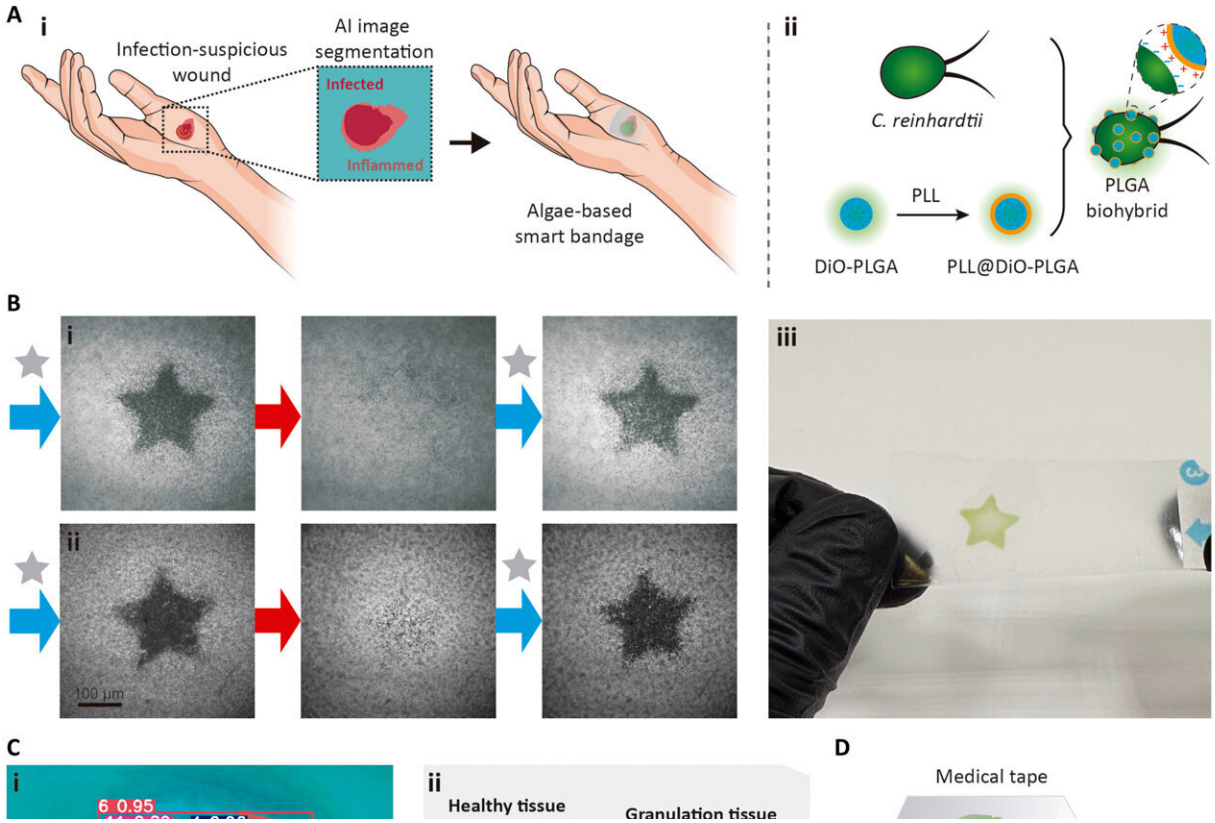
# How swarms of tiny light-controlled robots could revolutionize wound care

May 18 2026, by Paul Arnold




Demonstration of algae swarming for tailored wound dressing. Credit: *Science Advances* (2026). DOI: 10.1126/sciadv.aed0994

Having a swarm of microbots moving across your body may sound like the stuff of a horror movie, but it could actually be the future of targeted

drug delivery and advanced wound healing. Scientists have developed a way to use blue and red light as a remote control to assemble and disperse swarms of biohybrid microrobots that could one day transform how we treat injuries.

Details of the research are in a paper published in the journal *Science Advances*.

The microrobots come in two parts. The first is a living green microalga called Chlamydomonas reinhardtii (CR), which uses two tail-like structures (flagella) to swim through aquatic environments and respond to light.

The second part consists of nanoparticles made of a biodegradable plastic called PLGA. These act like tiny backpacks that can be loaded with medicine and are given a positive charge so they can attach to the algae, which has a negative charge.

