Burst of fetal neural activity necessary for vision

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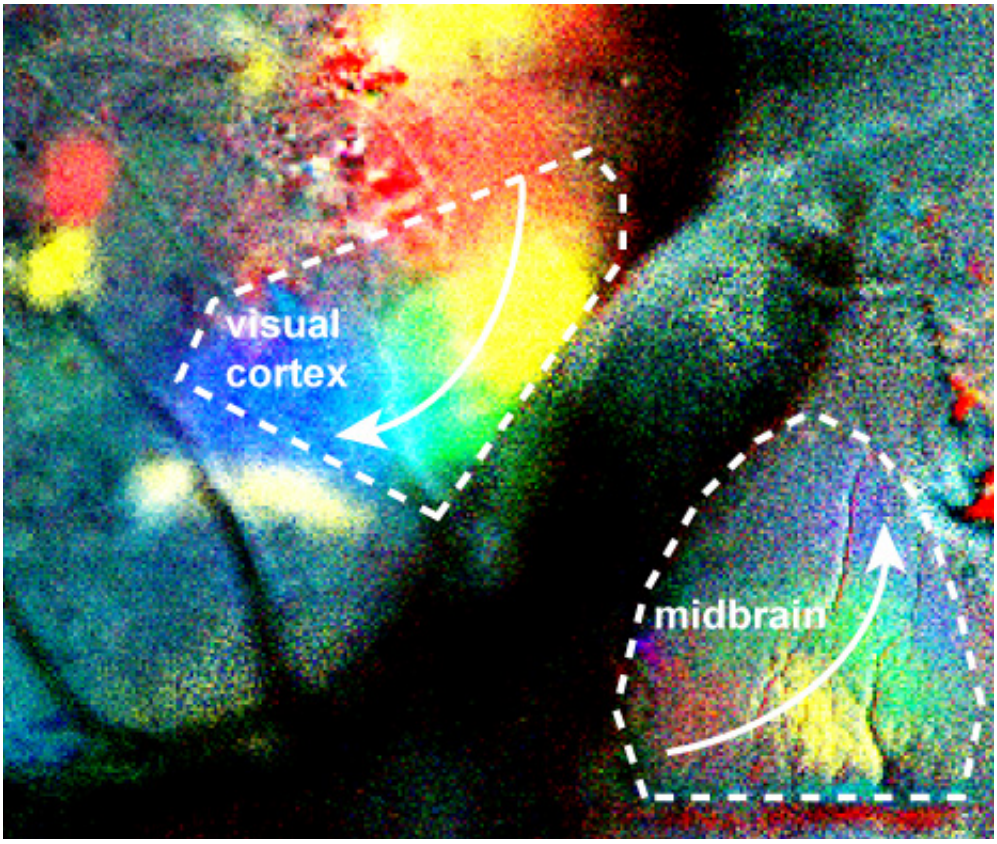

(Medical Xpress)—A sudden and mysterious burst of activity originating in the retina of a developing fetus spurs brain connections that are essential to development of finely-tuned sight, Yale researchers report in the journal *Nature*. Interference with this spontaneous wave of activity

could play a role in neurodevelopmental disorders such as autism, the scientists speculate.

The study in mice is the first to demonstrate in a living animal that this wave of activity spreads throughout large regions of the brain and is crucial to wiring of the visual system. Without the wiring, infants would not be able to distinguish details in their environment.

"If you interfere with this activity, the circuits are all messed up, the wiring details are all wrong," said Michael Crair, the William Ziegler III Professor of Neurobiology and Professor of Ophthalmology and Visual Science and senior author of the study.

For instance, this activity might allow a newborn human baby to perceive such details as the five fingers attached to her hand or her mother's face. This wave wires up the visual system so that infants are poised to learn from their environment soon after birth.

Video: A wave of 'spontaneous' activity sweeps across axons of retinal ganglion cells in the mid-brain of a 6-day old mouse. Such activity primes the developing neuronal circuits, enabling mice to process visual information after they open their eyes, usually between 10 days and two weeks.

The development of animals from a fertilized egg into trillions of intricately connected and specialized cells is the result of a precisely timed expression of genes. However, the Nature paper introduces another necessary factor—a mysterious wave of activity arising in the retina itself that propagates through several regions of the brain. Crair terms this wave an emergent property, or a trait possessed by a complex system that cannot be directly traced to its individual parts. This experiment in living, neonatal mice shows that this wave is crucial to the proper wiring not only of the visual system but other brain areas as well.

Crair said his lab plans to explore whether interruptions of this activity might play a role in neurodevelopmental disorders such as autism or schizophrenia.

Provided by Yale University