similar to those obtained using hydrogen peroxide.

These results demonstrate that an LMN diet is capable of inducing the generation of new cells in the adult brain, and of strengthening the neural networks which become affected with age and in neurogenerative processes such as Alzheimer's disease, as well as protecting neurons from oxidative and neural damage, two phenomena which occur at the origin of many diseases affecting the central nervous system.

In this study researchers have used different biochemical and molecular analysis techniques, with the help of specific antibodies, to detect different neuronal markers implied in the process of differentiation.

The group of researchers led by Dr Unzeta has spent years studying the effects oxidases have on oxidative stress as a factor implied in neurodegenerative disorders such as Parkinson and Alzheimer's disease, and the effects of different natural products with anti-inflammatory and antioxidant properties in different experimental models of Alzheimer's disease.

The study forms part of the CENIT project, which was awarded to La Morella Nuts in 2006 under the auspices of the INGENIO 2010 programme, with the objective of establishing methodologies for the design, evaluation and verification of functional foods which may protect against cardiovascular diseases and Alzheimer's disease. With

21.15m euros in funding and a duration of four years, the project has included the participation of 50 doctors and technicians from nine different companies, four universities (7 departments) and 2 research centres.

More information: "A diet enriched in polyphenols and polyunsaturated fatty acids, LMN diet, induces neurogenesis in the subventricular zone and hippocampus of adults mouse brain". Valente et al., 2009, *Journal of Alzheimer's Disease*, Volume 18:4. Valente T., Hidalgo, J., Bolea, I., Ramírez B., Anglés, N., Reguant, J., Morelló, J.R., Gutiérrez, C., Boada, M., Unzeta, M.

Source: Universitat Autònoma de Barcelona

Citation: Polyphenols and polyunsaturated fatty acids boost the birth of new neurons (2009, November 24) retrieved 4 May 2024 from <https://medicalxpress.com/news/2009-11-polyphenols-polyunsaturated-fatty-acids-boost.html>

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