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Biomimetic Artificial Periodontal Membranes And Method Of Fabricating The Same

Tech ID: 29630 / UC Case 2018-369-0

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INVENTORS

▶ Moshaverinia, Alireza

OTHER INFORMATION

KEYWORDS

Periodontitis, membrane, periodontal
membrane, biomimetic

CATEGORIZED AS

- ▶ **Materials & Chemicals**
 - ▶ Polymers
- ▶ **Medical**
 - ▶ Delivery Systems
 - ▶ Devices
 - ▶ Disease: Dental

RELATED CASES

2018-369-0

SUMMARY

UCLA researchers in the Departments of Dentistry and Chemistry have developed a novel biomimetic and degradable periodontal polymer membrane for use in guided tissue regeneration.

BACKGROUND

Periodontitis is a chronic destructive inflammatory disease of tooth-supporting tissue that affects more than 64 million American adults, with inadequate treatment leading to loosening and loss of teeth. Treatment involves surgical installation of a periodontal membrane, which prevents gum recession and allows ligament and bone to repopulate the root of the tooth during the healing process. Current membranes are non-absorbable and require a second operation for removal after healing; degradable membranes based on animal-derived collagen have been developed, but these suffer from poor mechanical properties and immunological responses due to foreign proteins. There is therefore significant need for novel periodontal membranes with tunable physical and biological properties.

INNOVATION

Professor Moshaverinia and coworkers have developed a series of degradable membranes with tunable mechanical and biological properties for the treatment of periodontitis. These polyester-based nanofibrous membranes are coated with polydopamine, an adhesive protein mimic. Biological growth factors can be bound to the membrane for improved bone growth, and mineral deposition on the coated membranes leads to enhanced differentiation of stem cells. Additionally, micropatterns on the membrane allow for fine control over the localization and differentiation of cells in the healing areas. The novel membranes can be used to culture stem cells and their half-life can be tuned from 50 to 10 days.

APPLICATIONS

- ▶ Guided periodontal tissue regeneration
- ▶ Treatment of periodontitis
- ▶ Socket preservation

ADVANTAGES

- ▶ Biopolymer coating improves mineralization and subsequent differentiation of stem cells
- ▶ Tunable degradation
- ▶ Enhanced mechanical properties reduces risk of membrane failure
- ▶ Improved tensile strength, elongation at break and reduced Young's modulus compared to gelatin-based materials
- ▶ Strong adhesion of cells to membranes

STATE OF DEVELOPMENT

Periodontal membranes have been developed and treated with cytokines and growth factors. Dental-derived human stem cells have been successfully cultured on these membranes and been shown to differentiate into bone cells (osteoblasts) within 2-4 weeks.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10907124	02/02/2021	2018-369

RELATED MATERIALS

- ▶ [A. Nasajpour, S. Ansari, C. Rinoldi, A. S. Rad, T. Aghaloo, S. R. Shin, Y. K. Mishra, R. Adelung, W. Swieszkowski, N. Annabi, A. Khademhosseini, A. Moshaverinia, A. Tamayol, A Multifunctional Polymeric Periodontal Membrane with Osteogenic and Antibacterial Characteristics, Adv. Funct. Mater. 2018, 28, 1703437.](#)

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ [Bioactive Adhesive Dental Restorative Cement](#)
- ▶ [Dental Adhesive Hydrogels And Uses Thereof](#)

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