Here's why your face doesn't perceive itchiness the same way your body does

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In a new study, researchers from North Carolina State University show that itch sensations in the face are perceived differently from those in the body due to differences in signaling between trigeminal (located in

the brain) and spinal pain pathways. The work could lead to the development of specific molecular targets for treating facial pain or itch. The study appears in Communications Biology.

"You can think of itch being transmitted from the skin to the brain as a series of switches that get flipped," says Santosh Mishra, associate professor of molecular biomedical sciences at NC State.

"On the body, itch signals go from neuronal projections in the skin through the dorsal root ganglia (DRG)—which are clusters of sensory cells located at the root of the spinal nerves—then to the spinal cord. But on the face and head, those signals travel to the trigeminal ganglia (TG)—which are clusters of sensory cells located in a small structure below the brain where it sits atop the skull."

"We know that in terms of itch, the face and torso have different thresholds—in mice, for example, they have lower itch response to histamine exposure on the cheek as compared to the nape of the neck," Mishra says. "We wanted to see what the mechanisms were behind this difference."

The researchers first looked at itch response in mice exposed to histamine on the cheek and nape. They observed that itch response on the cheek was significantly reduced when compared with the neck. Next, they looked at innervation—or how many nerves were present—in the face versus the neck to rule out structural causes for the difference in response.

Finally, they looked at the neuronal populations within the DRG and TG, and the neuropeptides they express.

The neurons within the DRG and TG differ, mainly because the sensory environments they work in differ. Skin doesn't need to be able to sense

taste or smell, for example. But it also seems as though the neuronal populations don't handle signals the same way, either.

In the DRG there are distinct pathways for pain and itch. Two peptides, Substance P (SP) and B-type natriuretic peptide (BNP), are associated with pain and itch respectively. If the signal to express SP is received, that initiates a pain response, and if the signal for BNP is received, it's itch.

The TG, on the other hand, has three potential pathways: one for SP expression, one for BNP expression, and one in which both are expressed. In the mice, it seemed as though when that third pathway activated, SP, the pain peptide, was overproduced compared to BNP.

"This overlap in the TG and overproduction of SP seems to be 'shunting' the itch response aside," Mishra says. "Our next steps will be to explore why SP is overproduced in this situation."

The researchers hope that the work could lead to better treatments for facial itch.

"Understanding how itch perception in the face differs from itch perception in the body could give us better molecular targets for future therapies," Mishra says.

More information: Wheeler, J.J. et al, Substance P and somatostatin neurons limit facial itch by recruiting distinct nociceptive circuits in the brainstem, *Communications Biology* (2026). DOI: 10.1038/s42003-026-10128-9
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