

Injectable hydrogel from kappa-carrageenan

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In news

Scientists **developed an injectable hydrogel derived from spirulina** that can help accelerated wound repair in internal injuries and rapid healing in diabetic patients.

Need for injectable hydrogel

Repeated dressing of diabetic wounds badly affects its healing process while it is difficult to assess the wound repair in internal injuries due to treatment complications.

To address this need, Scientists at the Institute of Nano Science and Technology (INST), Mohali, an autonomous Institute under the Department of Science and Technology (DST), have recently developed an **injectable hydrogel from kappa-carrageenan**, a **water-soluble polysaccharide found in edible red seaweeds** and a pigmented protein called C-phycoerythrin found in spirulina.

About injectable hydrogel

- The gelling property of κ -carrageenan was utilized by the researchers along with C-phycoerythrin as an injectable and regenerative wound dressing matrix to heal the wound rapidly and also to monitor its progress in real-time.
- The matrix developed was highly biocompatible.
- The research published in the journal 'Acta Biomaterialia' established the superior haemostatic (blood flow retarding) capabilities of the combination in traumatic injury conditions.
- The hydrogel matrix developed by Dr. Surajit Karmakar

and his group is fluorescent and allowed in vivo Near-infrared (NIR) imaging.

- Thus, **it could help monitor the recovery of the wound by taking the time-lapse 3D images of the hydrogel filled wound.** Changing depth of the wound bed allow detection of the percentage recovery in wounds.
- Such types of **imaging can allow real-time monitoring of wound repair in internal injuries** and diabetic patients where monitoring of wound repair is a challenge.
- **The anti-inflammatory response and rapid blood clotting ability of *κ-carrageenan-C-phycoerythrin* (κ -CRG-C-Pc) further empowered its applicability in rapid blood clotting, anti-inflammation,** and appropriate monitoring of accelerated wound recovery.

How did the scientist build this hydrogel?

The hydrogel was built by ionic cross-linking of *κ-carrageenan* monomers (β -d-galactose and 3,6-anhydro- α -d-galactose, linked by α -(1,3) and β -(1,4) glycosidic unions)) along with C-phycoerythrin, which provided an interconnected network of porous material with hydrophilic surface and mechanical stiffness. This porosity allowed nutrients transportation and gaseous exchange across the wound healing site for the proliferation of various cells.

Benefits

- According to scientists, the synthesized hydrogel will be highly beneficial for people of all age groups in wound healing applications.
- Its injectable property allowed its application in tough to reach internal injuries without opening the peritoneum of the patients.
- It also holds promise to be utilized in high altitude frost injury application due to its self-healing properties.

What is Spirulina?

- It is an organism that grows in both fresh and saltwater.
- It is a type of cyanobacteria, which is a family of single-celled microbes that are often referred to as blue-green algae.
- Just like plants, cyanobacteria can produce energy from sunlight via a process called photosynthesis.
- It can be consumed by humans and animals.