Nature Reviews Neurology **9**, 2 (2013); published online 27 November 2012; doi:10.1038/nrneurol.2012.244

PAIN

Brain biomarker levels correlate with neuropathic pain after spinal cord injury

Levels of specific metabolites in the anterior cingulate cortex (ACC) could signify neuropathic pain after spinal cord injury (SCI), new research published in *Pain* reveals. A team from the University of Miami, led by Eva Widerström-Noga, found that severe neuropathic pain in patients with SCI was accompanied by evidence of reduced glutamatergic metabolism and increased glial cell activation in the ACC.

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"Of significant interest to a mechanism-based understanding of chronic pain are alterations in the CNS and the extent to which these translate into clinical symptoms," explains Widerström-Noga. "Since the experience of pain, affective distress and cognitive control appears to be functionally integrated in the ACC, we hypothesized that greater pain severity and psychosocial impact would be associated with ACC metabolite concentrations reflecting neuronal dysfunction and, thus, potentially decreased pain modulation."

Using magnetic resonance spectroscopy, Widerström-Noga and colleagues measured levels of various metabolites in the ACC in four groups of individuals: SCI patients with severe, high-impact neuropathic pain (SCI-HPI); SCI patients with moderate, low-impact neuropathic pain; SCI patients without neuropathic pain; and able-bodied, pain-free controls. The researchers found lower levels of glutamate–glutamine (Glx) and higher levels of the glial marker myoinositol (Ins)—that is, a lower Glx:Ins ratio—in the SCI-HPI group compared with the other three groups.

The new findings implicate both glial activation and neuronal dysfunction in the generation and persistence of severe neuropathic pain in patients with SCI. Previous research in animal models has indicated that glia affect glutamate neurotransmission and other aspects of neuronal function after SCI.

"Our study is the first to suggest that the Glx:Ins ratio may be a useful biomarker for severe SCI-related neuropathic pain with significant psychosocial impact," says Widerström-Noga. "The utility of biomarkers needs to be further researched in order to determine generalizability between different neuropathic pain populations, and the relationships between biomarkers, clinical pain phenotypes and clinical pain trial outcomes."

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Original article Widerström-Noga, E. *et al.* Metabolite concentrations in the anterior cingulate cortex predict high neuropathic pain impact after spinal cord injury. *Pain* doi:10.1016/j.pain.2012.07.022