Multi-Functional Matrix to Promote Wound Healing and for Other Biomedical Applications

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing improved wound dressing materials that promote wound healing.

OVERVIEW

Wound healing is a complex and dynamic process of rebuilding skin and tissue. Chronic or impaired wounds result when tissues fail to progress through the necessary stages of healing. This is a significant clinical problem, affecting 5.7 million patients in the United States and costing an estimated $20 billion each year. According to the CDC, the cost of trauma-related deaths in U.S. is 2.4 times higher than cancer and cardiovascular diseases combined. By 2020, trauma will equal or surpass communicable diseases as the number one cause of disability-adjusted life years worldwide.

The choice of treatment and the development of novel therapeutics depend on the underlying biology and co-morbidity. Although current understanding of many cellular and molecular processes has advanced substantially, efficacy of single agent therapeutics is disappointing and more than 50 percent of wounds remain refractory to conventional treatment. This is partly due to the complex biochemical pathways involved in the dynamic wound healing cascade and the underlying pathology.

THE INVENTION

A NEW THERAPEUTIC PARADIGM:
Using Biofunctionalized Biomaterials to Recapitulate Tissue Structure Lost Due to Trauma or Underlying Disease to Improve Healing
UW–Madison researchers have developed semi-interpenetrating networks (sIPNs), a platform material that mimics the extracellular matrix and allows delivery of factors like therapeutic cells that promote healing to the wound bed. The sIPNs use a multi-functional hydrogel as a scaffold for damaged tissues. The polymer material consists of a biochemically-modified and cross-linked gelatin matrix, onto which are grafted various heterodifunctional polyethylene glycols (hPEGs). The hPEGs increase the biocompatibility and durability of the hydrogel and also provide attachment sites for therapeutic molecules. The biodegradable matrix allows for temporally and spatially controlled delivery of bioactive signals to modulate and complement the dynamics of the wound healing

THE WARF ADVANTAGE

Since its founding in 1925 as the patenting and licensing organization for the University of Wisconsin-Madison, WARF has been working with business and industry to transform university research into products that benefit society. WARF intellectual property managers and licensing staff members are leaders in the field of university-based technology transfer. They are familiar with the intricacies of patenting, have worked with researchers in relevant disciplines, understand industries and markets, and have negotiated innovative licensing strategies to meet the individual needs of business clients.

process, making these materials functional and clinically viable as wound dressings.

APPLICATIONS

- Wound healing
- Primary wound dressing
- Surgical and dental wound packing material

KEY BENEFITS

As a Primary Dressing

- Biocompatible, safe and effective
- Adheres to tissue and conforms to complex contours
- Intimate tissue contact to facilitate the delivery of active biomolecules
- Large area of continuous coverage
- Maintains moist healing environment
- Provides barrier to pathogens
- Functionalizable to promote healing and address co-morbidity
- Biodegradable
- Cost-effective to synthesize and manufacture with long shelf life
- Easily adaptable to current clinical practice
- Easy patient compliance with minimal bandage changes

In Advanced Wound Therapy

- Various loading modalities for small to large molecule therapeutics
- Tailorable delivery profile
- Amendable to deliver various therapeutic cells to the wound bed
- Facile, *in situ* cell entrapment without the labor intensive procedure for current epidermal/dermal equivalence
- Compatible with most current advanced wound therapies

STAGE OF DEVELOPMENT

This technology is in the design, development and manufacturing verification and validation phase for the planned first-in-human safety study. It has demonstrated feasibility in in-gel cell entrapment for cell-based therapies, including the development of facile, *in situ* forming organogenic epidermal/dermal equivalents.

The development of this technology was supported by WARF Accelerator. WARF Accelerator selects WARF's most commercially promising technologies and provides expert assistance and funding to enable achievement of commercially significant milestones. WARF believes that these technologies are especially attractive opportunities for licensing.

ADDITIONAL INFORMATION

Related Portfolios

WARF Accelerator Program Technologies

Publications

Faucher L.D., Kleinbeck K.R. and Kao W.J. 2010. Multifunctional Photopolymerized Semi-Interpenetrating Network (sIPN) System Containing Bupivacaine & Silver Sulfadiazine Is an Effective Donor Site Treatment in a Swine Model. J. Burn Care Res. 31, 137-145.

Kleinbeck K., Faucher L. and Kao W.J. 2010. Biomaterials Modulate IL-8 and Other Inflammatory Proteins During Re-Epithelialization in Cutaneous Partial Thickness Wounds in Pigs. Wound Repair Regen. 18, 486-498.

Fu Y. and Kao W.J. 2009. Drug Release Kinetics and Transport Mechanisms from Semi-Interpenetrating Networks of Gelatin and Poly(Ethylene Glycol) Diacrylate. Pharm. Res. 26, 2115-2124.

Kleinbeck K.R., Faucher L. and Kao W.J. 2009. Multifunctional *In Situ* Photopolymerized Semi-Interpenetrating Network System (sIPN) Is an Effective Donor Site Dressing: A Cross Comparison Study in a Swine Model. J. Burn Care Res. 30, 37-45.

Tech Fields

Medical Devices - Wound healing
Pharmaceuticals & Vitamin D - Skin & connective tissue
Materials & Chemicals - Polymers

CONTACT INFORMATION

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