

Special nerve cells cause goose bumps and nipple erection

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The sympathetic nerve system has long been thought to respond the same regardless of the physical or emotional stimulus triggering it. However, in a new study from Karolinska Institutet published in the *Nature Neuroscience*, scientists show that the system comprises different neurons that regulate specific physiological functions, such as erectile muscle control.

The sympathetic nervous system is involuntary and more or less beyond our conscious control. Its purpose is to maintain a balance of bodily functions and regulate daily activities, such as locomotion, ingestion, body temperature and the fight-or-flight response.

The system has long been considered non-specific and to produce the same response no matter what type of physical or emotional phenomena stimulate it. Earlier research has been limited to the study of certain organs or a handful of cells, and has therefore not been able to definitively demonstrate the presence of specificity in the system, whereby different cell types would have different functions.

In the present study, the researchers carried out a large-scale analysis of sympathetic nerve cells, from which they were able to demonstrate that there are many different types of sympathetic neurons and that the different types are associated with a particular functions.

"We've shown that the sympathetic system consists of many types of neuron that regulate specific functions in the body," says the study's lead

author Alessandro Furlan at the Department of Medical Biochemistry and Biophysics. "For example, one thing we found was that goose bumps and nipple erection are caused by neurons that are specialised to regulate these functions by controlling the erectile muscles in these tissues."

While the researchers expected to find that there was no one common signal controlling the maintenance of a functional balance in organs and glands, they were surprised that they could prove it by showing that sympathetic nerve cells are heterogeneous and specialised for different functions and that the organs they control are involved in their specialization.

"Now that we have the cellular and molecular information, the future promises to be very exciting when this knowledge can be used to understand how this system is formed during gestation and how the different neuron types go about controlling the body's functions," says study leader Patrik Ernfors, professor of tissue biology

More information: 'Visceral motor neuron diversity delineates a cellular basis for nipple- and pilo-erection muscle control', Alessandro Furlan, Gioele La Manno, Moritz Lübke, Martin Häring, Hind Abdo1, Hannah Hochgerner, Jussi Kupari, Dmitry Usoskin, Matti S Airaksinen, Guillermo Oliver, Sten Linnarsson and Patrik Ernfors, *Nature Neuroscience*, published online 29 August 2016, [DOI: 10.1038/nn.4376](https://doi.org/10.1038/nn.4376)

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