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Helping premature babies with new research

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Edmonton researchers with the University of Alberta's Faculty of Medicine & Dentistry have received a grant to use a hi-tech technique called "optogenetics" to study how the brain controls breathing. What they learn could one day help premature infants, or "preemies."

Using a combination of optical and genetic techniques, the researchers turn on and off different types of brain cells responsible for breathing by simply shining a light on them. The research could one day lead to better treatments for premature babies, who are often born with breathing difficulties, and for patients with other breathing disorders involving the brain.

Optogenetics almost seems like something found in a sci-fi movie. Selected as the research method of the year by the journal *Nature Methods* in 2010, it is the current "craze" in neuroscience research. For example, this technique is being used in lab models of spinal-cord injury to activate nerve cells, which drive certain muscles when the brain has lost this ability due to irreparable spinal cord damage.

Neuroscientist Greg Funk, who works in the faculty's Department of Physiology, received a five-year, $778,000 grant from the Canadian Institutes of Health Research to conduct his research. Funk and his team, which includes grad students Jennifer Zwicker and Vishaal Rajani and technician Tuca Alvares, will use different wavelengths of light via fibre-optic tools to shine light on different regions of the brain—all in an effort to better understand how the brain controls breathing rhythms.

The U of A researchers will also collaborate with two overseas researchers, Alex Gourine from University College London, and Sergey Kasparov from the University of Bristol. Kasparov is a viral geneticist who makes the optogenetics tools that target astrocytes, a type of brain cell.

Working with lab models, Kasparov and Gourine have shown that astrocytes are key detectors of carbon dioxide levels that signal the brain to increase breathing. Funk, along with Zwicker, are heading to England this spring to learn how to use these tools. They will then develop an optogenetics lab back at the U of A to study astrocytes in the regions of the brain responsible for breathing rhythms. They specifically want to look at triggers that cause increased breathing in low-oxygen situations. They will then inject the brain with viral DNA that has been genetically modified to respond to light. The viral DNA infects the brain cells they are studying, thus allowing the researchers to switch these brain cells on and off with light.

“Ultimately, this research could lead to new treatments for preemie babies with breathing difficulties,” says Funk.

Provided by University of Alberta