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“Burke Medical Research Institute Scientist Finds Identity Shift in Pain Neurons Can Cause Chronic Itch”

WHITE PLAINS, N.Y. – Nov. 7, 2013 – Confused pain neurons may underlie the chronic itchiness that often accompanies allergies, skin conditions and systemic diseases, according to a new study by researchers at the Burke Medical Research Institute (BMRI) and the Washington University School of Medicine, St. Louis (WUSTL). The researchers induced an insatiable urge to scratch, indicative of chronic itch, in mice by activating a specific molecular pathway involved in pain. They report in the November issue of the Journal of Clinical Investigation that activation of this pathway causes some pain-sensing neurons to switch to itch-sensing—providing new clues to the mystery of chronic itch.

Burke’s Molecular Regeneration and Neuroimaging Laboratory had set out to study molecular mechanisms of pain when Kaijie Ma, staff technician and a co-author of the paper, noticed that a particular strain of mice scratched themselves constantly. These mice had been genetically engineered to produce an activated version of the signaling protein B-RAF, and the researchers had expected the increased B-RAF activity to heighten pain responses. Surprised by the unexpected itching behavior, Jian Zhong, Ph.D., director of the lab and senior author of the paper, contacted Zhou-Feng Chen, Ph.D., at WUSTL, an expert in the physiology of itch.

Together, the two laboratories discovered that activation of the B-RAF pathway increased the expression of other proteins linked to itch-sensing. These then awakened previously dormant itch-sensing receptors located on pain neurons, effectively transforming them into itch neurons. This is the first time such an identity shift between sensory neurons has been documented. The new findings demonstrate that the same sensory neurons can mediate different types of sensations using different receptors.

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Moreover, they suggest that the same brain regions can receive both itch signals and pain signals. “Those pain neurons were thought to have specific connections to pain centers in the brain, but now we think the brain areas for pain and itch may be overlapping,” Dr. Zhong said. “Maybe the converted neurons don’t need to rewire.”

Little is understood about the biological mechanisms of chronic itch, also known as pruritus, which is typically resistant to the antihistamine treatments that alleviate short-term, acute itching. The new research suggests that the intractability of chronic itch stems from pain neurons that pick up itch-sensing, and points to new treatment approaches. In mice, the researchers showed that inhibiting certain proteins could reverse chronic itch. “Humans suffering from pruritus may eventually find relief in therapeutics that target these proteins, such as anti-kinase drugs currently used in cancer treatments,” Zhong said.

Funded by grants and private donations, Burke’s Medical Research Institute is academically affiliated with Weill Cornell Medical College and engages in cutting-edge basic, translational and clinical research to bring about new knowledge that can become the basis for future rehabilitation therapies in the areas of stroke, traumatic brain injury and spinal cord injury and other neurological conditions. The institute strives to assist patients to recover more fully, not just decrease disability, which has been the focus of mainstream rehabilitation research historically. To that end, it also has recently added new research laboratories in the areas of motor recovery and vision restoration.

Burke Medical Research Institute is part of the Burke Rehabilitation Center, which also comprises the Burke Rehabilitation Hospital. The hospital is a private, not-for-profit, acute rehabilitation hospital that is the only hospital in Westchester County dedicated solely to rehabilitation medicine. Founded in 1915, Burke offers both inpatient and outpatient programs for those who have experienced a disabling illness, traumatic injury or joint replacement surgery. Along with the hospital’s world-renowned doctors and therapists providing state-of-the-art treatment, Burke Medical Research Institute scientists explore the frontiers of rehabilitation medicine. All share the Burke mission to ensure that every patient makes the fullest possible recovery from illness or injury regardless of their ability to pay. For additional information on Burke Rehabilitation Center, please visit burke.org.

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