

Omega-3 Fatty Acid Deficiency Contributes to Depression

Increasingly, the western diet is lacking in omega-3 polyunsaturated fatty acids, which are "essential" lipids that the body utilizes in key cellular processes. Previous studies have suggested that a dietary insufficiency of omega-3 fatty acids may contribute to a variety of disorders. Researchers from INSERM (France) and INRA (France), and colleagues, have employed a mouse model, fed a diet low in omega-3 fatty acids, and found that reduced levels of omega-3s have deleterious consequences on synaptic functions and emotional behaviors. Hypothesizing that chronic malnutrition during intra-uterine development may later influence synaptic activity involved in emotional behavior (such as depression and anxiety) in adulthood, the team studied mice fed a life-long diet imbalanced in omega-3 and omega-6 fatty acids. They found that omega-3 deficiency disturbed neuronal communication specifically. The researchers observed that only the cannabinoid receptors, which play a strategic role in neurotransmission, suffer a complete loss of function. This neuronal dysfunction was accompanied by depressive behaviors among the malnourished mice. Among omega-3 deficient mice, the usual effects produced by cannabinoid receptor activation, on both the synaptic and behavioral levels, no longer appear. Thus, the CB1R receptors lose their synaptic activity and the antioxidant effect of the cannabinoids disappears. Consequently, the researchers discovered that among mice subjected to an omega-3 deficient dietary regime, synaptic plasticity, which is dependent on the CB1R cannabinoid receptors, is disturbed in at least two structures involved with reward, motivation and emotional regulation: the prefrontal cortex and the nucleus accumbens. These parts of the brain contain a large number of CB1R cannabinoid receptors and have important functional connections with each other. The team concludes that: "These findings identify a plausible synaptic substrate for the behavioral alterations caused by the [omega-3 fatty acids] deficiency that is often observed in western diets."

Mathieu Lafourcade, Thomas Larrieu, Susana Mato, Anais Duffaud, Marja Sepers, Isabelle Matias, et al. "Nutritional omega-3 deficiency abolishes endocannabinoid-mediated neuronal functions." *Nature Neuroscience*, 30 January 2011.