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Korea develops AI-based microneedle patch for diabetic wound healing

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The AI-guided 4D-printing strategy could be extended to soft biomedical robots or tissue-interfacing devices



Chronic diabetic wounds heal slowly and are highly vulnerable to infection. Addressing this concern, researchers at Hanyang University, South Korea, have developed an artificial intelligence (AI)-guided, 4D-printed microneedle patch that actively closes wounds, fights bacteria, and promotes tissue repair.

Inspired by the carnivorous plant *Drosera capensis*, the device combines shape-changing materials, adhesive DNA nanoparticles, and antibacterial zinc treatment, demonstrating how AI can transform biological inspiration into programmable medical technology.

Laboratory experiments showed that the microneedles rapidly recovered their programmed curved shape at body temperature, helping close wounds and maintain stable tissue contact. The platform also incorporated adhesive DNA nanoparticles designed to support tissue regeneration and a zinc-treated surface that provided antibacterial protection.

While further research is needed before clinical use, the technology could be adapted for smart wound patches, implants, scaffolds, and stents that respond to the body's environment. In the long term, it may support the development of intelligent biomaterials that improve healing and reduce complications.