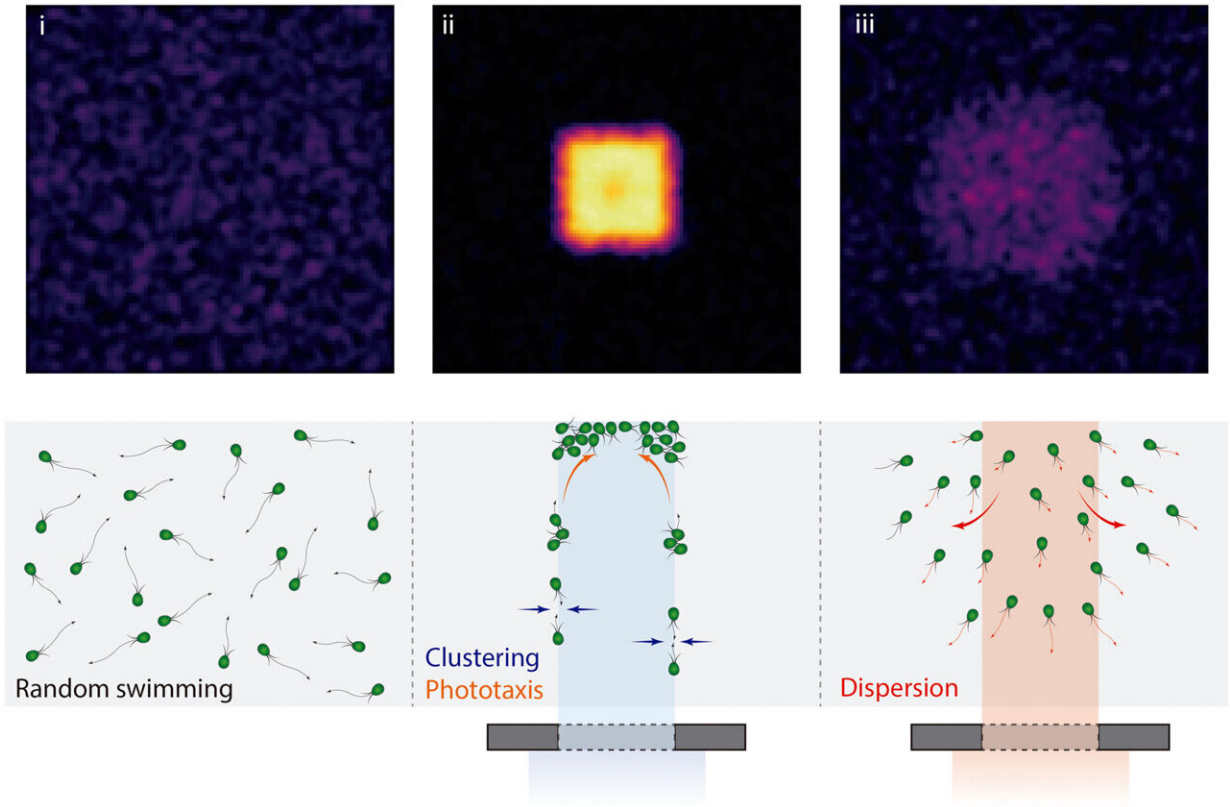
In nature, CR algae are highly sensitive to light and use their flagella to swim toward or away from it to survive. Their behavior changes depending on the color of the light they encounter.

## Guiding swarms of microrobots

Taking advantage of this, the researchers developed a system where they used light to guide millions of cells to split apart, merge together, and change shape on command, creating a variety of patterns like a gear and a star.

"Such reversible swarming behavior is realized by combining the wavelength-dependent assembly ability of CR and its inherent phototactic properties with light exposures through a series of different mask openings that define the desired swarm geometry," explained the

study authors in their paper.




Light triggered swarming with CR microrobots. Credit: *Science Advances* (2026). DOI: 10.1126/sciadv.aed0994

To demonstrate how their innovation could work in a medical setting, the scientists tested it on a simulated wound on an artificial skin model.

They used an AI program to automatically scan the shape of the injury and project the exact patterns of light needed to guide the microrobots. These tiny medical helpers successfully carried and released drug-loaded particles to the target area.

## What's next?

Looking ahead, the research team plans to upgrade their system to handle more complex medical treatments for open wounds.

In addition to their potential medical applications, they could also be used for environmental cleanup operations. "The biohybrid microrobot swarms can dynamically change their morphology, size, and position. The reversible nature of the generated swarms and their remarkable versatility and reconfigurability hold considerable promise for a myriad of possible microrobotic applications," said the researchers.

**More information:** Víctor de la Asunción-Nadal et al, Light-switchable swarming of biohybrid microrobots, *Science Advances* (2026). DOI: 10.1126/sciadv.aed0994