New scaffolding repairs severe teeth and jawbone defects

Scientists from Norway develop method for bone regeneration

Dental researchers at the University of Oslo have developed a new artificial scaffolding that aids bone regeneration. Within a few years, they hope to market their invention to help patients with serious teeth and jaw damage caused by severe periodontitis, mandibular cancer, infection or trauma.

According to the researchers, the artificial scaffolding could be used in particular for cases in which the gap between two bone fragments is too wide, or when large parts of the bone have been damaged through surgical removal or radiotherapy. The scaffolding helps the body repair such serious defects, the researchers explained.

"With the new method, it is sufficient to insert a small piece of synthetic bone-stimulating material into the bone. The artificial scaffolding is as strong as real bone and yet porous enough for bone tissue and blood vessels to grow into it and work as a reinforcement for the new bone," said Prof. Ståle Petter Lyngstad, dean of research at the Department of Biomaterials at the university’s Institute of Clinical Dentistry.

The scaffolding can be produced like cinder blocks and cut into individual shapes to fit into specific bone defects. It is manufactured from a mixture of water and ceramic powder, which is poured through foam rubber that was designed to look like trabecular bone. The ceramic powder consists of medical-grade titanium dioxide monodisperse nanoparticles, which are also widely used as an additive in sweets, toothpaste and baked goods. Once the mixture has solidified, it is heated to a temperature that causes the foam rubber to dissolve into water vapor and carbon dioxide and the nanoparticles to ligate into one solid structure. It has an open porosity of 90 percent, containing mostly empty space that can be filled with new bone.
Antibacterial agent boosts toothpaste effectiveness

Adding triclosan and copolymer to fluoride toothpaste appears to help reduce plaque, inflammation, bleeding and tooth decay

Regular use of fluoride toothpaste containing triclosan or antibacterial agents and a copolymer, which helps prevent the triclosan from being washed away by saliva, reduces plaque, gingivitis and bleeding gums and slightly reduces tooth decay compared with fluoride toothpaste without those ingredients, according to a new review in The Cochrane Library.

“We are very confident that adding triclosan and copolymer to a fluoride toothpaste will lead to additional benefits, in terms of less plaque, inflammation, bleeding and tooth decay,” said Philip Riley, a researcher at the University of Manchester in England, and a co-author of the study. But he added, “We don’t know how important the effects are clinically.”

Tooth decay and gingivitis are the main causes of tooth loss. Both are caused by plaque, the film of bacteria that builds up on teeth, and if left untreated, can lead to periodontitis, a more serious gum disease that can cause pain and loose teeth.

A team from the Cochrane Oral Health Group reviewed 30 published studies of toothpastes containing triclosan and copolymer. Their analysis of the combined data found a 22 percent reduction in plaque, a 22 percent reduction in gingivitis, a 48 percent reduction in bleeding gums, and a 5 percent reduction in tooth decay (cavities) compared with toothpaste with fluoride alone. However, they did not find sufficient evidence that triclosan/copolymer toothpaste reduced the incidence of periodontitis more than toothpaste without the combination. No adverse reactions to triclosan or the copolymer were reported.

The findings of the review are not surprising, according to Clifford Whall, PhD, director of the American Dental Association’s Seal of Acceptance Program and Product Evaluations. The ADA’s Council on Scientific Affairs has independently reviewed data on the safety and effectiveness of triclosan/copolymer for reducing cavities, plaque and gingivitis. The council concluded that there were sufficient clinical studies that showed these toothpastes reduced the incidence of cavities, the presence of plaque and gingivitis.

Most of the studies of toothpastes evaluated in the Cochrane report were directly or indirectly supported by companies that make toothpaste. Only three studies appeared to be independent, according to the reviewers. The independent or government-funded research community and industry should work together to research antibacterial agents in toothpastes, Riley noted. “But we would argue for complete independent control of the research, including study design, conducting the study and ownership of the data.”

(China’s Science Daily; Health Behavior News Service; Center for Advancing Health)

Fluoride toothpaste recommended at child’s first tooth

To fight cavities in children, the American Dental Association’s Council on Scientific Affairs is updating its guidance to caregivers that they should brush their children’s teeth with fluoride toothpaste as soon as the first tooth comes in. This new guidance expands the use of fluoride toothpaste for young children.

To help prevent children’s tooth decay, the CSA recommends that caregivers use a smear of fluoride toothpaste (or an amount about the size of a grain of rice) for children younger than 3 years old and a pea-sized amount of fluoride toothpaste for children 3 to 6 years old.

For half a century, the ADA has recommended that patients use fluoride toothpaste to prevent cavities, and a review of scientific research shows that this holds true for all ages,” said Edmond L. Truelove, DDS, chair of the CSA. “Approximately 25 percent of children have or had cavities before entering kindergarten, so it’s important to provide guidance to caregivers on the appropriate use of fluoride toothpaste to help prevent their children from developing cavities.”

Tooth decay is one of the most common chronic childhood diseases, with more than 16 million children suffering from untreated tooth decay in the United States, according to the U.S. Centers for Disease Control.

CSA previously recommended using just water to brush the teeth of children younger than 2 years old and to brush the teeth of children 2 to 6 years old with a pea-size amount of fluoride toothpaste. The new guidance is intended to provide children cavity protection while limiting their risk of developing fluorosis.

Before being formed and placed, the scaffolding ends up with an open porosity of 90 percent, containing mostly empty space that can be filled with new bone and blood vessels. Instead of degrading over time, it remains an integral part of the repaired bone, working as reinforced, Photos Provided by University of Oslo

Because the scaffolding has shown positive results in preliminary animal studies, the researchers are currently planning to undertake clinical trials on patients with periodontitis and damaged mandibular bone. They also hope that orthopedists will show interest in the new method.

The new material was developed in collaboration with Corticalis, a Norwegian company that specializes in innovative biomaterials. The researchers are currently looking for an industry partner to market their invention.

(Source: University of Oslo)