Breakthrough: Scientists invented a gel that can heal all wounds on the body and in the internal organs

Currently, this gel has been successfully tested on mice and rabbits. If successfully tested in humans, it could be a breakthrough in orthopedic and cosmetic surgery, replacing tissue and skin grafts, which are still inadequate.

A small cut can quickly heal in a few days without scarring. It is thanks to an amazing self-repair mechanism of our biological body.

After the wound is stopped, immune cells will rush there, mobilizing blood vessels to rebuild capillaries for you, recruiting new skin cells to help you heal the wound. Fat cells to tighten the skin, leaving no scars.

Unfortunately, this mechanism does not work well with large wounds, such as when someone has a car accident, surgical incisions or weapons attacks on the battlefield.

To overcome this problem, a team at Johns Hopkins Medical University in the United States developed a special injection gel, reinforced with nanofibre. It can help any large open wound to heal completely without leaving a scar. This injected gel serves as a scaffold that allows muscle, skin and fat tissue to attach and grow on it, until they heal any wound.

Currently, this gel has been successfully tested on mice and rabbits. If successfully tested in humans, it could be a breakthrough in orthopedic and cosmetic surgery, replacing tissue and skin grafts, which are still inadequate.

" *Soft tissue loss is a common problem in clinical medicine,* " said Sashank Reddy, a reconstructive surgeon from Johns Hopkins Medical College in Baltimore, Maryland, USA. When faced with large open wounds, surgeons currently do not have many options.

One is that they may choose to transplant tissue from another patient's body area into the wound site. But this invisible medium creates a new wound and loses tissue in a different position on the body.

The second option is to transplant synthetic types of artificial tissue. But immune cells often attack and remove those implants, leaving thick and fibrous scars on the body looking ugly and scary.

"As a plastic surgeon, every day I see patients who lose soft tissue such as skin, fat and muscles due to surgery for cancer, trauma or other conditions. Now, the options of we just stop at the transplant, an option that will cause fibrosis and other problems for the patient, or 'borrow' tissue from another location on the body, but they can cause deformation in the new location. ", Dr Reddy said.

To remove scars, doctors have to separate fat from one part to another using a process called fat grafting. This is not always successful, because usually, half of the fat will die after the transplant and even the doctors do not anticipate the risk in this type of surgery.

The most advanced technique for regenerating damaged tissue areas is the gellike filler. When a patient has small, approximately 1 finger wounds, surgeons often inject a gel made of hyaluronic acid (HA).

It is a gel that macrophage immune cells can get inside. When macrophages make nests in HA gel, they send out signals, invite more blood-forming cells and other cells inside to repair the wound for the patient.

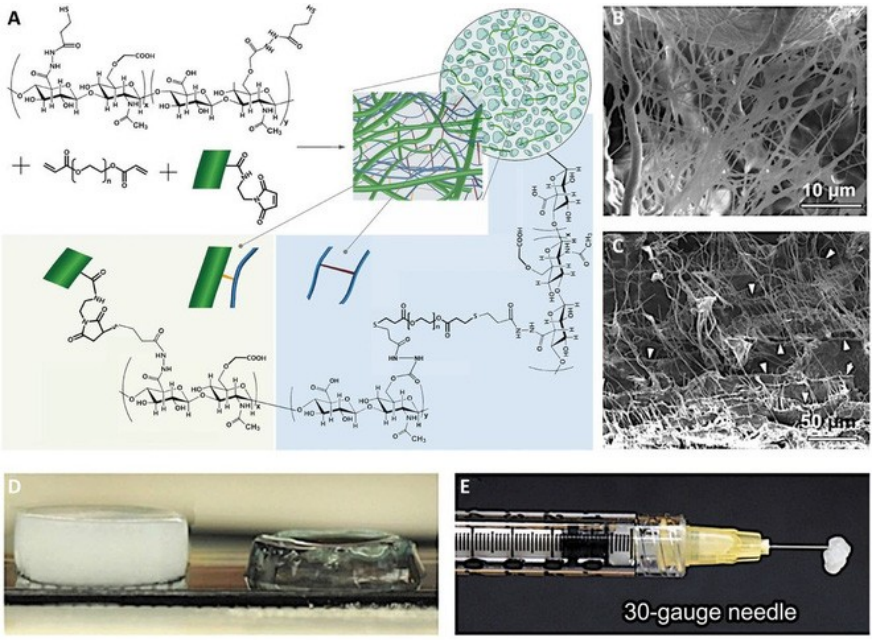
But this is only effective for small wounds, while for larger wounds in the tissue, HA gel is often too weak to retain their shape. Researchers have tried to strengthen the gellike by linking molecules together.

