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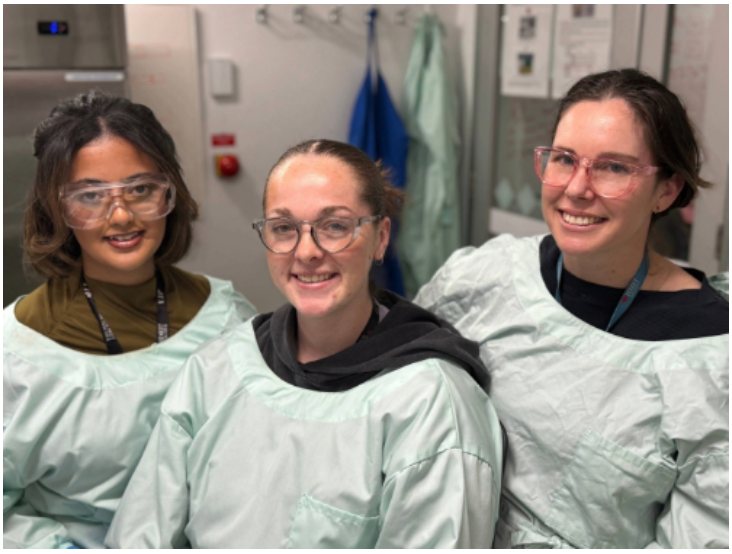
Australian Scientists Use Electrical Pulses to Guide Stem Cells



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MELBOURNE, Dec. 3, 2025 — Scientists in Australia have developed a novel method to guide stem cell growth using tiny electrical pulses, opening new possibilities for lab-grown tissues, organs, nerves, and bones.

Researchers at the Royal Melbourne Institute of Technology (RMIT) used advanced atomic force microscopy to observe in real time how stem cells physically respond to electrical stimulation. Their findings show that even subtle electrical cues can reshape a cell's internal structure within minutes, influencing its eventual specialization.

Traditionally, stem cell development relies on chemical solutions to induce differentiation into muscle, bone, or nerve cells. However, this approach has limitations. According to Amy Gelmi, senior lecturer at RMIT's School of Science and lead researcher, electrical signals offer a more precise way to control stem cell fate, better mimicking the body's natural environment.

Co-researcher Peter Sherrell explained that electrical stimulation enables the formation of specific cell types with greater accuracy, providing promising applications in tissue engineering and regenerative medicine. Even minor changes in electrical patterns can alter a cell's stiffness and shape, which are crucial for proper development.

The team combined laboratory experiments with computer modeling to predict cell responses to various electrical patterns, paving the way for therapies in wound healing, implant integration, and organ regeneration.

“Understanding how cells ‘talk’ to electrical cues gives us a roadmap for designing materials and devices that interact naturally with living tissue,” said co-researcher Joseph Berry from the University of Melbourne.

The study represents a significant step forward in creating next-generation biomedical therapies through the combination of bioengineering and precise electrical guidance of stem cells.