A new role for sodium in the brain

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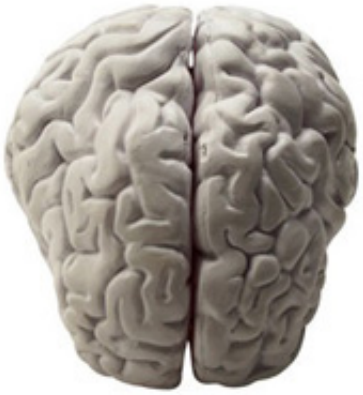

Researchers at McGill University have found that sodium – the main chemical component in table salt – is a unique "on/off" switch for a major neurotransmitter receptor in the brain. This receptor, known as the kainate receptor, is fundamental for normal brain function and is implicated in numerous diseases, such as epilepsy and neuropathic pain.

Prof. Derek Bowie and his laboratory in McGill's Department of Pharmacology and Therapeutics, worked with University of Oxford researchers to make the discovery. By offering a different view of how the brain transmits information, their research highlights a new target for drug development. The findings are published in the journal *Nature Structural & Molecular Biology*.

Balancing kainate receptor activity is the key to maintaining normal brain function. For example, in epilepsy, kainate activity is thought to be excessive. Thus, drugs which would shut down this activity are expected to be beneficial.

"It has been assumed for decades that the "on/off" switch for all brain receptors lies where the neurotransmitter binds," says Prof. Bowie, who also holds a Canada Research Chair in Receptor Pharmacology. "However, we found a completely separate site that binds individual atoms of sodium and controls when kainate receptors get turned on and off."

The sodium switch is unique to kainate receptors, which means that drugs designed to stimulate this switch, should not act elsewhere in the brain. This would be a major step forward, since drugs often affect many locations, in addition to those they were intended to act on, producing negative side-effects as a result. These so called "off-target effects" for drugs represent one of the greatest challenges facing modern medicine.

"Now that we know how to stimulate kainate receptors, we should be able to design drugs to essentially switch them off," says Dr. Bowie.

Dr. Philip Biggin's lab at Oxford University used computer simulations to predict how the presence or absence of sodium would affect the kainate receptor.

Provided by McGill University