MEDIA RELEASE

IBN’s Nanogel Heals Burn Wounds Faster

Singapore, May 16, 2014 – Researchers at the Institute of Bioengineering and Nanotechnology have developed a nanogel that can accelerate the healing of burn wounds to minimize the risk of infection and scarring. The technology is based on IBN’s proprietary self-assembling ultrashort peptide technology, which are short sequences of amino acids.

“There is currently no commercial dressing available that can treat burn wounds rapidly. Our peptide hydrogel targets second to third degree burn wounds and fills a niche neglected by existing treatment options,” said IBN Executive Director Professor Jackie Y. Ying.

For second to third degree burns, the top (epidermis) and underlying (dermis) layers of the skin are destroyed, leaving very few viable skin cells for regeneration. Recovery using standard wound treatment could take between 2 to 10 weeks. The likelihood of scar formation and infection increases when the healing duration is prolonged.

In a recent study published in Biomaterials, the IBN researchers found that the peptide hydrogels can promote skin regeneration by acting as a scaffold for skin cells to grow. When water is added, the peptides self-assembled into nanofibers that entrap water to form a fibrous gel, which resembles the extracellular matrix.

Extracellular matrix is an integral component of skin tissue, which provides the mechanical and structural support for cells in the human body. Rich in moisture and porous, the peptide-based hydrogels provide the extracellular matrix-like environment for skin cells to grow.

IBN’s nanogel can heal burn wounds much faster than the silicone-based wound dressing currently used in clinics. In animal studies, IBN’s hydrogels achieved close to 100% wound closure after just 2 weeks compared to silicone dressing, which only healed 63% of the injured area.

This work builds on the ultrashort peptides discovered in 2009 by Dr Charlotte Hauser, IBN Team Leader and Principal Research Scientist. The aliphatic peptides were designed using much fewer amino acids compared to existing self-assembling peptides. Non-immunogenic and non-toxic, the peptides are ideal for a variety of biomedical applications.
“Ultimately, we hope to develop a gel that can incorporate bioactive agents to further enhance skin regeneration. Our peptides could also be used to develop synthetic skin substitutes for deeper burns,” said Dr Hauser.

This work was conducted in collaboration with the DSO National Laboratories, which was interested to develop rapid and first-line treatment of soldiers injured in blasts, and the National University Hospital, which established the animal model for preclinical validation of the hydrogels.

If commercialized, IBN’s new hydrogels could be manufactured as a membrane patch, topical gel or spray. The research team is also looking into a dry-powder formulation, in which the gel can be activated by just adding water. Such a product would have a longer shelf-life and could be included in first aid kits for wound care therapy.

IBN researchers have also investigated the use of these ultrashort peptides for other therapies such as the treatment of Alzheimer’s, cancer and degenerative disc disease. The peptide-based technology has recently been licensed to 3-D Matrix Asia Pte. Ltd. for bone regeneration and drug delivery systems in orthopedic surgery.

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Reference:


Images Available on Request:

The IBN nanogel may be commercialized as a membrane patch for faster healing of burn wounds.
(From left) IBN researchers, Dr Charlotte Hauser and Dr Yihua Eva Loo, examining the peptide hydrogel they have produced in the lab.

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**About the Institute of Bioengineering and Nanotechnology**

Established in 2003, the Institute of Bioengineering and Nanotechnology (IBN) is the world’s first bioengineering and nanotechnology research institute. IBN’s mission is to conduct multidisciplinary research across science, engineering, and medicine for breakthroughs to improve healthcare and quality of life.

IBN’s research activities are focused in the following areas:

- **Nanomedicine**, where functionalized polymers, hydrogels and biologics are developed as therapeutics and carriers for the controlled release and targeted delivery of therapeutics to diseased cells and organs.

- **Cell and Tissue Engineering**, where biomimicking materials, stem cell technology, microfluidic systems and bioimaging tools are combined to develop novel approaches to regenerative medicine and artificial organs.

- **Biodevices and Diagnostics**, which involve nanotechnology and microfabricated platforms for high-throughput biomarker and drug screening, automated biologics synthesis, and rapid disease diagnosis.

- **Green Chemistry and Energy**, which encompass the green synthesis of chemicals and pharmaceuticals, catalytic conversion of biomass, utilization of carbon dioxide, and new nanocomposite materials for energy applications.

**Scientific Impact**

- More than 950 papers published in leading scientific journals
- Over 1,000 seminars and presentations at international conferences, including over 660 invited, keynote and plenary lectures
- Organized premier scientific meetings such as the International Conference on Bioengineering and Nanotechnology, *Nano Today* Conference, and the IBN International Symposium
Technological and Commercialization Impact
- Over 500 active patents and patent applications
- More than 80 licensed patents and patent applications
- 7 spin-off companies
- Over 150 active research collaborations with industrial, clinical and academic partners

Nurturing Future Research Talents
- Trained 107 PhD students
- More than 72,300 students and teachers from 290 local and overseas schools/universities have participated in IBN’s Youth Research Program
- Over 1,880 students and teachers have completed research attachments at IBN

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