OHSU researchers reveal the science of shivering

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PORTLAND, Ore. â€“ Researchers at Oregon Health & Science Universityâ€™s Neurological Sciences Institute have uncovered the system that tells the body when to perform one of its most basic defenses against the cold: shivering. The scientists have discovered the brainâ€™s wiring system, which takes temperature information from the skin and determines when a person should start shivering. Their findings are published in the advance online edition of the journal Nature Neuroscience.â€œShivering, which is actually heat production in skeletal muscles, requires quite a bit of energy and is usually the last strategy the body uses to maintain its internal temperature to survive in a severe cold environment. Other strategies to defend against the cold, such as reducing heat loss to the environment by restricting blood flow to the skin, also appear to be controlled by the sensory mechanism that we found,â€• explained Kazuhiro Nakamura, Ph.D., an OHSU Fellow for Research Abroad from the Japan Society for the Promotion of Science. He published the research along with his colleague Shaun Morrison, Ph.D., a senior scientist.â€œOne fascinating aspect of this study is that it shows the sensory pathway for shivering, which can be thought of as brain wiring, is parallel to but not the same as the sensory pathway for conscious cold detection. In other words, your body is both consciously and subconsciously detecting the cold at the same time using two different but related sensory systems.â€•The research was conducted by studying rats. It is believed that the information directly applies to humans because previous research has demonstrated many parallels between the two species regarding this basic function of sensing and regulating heat. While studying these rats, the researchers were able to trace the shivering sensory pathway from the skin to specialized cells in a portion of the brain called the lateral parabrachial nucleus. These cells can then transmit information to another part of the brain called the preoptic area, which decides when the body should start shivering. Shivering is one of the many automatic and subconscious regulatory body functions, often called homeostatic functions that the brain regulates. Other examples include the adjustment of breathing rates, blood pressure, heart rate and weight regulation. Throughout the day, all of these important functions take place in the body without conscious thought. Without these important functions, humans and other animals could not survive. â€œThis research is a fundamental science discovery that furthers our knowledge about one of the many functions that our brains are constantly monitoring, responding to and adjusting to keep us alive and healthy,â€• explained Morrison. â€œIt is noteworthy, however, that there are conditions, such as hypothermia and hyperthermia, in which thermal sensory pathways come into play and knowledge of the brainâ€™s wiring can provide important clues to locating dysfunction in patients with abnormal thermal sensation. In addition, our ability to sense and respond to temperature changes degrades as we age.â€•