Bone regeneration through tissue engineering offers new prospects for oral procedures

Regeneration of bone tissue could greatly benefit people with jaw-bone deficiencies due to tooth loss, infection or trauma. While an ideal method of bone tissue engineering is not yet available, research with a collagen-hydroxyapatite-Mesenchymal stem cell composite is showing promise. Hydroxyapatite is the main component of bone mineral and tooth enamel. A report in the Journal of Oral Implantology details researchers’ efforts to synthesize a collagen-hydroxyapatite composite through mineralization of collagen fibrils with nanometer-sized apatite crystals. The biological properties of the composite were evaluated by culturing with mouse and human mesenchymal stem cells.

Currently, the methods of bone repair and regeneration include the following bone graft types:
- Autografts: grafting bone from the same person
- Allografts: taking bone tissue from another person
- Xenografts: collecting material from a nonhuman species
- Alloplasts: using synthetic materials

Each of these methods has limitations that tissue engineering involving scaffolds and living cells can surpass. The scaffold is an artificial structure that is combined with living Mesenchymal stem cells to form a tissue engineering construct that can repair or regenerate bone. Mesenchymal stem cells, which can differentiate into a variety of cell types, are used to precipitate bone growth.

The current study tested three ratios of collagen to hydroxyapatite: 80:20, 50:50, and 20:80. Both the 80:20 and 50:50 composites supported attachments and proliferation of mouse mesenchymal stem cells and human periodontal ligament stem cells in laboratory tests. The 50:50 ratio had the best mechanical properties suitable for bone grafting applications. The authors report that these findings indicate a strong potential for collagen-hydroxyapatite composite complexes in bone tissue regeneration. The composites are porous and sponge-like, and show good biocompatibility and biomimetic properties.

Alveolar bone deficiency is a limiting factor for dental implant-supported prosthetic therapies. The effective formation of new bone offers a basis for further procedures to successfully repair teeth and jaws.


About Journal of Oral Implantology
The Journal of Oral Implantology is the official publication of the American Academy of Implant Dentistry. It is dedicated to providing valuable information to general dentists, oral surgeons, prosthodontists, periodontists, scientists, clinicians, laboratory owners and technicians, manufacturers and educators. The JOI distinguishes itself as the first and oldest journal in the world devoted exclusively to implant dentistry. For more information about the journal or society, visit www.joionline.org.

$1.5 million gift establishes first endowed professorship at UMSOD

The University of Maryland School of Dentistry (UMSOD) has received the largest one-time gift in the school’s 175-year history, a $1.5 million donation from alumni Frederick G. Smith, MS, DDS ’78, and Venice K. Paterakis, DDS ’81, that will establish the institution’s first endowed professorship.

This donation will provide resources to fund the work of the school’s distinguished faculty.

“As the world’s first college of dentistry, established in 1840, we celebrate our 175th anniversary this year. This historic gift pays tribute to the school’s illustrious past as a leader in dental and dental hygiene education while ensuring that the UMSOD will remain among the premier dental schools in the world,” said Dean Mark A. Reynolds, DDS ’86, PhD. “I speak for all of us here at the School of Dentistry when I express my heartfelt gratitude to Dr. Smith and Dr. Paterakis for their generosity.”