

# Fragile X syndrome -- A stimulating environment restores neuronal function in mice

May 23 2007

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Fragile X syndrome is the most common form of inherited mental retardation, occurring in 1 in 3600 males and 1 in 4000 to 6000 females.

The researchers, led by Huibert Mansvelder, published their findings in the May 24, 2007 issue of the journal *Neuron*, published by Cell Press.

To understand the details of the neuronal pathology of Fragile X syndrome, the researchers studied mice in which the same gene that causes the disease in humans had been knocked out. The scientists performed a detailed analysis of the electrophysiological properties of neurons in the prefrontal cortex, a region responsible for higher cognitive functions, including learning and memory, that are affected in humans with the disorder.

The scientists' analysis revealed that the neurons in the mice showed reduction of a particular form of a process called "long-term potentiation" that is central to the formation of new circuit pathways in learning and memory. The researchers' experiments showed that this reduction was due to abnormalities in the pore-like channels that regulate the flow of calcium into neurons.

Importantly, they found that increased stimulation of neurons in the mice, which enhanced calcium signaling, could restore normal long-term potentiation and neuronal plasticity.

There have been reports that Fragile X patients can still learn and memorize information but need more repetition and stimulation. Also, studies by other researchers had shown that exposing Fragile X knockout mice to a stimulating environment ameliorated behavioral and neuronal abnormalities.

So, Mansvelder and colleagues tested whether exposure of the knockout mice to an enriched environment caused higher stimulation that would restore normal neuronal plasticity. They gave such mice a variety of cage toys, and also gave them time in play cages that contained running wheels, tunnels, different bedding material, and interesting objects.

The researchers found that such an enriched environment did, indeed, restore normal neuronal plasticity. The researchers concluded that "increased sensory, cognitive, and motor stimulation by environmental enrichment facilitates the development of synaptic plasticity in cortical areas involved in higher cognitive function. The results of this study demonstrate that in prefrontal cortex of Fragile X knockout mice, excitatory synapses can show lasting increases in synaptic strength, but this requires increased neuronal activity to occur."

Source: Cell Press

Citation: Fragile X syndrome -- A stimulating environment restores neuronal function in mice (2007, May 23) retrieved 23 April 2024 from <https://medicalxpress.com/news/2007-05-fragile-syndrome-environment-neuronal.html>

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