Electrical stimulation to help the blind see

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(Medical Xpress) -- In people who have lost vision due to an injury or disease, the brain is still capable of "seeing." Researchers from the Massachusetts Institute of Technology's Cognitive and Brain Science Department are hoping to use this idea and the use of electrical stimulation to work to someday help restore vision to those who have lost it.

In a new study published in the *Proceedings of the National Academy of Sciences*, the researchers show how they have discovered a way to restore something similar to sight.

Using two male rhesus monkeys with intact vision, the researchers trained the monkeys to stare at two dots on a computer screen. They were given rewards when their gaze was directed towards the larger and higher contrast dots. Once the monkeys were trained to look at the larger of the two dots the researchers, led by Peter Schiller, implanted electrodes in the monkey's primary visual cortex. At this point, they removed one of the dots on the computer screen. It was replaced with a phosphine by stimulating the area in the visual cortex. Based on what the monkeys had been trained to do, Schiller knew if the monkey's gaze moved in the direction of the phosphine that it must be larger than the dot on the screen.

Schiller adjusted the dot on the screen by changing its size, color and contrast and was able to determine that the sizes of the phosphine stars were between nine and 26 arc minutes.

This study is designed to help researchers understand the brain. Schiller's goal is to be able to develop a visual prosthesis that combines electrical stimulation with a small camera. This would allow the camera's images to be translated and provide a method of sight to those who have lost their vision. Schiller says the challenge now will be to build electrode arrays that are powerful and resilient enough to provide information to the brain without damaging delicate neurons.

More information: New methods devised specify the size and color of the spots monkeys see when striate cortex (area V1) is electrically stimulated, *PNAS*, Published online before print October 10, 2011, doi: 10.1073/pnas.1108337108

Abstract

Creating a prosthetic device for the blind is a central future task. Our research examines the feasibility of producing a prosthetic device based on electrical stimulation of primary visual cortex (area V1), an area that remains intact for many years after loss of vision attributable to damage to the eyes. As an initial step in this effort, we believe that the research should be carried out in animals, as it has been in the creation of the highly successful cochlear implant. We chose the rhesus monkey, whose visual system is similar to that of man. We trained monkeys on two tasks to assess the size, contrast, and color of the percepts created when single sites in area V1 are stimulated through microelectrodes. Here, we report that electrical stimulation within the central 5° of the visual field representation creates a small spot that is between 9 and 26 min of arc in diameter and has a contrast ranging between 2.6% and 10%. The dot generated by the stimulation in the majority of cases was darker than the background viewed by the animal and was composed of a variety of low-contrast colors. These findings can be used as inputs to models of electrical stimulation in area V1. On the basis of these findings, we derive what kinds of images would be expected when implanted arrays of electrodes are stimulated through a camera attached to the head whose images are converted into electrical stimulation using appropriate algorithms.