Newly discovered cell in fruit flies is essential for touch sensation

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A fruit fly (Drosophila melanogaster) feeding off a banana. Credit: Sanjay Acharya/Wikimedia Commons, CC BY-SA

Researchers at the Francis Crick Institute have uncovered a key role for a new type of cell in touch detection in the skin of the fruit fly.

Touch allows animals to navigate their environment by gathering information from the outside world. In their study published today in *Nature Cell Biology*, Dr. Federica Mangione and Dr. Nicolas Tapon shed light on how touch-sensitive organs assemble during development.

In particular the team studied the development of mechanosensory bristles—tactile hairs found on the skin of the fruit fly—which are similar to hair follicles in mammals.

They found that bristles send signals to neighboring epidermal cells to recruit a new cell type, named the F Cell, which participates in touch sensing.

Using advanced imaging techniques, the team were able to characterize the structure and features of the F-Cell, finding that they adopt a unique shape which wraps around the tactile bristle.

Using electrophysiological recordings—a technique to measure the activity of a neuron in response to a stimulus—the researchers showed that F-Cells are important for bristle function. When they removed the F-Cells from the epidermis, neuron firing in response to touch was strongly reduced.

Using behavioral assays—a way to measure animal behavior—flies lacking F-Cells were also unable to scratch themselves with their leg in response to lightly touching the bristles, showing insensitivity to touch.

Dr. Federica Mangione, Postdoctoral Fellow at the Crick and first author said, "The whole journey of identifying, characterizing and even naming a new cell type was very exciting. I noticed that one epidermal cell next to each bristle became remarkably different from its neighbors, then was incorporated into the bristle itself as it changed shape and wrapped around the other cells. Showing it is required for touch sensation in the

adult fly was truly a thrilling moment."

Dr. Nic Tapon, Group Leader of the Apoptosis and Proliferation Control Laboratory at the Crick said, "We used the fly tactile bristle as it's an accessible way to understand the sense of touch—bristles fulfill a similar role to our own hair follicles. We were very surprised to find a new cell type as the epidermis is a well-studied structure, although how these structures are built during development is not well understood. To answer the all-important question of whether the F-Cell is important for touch sensing, through collaborative working at the Crick and Oxford University, we were able to bridge two different fields—epidermal development and sensory biology—to give a very clear answer."

The sense of touch from a developmental perspective is not well understood, and decline in touch sensing is a major problem during aging and neurodegenerative conditions like Alzheimer's disease. People with autism spectrum disorder can also experience altered touch perception.

By finding that specialized non-nerve cells are crucial for touch sensitivity in the fly, the researchers hope this can add to our understanding of touch in mammals and eventually humans.

Dr. Federica Mangione said, "We still have a lot to learn about how the sense of touch develops and the role of specialized cells in touch sensing. There are specialized epidermal cells in mammals, like the Merkel cells, but we don't yet know if there's a direct equivalent to the F-Cells. More research is needed to understand the biology of these exciting cell types and how they participate in sensing touch—both in healthy people and those living with conditions impacting their touch perception."

More information: Federica Mangione, Co-option of epidermal cells enables touch sensing, *Nature Cell Biology* (2023). DOI:

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