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Motor nerve targeting to limb muscles is controlled by ephrin proteins

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Montréal, December 24, 2008 - A study from a team of researchers including Dr. Artur Kania, Director of the Neural Circuit Development Research Unit at the IRCM, and Dr. Dayana Krawchuk, postdoctoral fellow, shows how a family of proteins present in the developing limb control nerve targeting from the spinal cord to the muscles of the limb. This discovery, co-authored by scientists from Columbia University in New York City, is published on December 26, 2008 in the journal *Neuron*.

The nervous system is a highly precise and intricate nerve network whose major purpose is to analyze and respond to external stimuli through coordinated movement. Such precision stems from the accuracy of nerve connections formed between neurons and muscles. "To understand how this occurs," explains Dr. Kania, "we study a simple system in which nerves extend from the spinal cord to the limb to connect to either flexor muscles (i.e. biceps arm muscle) or extensor muscles (i.e. triceps arm muscle)." Previously, the researchers found that nerves connecting to extensor muscles were guided towards specific targets by a protein present in the developing limb (ephrin-A).

Using chick and mouse embryos as models, the team of scientists now discovered that nerves connecting to the antagonist muscle group, the flexor muscles, are guided by a closely-related protein family, also present in the developing limb (ephrin-B). Together, these studies present a complete picture of how both limb nerves correctly connect the nervous system to muscles. Furthermore, by studying the wiring of a

relatively simple nerve connection, the team of scientists has discovered a molecular strategy that is very likely widely used in the nervous system to wire much more complex neural circuits, such as those required for learning, memory and coordinated movement.

Miswiring of the nervous system is thought to be a factor in disorders such as epilepsy and mental retardation. By studying the process of limb nerve development, this team of scientists contributes further to the development of new strategies for treatment of patients with a diseased and damaged nervous system. That is because knowing how nerves form is crucial in designing therapies that aim to rebuild damaged or diseased nerves.

"The study of the ephrin proteins should help us understand diseases such as autism, schizophrenia as well as a number of neurological disorders," says Dr. Rémi Quirion, a scientific director at the Canadian Institutes of Health Research (CIHR). "We are proud to support this important study and hope it will help to improve the lives of people with these health problems."

Source: Institut de recherches cliniques de Montreal