

Researchers discover molecular mechanism that desensitizes us to cold

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Findings demonstrate mechanism used by numerous membrane proteins throughout the body – opens pathway to new areas of exploration

Mount Sinai School of Medicine researchers have discovered how the membrane protein that allows us to sense cold works and how this protein becomes desensitized so that one no longer feels the cold. The study, published this week as an advance online publication by Nature Neuroscience, focused on a specific region of the cold receptor which is found in many other receptors, including ones involved in taste, vision and fertilization. Therefore, the findings may have important implications across a wide range of areas.

Diomedes Logothetis, PhD, Dean of the Mount Sinai Graduate School of Biological Sciences, post-doctoral fellow Tibor Rohacs and colleagues studied the receptor that is responsible for the sensation of cold. They found that a specific region of this receptor interacts with a signaling lipid in the cell membrane called PIP2. Cold or menthol stimulate this receptor and alter the electrical properties of the membrane, a process that leads to the sensation of cold. When the receptor is stimulated, calcium enters the cell and stimulates the breakdown of PIP2. When PIP2 is broken down, the receptor becomes inactive, thus ending the sensation or desensitizing the cell to the cold stimulus.

"This finding provides critical information to help us understand how we sense heat and cold and from that to expand our understanding of

temperature regulation," said Dr. Logothetis. "Additionally, because the region of this receptor that interacts with PIP2 is found in many similar membrane proteins, we now have a new lead in investigating regulation of the many functions in which these proteins are involved."

Many signals, such as neurotransmitters and growth factors are known to catalyze the breakdown of PIP2. Now that researchers know how PIP2 interacts with this large class of membrane proteins, they can begin to look out how these signals work and what effects they are having in various areas of the body.

Source: Mount Sinai Hospital / Mount Sinai School of Medicine

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