A Novel Basic Fibroblast Growth Factor Conjugate for Broad Therapeutic Application

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SUMMARY

UCLA scientists have developed a novel polymer conjugate of basic fibroblast growth factor (bFGF) for use in commercial and possibly clinical applications. This is the first bFGF conjugate to enhance bioactivity and stability under environmental stressors.

BACKGROUND

Basic fibroblast growth factor (bFGF) is an important protein that has many commercial applications due in part to its involvement in numerous physiological functions including embryonic development, angiogenesis, tissue and bone regeneration, development/maintenance of the nervous system, stem cell renewal, and wound repair. The clinical use of bFGF has been hindered due to the instability and rapid degradation of the protein. Novel polymer conjugates of bFGF that retain biological activity and stability under stressors show promising use for a range of applications that include, but are not limited to, wound healing, burn repair, cardioprotection, bone regrowth, neuronal repair, stem cell self renewal, as well as use as a reagent in laboratory settings.

INNOVATION

Researchers in the laboratory of Dr. Heather Maynard at UCLA have developed a novel polymer conjugate of bFGF that remains stable under environmental stressors such as extended storage, heat, enzymes, low pH, and stirring. This technology embodies conjugation of a heparin-mimicking polymer to a therapeutic protein to increase stability and enhance bioactivity of the growth factor. The invention circumvents the issue of using heparin itself to encapsulate a protein, where the anti-coagulation properties of heparin may cause adverse effects in a patient. This innovation provides the first polymer conjugate of bFGF that enhances its bioactivity and stability under various denaturing conditions.

APPLICATIONS

- Potential products: topical treatment for wound healing or burn repair, as an injectable therapeutic for many different diseases, as cell culture additives for stem cell self renewal, and for the use as a reagent in research settings.
- Commercial applications: wound healing for chronic and acute wounds, wound healing after burn or burn repair, bone regrowth, cardioprotection, neuronal regeneration, and various kinds of tissue regeneration
- Personal care products: bFGF proliferation of dermal fibroblast and keratinocytes, stimulation of hair growth, improvement of skin elasticity, wrinkle treatment, and collagen and elastin synthesis

ADVANTAGES

- Increases stability of bFGF and enhances bioactivity
- Minimum concentration of polymer required to stabilize bFGF
- Potentially any heparin binding protein can be conjugated to the polymer
- Increased lifetime of bFGF for potential in vivo applications

STATE OF DEVELOPMENT

The invention has been tested in in vitro experiments, and stabilization and enhanced bioactivity of bFGF by the heparin mimicking polymer conjugate has been demonstrated. The polymer displays no cytotoxic activity and has no effect on receptor binding.

CONTACT

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INVENTORS

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OTHER INFORMATION

KEYWORDS

Protein Synthesis, basic fibroblast growth factor (bFGF), FGF2, polymer conjugates, heparin, polysaccharide heparins, heparin-mimicking polymer

CATEGORIZED AS

- **Medical**
  - Disease: Dermatology
  - Therapeutics
- **Research Tools**
  - Protein Synthesis

RELATED CASES

2012-340-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,039,807	08/07/2018	2012-340
United States Of America	Issued Patent	9,925,270	03/27/2018	2012-340

RELATED MATERIALS

- A heparin-mimicking polymer conjugate stabilizes basic fibroblast growth factor. Nat Chem. (2013)
- Nanoscale growth factor patterns by immobilization on a heparin-mimicking polymer. J Am Chem Soc. (2008)

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- PolyProtek: Platform for Delivering and Stabilizing Therapeutic Biologics, Vaccines, and Industrial Enzymes
- Dual-Enzyme Responsive Peptides
- Update To Degradable Trehalose Glycopolymers
- Noncrushable/Nonabusable Pill Formulations
- Trehalose Hydrogels For Stabilization And Delivery Of Proteins
- A Novel Glycopolymer to Enhance Protein Stability

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