MedicalXpress

Team IDs binocular vision gene

September 14 2007

In work that could lead to new treatments for sensory disorders in which people experience the strange phenomena of seeing better with one eye covered, MIT researchers report that they have identified the gene responsible for binocular vision.

Unlike horses and eagles, whose eyes on the sides of their heads provide two different scenes, humans see a single, in-depth view. Now researchers from the Picower Institute for Learning and Memory at MIT have identified the gene responsible for melding images from two eyes into one useful picture in the brain.

The work, which appeared in the Sept. 4 issue of the Public Library of Science (PloS) Biology and in the journal Cerebral Cortex, shows that a novel gene is necessary for binocular vision.

“There are other instances in the brain where two different inputs have to be properly aligned and matched—such as auditory and visual projections to the midbrain that enable us to orient to sound,” said lead author Mriganka Sur, Sherman Fairchild Professor of Neuroscience at the Picower Institute and head of the Department of Brain and Cognitive Sciences at MIT. “This is the first study to pinpoint a gene with this kind of job.”

Two points of view

Binocular vision allows us to perceive depth and carry out detailed visual

processing. The images projected by each eye are aligned and matched up in brain regions called the visual thalamus and cortex.

The MIT researchers discovered that the genes Ten_m3 and Bcl6 have a key role in the early development of brain pathways for vision and touch. Ten_m3 appears to be critical for the brain to make sense of the two disparate images from each eye.

In mice that had the Ten_m3 gene knocked out, projections from their two eyes were mismatched in their brains. Because each eye's projection suppresses the other, the mice were blind, even though their eyes worked normally.

Remarkably, the researchers found that when the output of one eye was blocked at a molecular level, the knockout mice could see again. With one eye's conflicting input shut down, the other eye was able to function, though only with monocular vision.

"This is an amazing instance of 'gain of function' that proves immediately that the gene is directly responsible for creating matched projections from the two eyes," Sur said.

Human disorders in which the Ten_m family of genes is affected are often accompanied by visual deficits. "There are reports of human visual conditions in which simply closing one eye allows a person to see much better," Sur said. "We believe that genes such as Ten_m3 are at the heart of these disorders."

Source: Massachusetts Institute of Technology