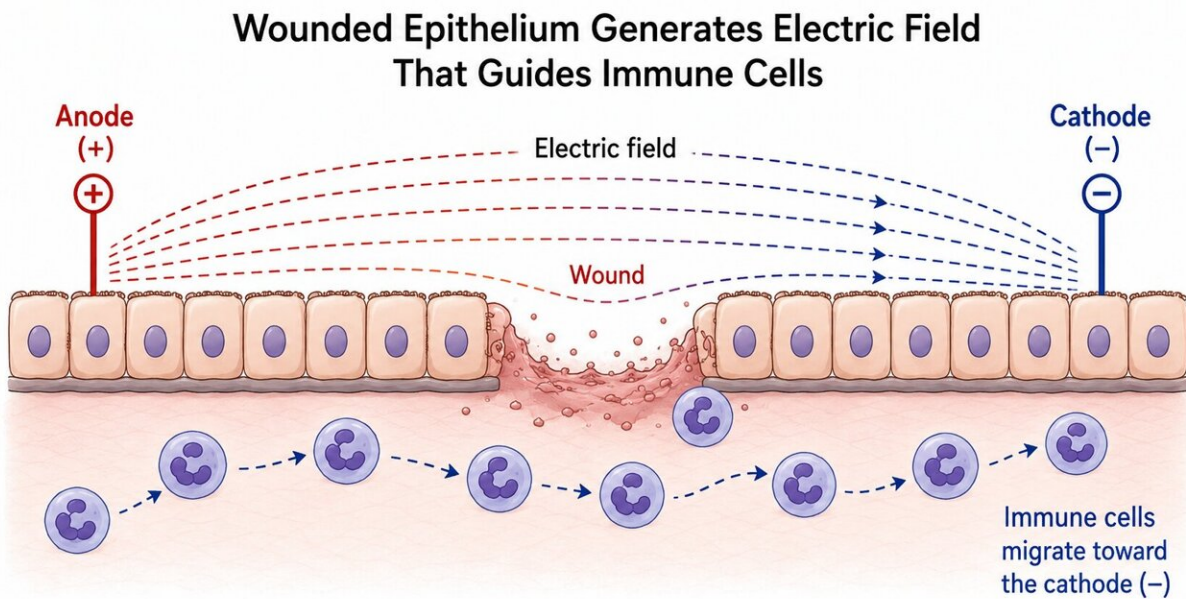


Built-in 'antenna' may help cells sense a healing spark to guide repair after injury

June 29 2026, by Sayan Tribedi



A schematic showing how a skin wound disrupts the epithelium, creating a natural electric field that guides immune cells toward the injury site during wound healing. Credit: generated using AI tools for illustrative purposes

When skin is wounded, it doesn't just send out chemical distress signals; it also generates a subtle electrical field. This "electric beacon" forms as the usual voltage across the tissue collapses, creating a guiding current around the injury. Scientists have long known that this weak electric

field plays a crucial role in directing immune and skin cells toward the cut—a phenomenon called electrotaxis, essential for wound healing. But for decades, a fundamental question remained: How do individual cells detect and navigate using such subtle electric cues?

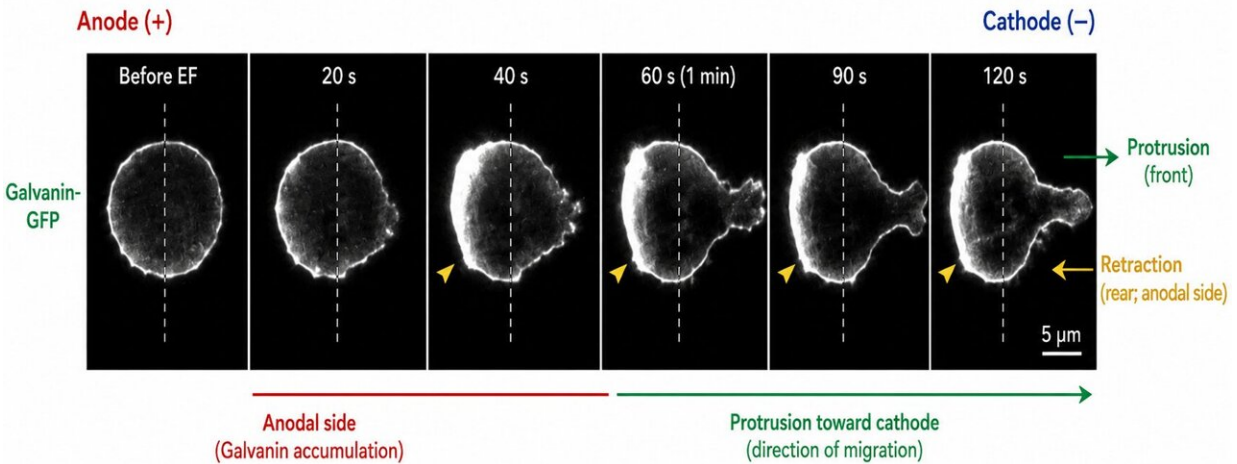
Even after considerable research in this area, the exact method by which cells detect this signal was still unknown. The obvious culprits, like growth factor receptors and ion channels, had all been disproven, making [electrotaxis](#) unique among other methods of cell guidance, such as [chemotaxis](#).

