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**EMBARGOED FOR RELEASE MARCH 7, 2014
6:00 PM Mountain Time/8:00 PM Eastern Time**

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Stanford Researchers Show Conditioned Pain Modulation Equals Less Activity in the Human Spinal Cord

March 7, 2014, Phoenix, AZ -- Researchers have demonstrated that conditioned pain modulation (CPM), a measure of the brain's ability to regulate pain, decreases activity in the human spinal cord as visible via functional magnetic resonance imaging (fMRI).

“This study confirmed our hypothesis that CPM results in significant reductions in spinal dorsal horn activity in humans.” said lead study author Ian Mackey, of Stanford University in Palo Alto, Calif. The results were presented in a scientific poster today at the American Academy of Pain Medicine's 30th Annual Meeting.

Recent research has focused on the brain's powerful ability to regulate the pain experience, a capacity that is reduced in patients with chronic pain. CPM is one way scientific investigators test endogenous analgesia in this setting. CPM is when pain produced by a (conditioning) stimulus at one body part results in reduced pain perception to a second pain-producing (test) stimulus at a distant body part. The CPM effect is the reduced pain rating of the second or test stimulus, also described as “pain inhibiting pain.”

Low CPM efficiency, which indicates a low capacity to inhibit pain through the body's endogenous systems, has been associated with the development of various pain syndromes, including irritable bowel syndrome, temporomandibular disorders, fibromyalgia and tension type headache and – in some reports – with neuropathic pain (Yarnitsky, *Curr Opin Anaesthesiol* 2010;23(5):611-5).

The current study set out to measure whether the same spinal basis first described in rats also could be characterized in humans. Institutional Review Board approval was obtained for the study, which was funded through the National Institutes of Health and the Redlich Pain Endowment.

Working with the hypothesis that CPM would reduce fMRI activity in the human spinal dorsal horn, the investigators used a standard CPM task in which the test stimulus of heat pain was applied to the left forearm twice, once with and once without the CPM component (a foot immersed in a cold water bath of 12 degrees Celsius). The investigators collected two separate fMRI scans.

What the investigators found was significant activity within the ipsilateral dorsal horn; fMRI activity was significantly less during the test stimulus plus CPM compared with the test stimulus alone. Furthermore, changes in spinal cord activity correlated with the changes in perceived pain reduction due to CPM.

Subjecting healthy subjects to fMRI scans during noxious stimuli has led to researchers' ability to create high-resolution, neuronal activation maps of the human cervical spinal cord, after correction for physiologic noise (Nash et al, *Pain* 2013;154(6):776-81). Imaging techniques that create objective evidence of pain transmission are contributing to a growing body of scientific literature to help scientists better understand the changes that occur in the central nervous system during acute and chronic pain.

“We hope these findings will serve as a platform for investigation of abnormal spinal pain inhibitory systems in human chronic pain conditions – and will help with targeting effective therapies for chronic pain,” Mackey said.

Poster 221 – Conditioned Pain Modulation Decreases Dorsal Horn BOLD Signal in the Human Spinal Cord

About AAPM

The American Academy of Pain Medicine is the premier medical association for pain physicians and their treatment teams with over 2,500 members. Now in its 31st year of service, the Academy's mission is to optimize the health of patients in pain and eliminate pain as a major public health problem by advancing the practice and specialty of pain medicine through education, training, advocacy and research. Information is available on the Academy's website at www.painmed.org.

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