Claudin 11 stops the leaks in neuronal myelin sheaths

December 1 2008

Devaux and Gow demonstrate how a tight junction protein called claudin 11 makes the neuronal myelin sheath a snug fit. The study will be published in the December 1, 2008 issue of the *Journal of Cell Biology*.

Like the rubber coating on a copper wire, the myelin sheath—a membrane extension of glial cells that spirals around the axons of neurons—creates an insulation layer that prevents current leakage from axons and aids electrical conduction along the length of the axon.

Claudin 11 forms tight junctions between successive spiral layers of the myelin sheath, but it was unknown whether it was required for myelin to act as a good insulator. To examine this question, Devaux and Gow compared electrical recordings from the optic nerve of wild-type and claudin 11 knockout mice. They found that although claudin 11 deficiency caused no gross defects in the appearance of the myelin sheath, it slowed electrical signals—at least in neurons with small-diameter axons.

Using a computer model that incorporates the resistive and capacitive properties of axons (and their myelin sheaths), the authors showed that claudin 11 adds to the electrical resistance of myelin by preventing leakage of charged ions (and electrical current) through the spiral space between myelin layers. The reduced resistance in the absence of claudin 11 affects small-diameter axons most severely because such axons have thinner myelin sheaths and thus less insulation to begin with. Because neurons with small-diameter axons are mostly found in the CNS, the

authors speculate that defects in claudin 11 could be associated with deficits in cognition and perception, like those found in schizophrenia or neurodegenerative diseases.

Citation: Devaux, J., and A. Gow. 2008. J. Cell Biol. doi:10.1083/jcb.200808034. (www.jcb.org)

Source: Rockefeller University