Merkel cells are initial sites for sensing touch, researchers prove

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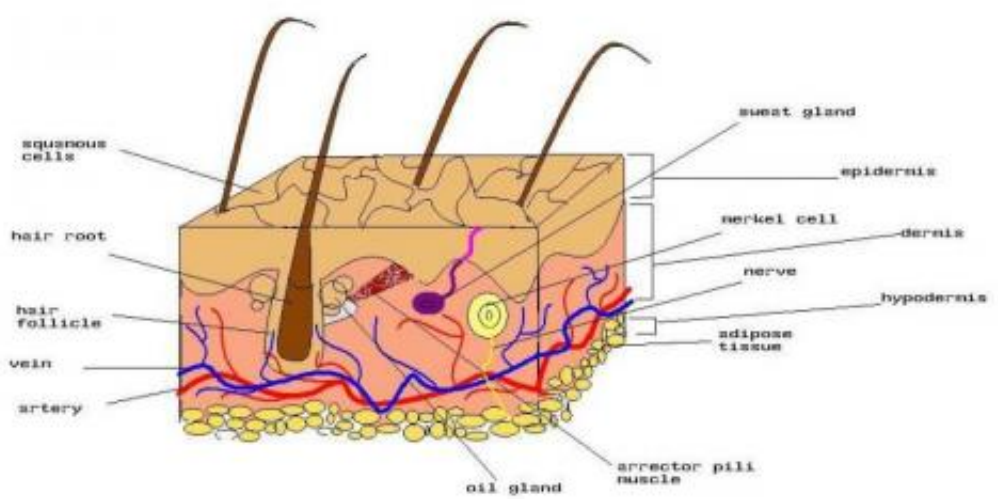

Diagram of human skin. In humans, Merkel cells (yellow dot) are found clustered beneath the epidermal ridges (aka fingerprints). Credit: Crystal Mason/Wikipedia

By solving a long standing scientific mystery, the common saying "you just hit a nerve" might need to be updated to "you just hit a Merkel cell," jokes Jianguo Gu, PhD, a pain researcher at the University of Cincinnati (UC).

That's because Gu and his research colleagues have proved that Merkel

cells— which contact many sensory nerve endings in the skin—are the initial sites for sensing touch.

"Scientists have spent over a century trying to understand the function of this specialized skin cell and now we are the first to know … we've proved the Merkel cell to be a primary point of tactile detection," Gu, principal investigator and a professor in UC's department of anesthesiology, says of their research study published in the April 15 edition of *Cell*, a leading scientific journal.

Of all the five senses, touch, Gu says, has been the least understood by science—especially in relation to the Merkel cell, discovered by Friedrich Sigmund Merkel in 1875.

"It's been a great debate because for over two centuries nobody really knew what function this cell had," Gu says, adding that while some scientists—including him—suspected that the Merkel cell was related to touch because of the high abundance of these cells in the ridges of fingertips, the lips and other touch sensitive spots throughout the body; others dismissed the cell as not related to sensing touch at all.

To prove their hypothesis that Merkel cells were indeed the very foundation of touch, Gu's team—which included UC postgraduate fellow Ryo Ikeda, PhD—studied Merkel cells in rat whisker hair follicles , because the hair follicles are functionally similar to human fingertips and have high abundance of Merkel cells. What they found was that the cells immediately fired up in response to gentle touch of whiskers.

"There was a marked response in Merkel cells; the recording trace 'spiked'. With non-Merkel cells you don't get anything," says Ikeda.

What they also found, and of equal importance, both say, was that gentle

touch makes Merkel cells to fire "action potentials" and this mechano-electrical transduction was through a receptor/ion channel called the Piezo2.

"The implications here are profound," Gu says, pointing to the clinical applications of treating and preventing disease states that affect touch such as diabetes and fibromyalgia and pathological conditions such as peripheral neuropathy. Abnormal touch sensation, he says, can also be a side effect of many medical treatments such as with chemotherapy.

The discovery also has relevance to those who are blind and rely on touch to navigate a sighted world.

"This is a paradigm shift in the entire field," Gu says, pointing to touch as also indispensable for environmental exploration, tactile discrimination and other tasks in life such as modern social interaction.

"Think of the cellphone. You can hardly fit into social life without good touch sensation."

Provided by University of Cincinnati Academic Health Center

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