Now, a new study, published in [Cell](#), sheds light on this enigma, suggesting that cells may use a built-in "antenna" protein to sense these electric fields, finally naming this long-sought cellular sensor.

Hunting a hidden cell antenna

To crack this long-standing mystery, a team led by Dr. Nathan M. Belliveau embarked on a massive genetic hunt. They used advanced CRISPR technology to systematically knock down thousands of genes in neutrophil-like cells, specifically looking for those essential for electric-field-guided movement. This large-scale "electrotaxis screen" quickly pinpointed a standout: a previously little-known protein they named Galvanin (also known as TMEM154).

Galvanin-GFP Rapidly Accumulates on the Anodal Side and Marks the Cell Rear



A time-lapse illustration showing Galvanin-GFP rapidly accumulating on the anodal side of a migrating neutrophil-like cell, alongside coordinated front-edge protrusion and rear-edge retraction that reorient the cell toward the cathode. Credit: generated using AI tools for illustrative purposes

Their findings were striking. Cells engineered to lack Galvanin completely lost their ability to reliably migrate in an electric field. Conversely, introducing Galvanin into normally sluggish cells transformed them into eager electrotaxis performers. As Belliveau's team put it, Galvanin is "required for electric-field-guided migration of rapidly moving cells."

In essence, they had found the "antenna" that tells a mobile cell, like a neutrophil, which way the current is flowing.

But Galvanin isn't just a passive sensor. The researchers observed that when an electric field was applied, Galvanin molecules rapidly rushed to

one side of the cell, accumulating on the anodal side (the side facing the positive electrode). This relocalization happened almost instantly, effectively reorienting the cell's internal compass and steering it.

This dynamic movement suggests Galvanin directly senses the electric field, translating external electrical cues into internal signals that guide cell migration.

Charge makes the difference

What powers this sensing? The team found a clever explanation: charge. Galvanin's extracellular domain carries many negative charges, partly from sugars attached to it. Those negative charges make Galvanin behave like a little electrophoretic paddle: In an EF, it is pulled toward the positive side of the cell.

The researchers estimate Galvanin's net charge at about -18 elementary charges (largely due to glycosylation), a hugely negative cargo for a surface protein.

Mutant tests confirmed this: A version of Galvanin missing its inner tail still moved to the front in a field, but it couldn't steer the cell without the tail. Replacing Galvanin's ectodomain with a synthetic, highly negative stalk could rescue the migration response, proving that the charge is key. In short, Galvanin is a built-in field sensor whose juicy negative exterior lets it drift in a field and tell the cell which way is "up."

Steering cells for healing

This discovery opens many doors. It suggests a mechanism for electrical guidance during wound repair that was barely understood before. Scientists now know cells really do have a molecular antenna to sense

wounds' electric fields. It also links electrotaxis to well-known processes: glycosylation (the addition of sugars) was already suspected in guiding fields, and now Galvanin is the likely carrier for those glycan-based charges.

Going forward, scientists will want to map out Galvanin's partners inside the cell—how does its tail hook into the signaling that drives the cell's legs (cytoskeleton)? They also need to test Galvanin in living tissues: Does it help neutrophils and skin cells actually arrive faster at real wounds? These questions are urgent because electrical therapies for healing are already used clinically, but without knowing why they work.

Now, Galvanin provides a tangible target. One can imagine engineering immune or stem cells to carry a Galvanin-like sensor, to "herd" them with tiny electrical cues for therapies, or tuning their sugar coating to change a cell's sensitivity.

A wired future in regenerative medicine

The upshot for everyday science fans is surprising. Your cells have an antenna. A skin injury generates a built-in "electric GPS" that calls immune cells to the site, and Galvanin is the protein that listens. This renders electrotaxis less spooky and more familiar—it's not just passive physics, but a receptor-driven effect like chemotaxis. It also offers hope: If we can plug into that system, we might guide healing with electrical signals in a smarter way.

In the words of the authors, this is a major step. "We identified Galvanin (TMEM154) ... as required for electric-field-guided migration of rapidly moving cells." The mystery sensor is no longer missing—Galvanin it is. "These data suggest Galvanin acts as a direct sensor of the electric field," they write. A new era of bioelectric medicine may be on the horizon, as we finally know what reads the silent

electric cues at our wounds.

More information: Nathan M. Belliveau et al, Galvanin (TMEM154) is an electric-field sensor for directed cell migration, *Cell* (2026). [DOI: 10.1016/j.cell.2026.04.026](https://doi.org/10.1016/j.cell.2026.04.026)

© 2026 Science X Network

Citation: Built-in 'antenna' may help cells sense a healing spark to guide repair after injury (2026, June 29) retrieved 29 June 2026 from <https://sciencex.com/news/2026-06-built-antenna-cells-injury.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--