But too many molecular bonds block certain pathways of macrophages and other cells. It alters biological properties and macrophages now release the signal for scar tissue formation instead of regenerating any other normal tissue.

Now, Dr. Reddy and his colleagues have come up with a better solution to reinforce HA gel. First, they created nanofibers that are just 1% of the diameter of a human hair from polycaprolactone. This is a biodegradable

polymer that has been used for decades to make sutures.

They then process these fibers so they can bind to the HA gel, creating a gel that is as resilient as soft tissue. These strands are similar to the reinforced parts in concrete, forming a scaffold that allows healthy tissue to adhere to it and begin the healing process.



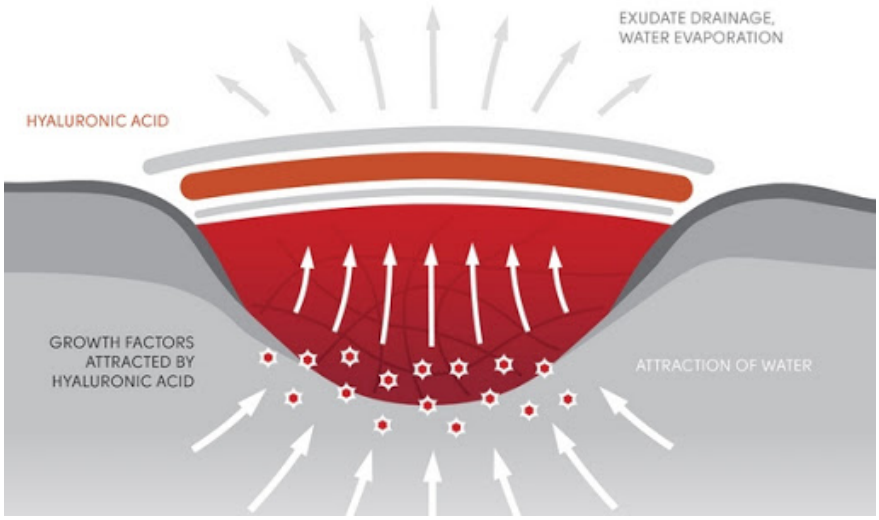
To test his material, Dr. Reddy and colleagues injected it into mice and rabbits. These animals had previously had surgery to remove part of their body's fat tissue.

Unexpectedly, the animals that were only injected with HA gel were unable to recover wounds larger than 1 cm. However, when injected with nano gel mixtures, macrophages quickly penetrated and resided on the nano scaffolding, recruiting cells to regenerate blood vessels and adipose tissue for these mice and rabbits.

The results were published by Dr. Reddy and colleagues in the journal ScienceTranslational Medicine.

" *This new gel is a scientific breakthrough,* " said Ali Khademhosseini, a biology expert at the University of California, Los Angeles. He noted that this gel, unlike other gels, does not require growth factors and biomarkers.

Instead, this gel only supports the body to heal the most natural way. Therefore, it could easily be licensed by the US Food and Drug Administration, Khademhosseini said.



The gel may also help repair soft tissues inside the internal organs, such as heart muscle cells. Hai-Quan Mao, a biomaterial specialist and researcher at Johns Hopkins, said they hope to create cardiac stem cell matrices matrix that form the gel. If successful, their gel could also help repair tissue damage after heart attacks for patients.

With this vision, Dr. Reddy's team hopes they will be able to go to human trials this year or next. To commercialize this miraculous gel, they also founded a startup called LifeSprout.

" *As an engineer, our job is to invent something, then try to put it into practical applications* ," Hai-Quan Mao said. " *In the case of this gel, we find it will be needed for doctors and patients. We have initially tested it successfully and are trying to commercialize it. We are looking to go all the way around. [research-application] ".*