Silver nanoparticle-coated membrane may enhance dental implant treatment

By DTI

CRAWLEY, Australia: Alveolar bone loss is a common problem for patients seeking dental implant placement. A barrier between the bone substitute and gingiva that can prevent fibrous tissue ingrowth and bacterial infection, as well as induce bone formation, is a key factor in improving the success of alveolar ridge reconstruction. Researchers at the University of Western Australia have improved a bioactive collagen barrier material for guided bone regeneration, giving it antibacterial and anti-inflammatory properties.

In their study, the researchers used a CelCiro collagen membrane (Orthocell), which is approved for guided bone regeneration in dentistry, and coated it with silver nanoparticles (AgNPs) using two low-temperature fabrication methods: sonication and sputtering.

Scanning electron microscopy revealed that sonication could accurately deposit AgNPs on the membrane, with higher AgNP concentrations depositing more nanoparticles on the collagen fibres. Sputtering, however, was difficult to control and led to large uneven deposition of AgNPs.

To test the membrane’s antibacterial properties, the researchers prepared AgNP-coated collagen membranes with different nanoparticle concentrations and placed them on bacterial inoculation plates. After four days, samples fabricated via either sonication or sputtering exhibited an excellent antibacterial effect against Staphylococcus aureus and Pseudomonas aeruginosa.

Next, the team seeded mesenchymal stem cells, which can differentiate into a variety of cell types including bone cells, on AgNP-coated collagen membranes. After 24 hours in culture, they observed an AgNP dose-dependent decline in cell numbers on sonication-coated samples; however, proliferation rates after day one were similar. According to the researchers, sputter-coated collagen severely inhibited cell growth—suggesting that this technique is not suitable for coating collagen membranes for cell proliferation.

To assess the anti-inflammatory effects of the AgNP coating, the researchers examined the expression of two inflammatory cytokines, interleukin-6 (IL-6) and tumour necrosis factor alpha (TNF-α), in macrophages seeded on collagen membranes. Their findings demonstrated the anti-inflammatory properties of the coated membranes.

Finally, the researchers examined the osteogenic differentiation of mesenchymal stem cells seeded on AgNP-coated collagen membranes. Expression of early osteogenic markers was far higher in cells cultured on AgNP-coated membranes than on uncoated membranes initially; however, there was no significant difference later in culturing.

The optimised AgNP-coated collagen membrane showed the ability to guide bone regeneration, as well as exhibit antibacterial and anti-inflammatory capacity, with limited cellular toxicity. The researchers emphasised the potential application of such membranes in dental surgery, particularly for alveolar bone augmentation and bone graft integration.

The study, titled “Fabrication of a silver nanoparticle-coated collagen membrane with anti-bacterial and anti-inflammatory activities for guided bone regeneration”, was published in the November 2018 issue of Biomedical Materials.

Recent study suggests sugar tax is needed in New Zealand

By DTI

DUNEDIN, New Zealand: The debate around sugar and its ill effects on society and how to address this has taken many forms; one of the main measures being sugar tax, which has already been implemented in countries such as Belgium, Fiji, France, Mexico, Spain and the UK. A new study from the University of Otago has found that New Zealand (NZ) citizens too could benefit from such a tax, as people who consume high-sugar drinks are also more likely to make general unhealthy dietary decisions.

According to lead author Dr Kirsten Robertson, a senior lecturer at the university’s Department of Marketing, NZ has a significant problem regarding the consumption of sugar-sweetened beverages (SSBs). “While a number of other countries have successfully implemented national taxes on SSBs, NZ has a significant problem regarding the consumption of high-sugar food and drink,” she said.

The study, titled “Supporting a sugar tax in New Zealand: Sugar sweetened beverage (‘fizzy drink’) consumption as a normal behaviour within the obesogenic environment”, was published in PeerJ on 19 October 2018.

Researchers from the University of Otago believe New Zealand citizens would benefit from a sugar tax to help reduce their consumption of high-sugar food and drink. (Photograph: photographyfirm/Shutterstock)

Researchers from the University of Western Australia have evaluated two silver coating methods which may improve guided bone regeneration. (Photograph: GaroManjikian/Shutterstock)
Heavy smoking during Irish famine led to dental caries, study finds

By DTI

DUNEDIN, New Zealand: Despite the vast amount of research on smoking, the relationship between smoking and oral health in an archaeological sample of a historical population has never been done. In a new study, scientists from the University of Otago in New Zealand and Queen’s University Belfast in Northern Ireland have examined the teeth of 363 adult victims of the Great Irish Famine, who died in the Kilkenny Union Workhouse between 1847 and 1851.

The dentition of a 26- to 35-year-old male from the Irish famine era showing dental caries, tooth loss, abscesses, calculus, periodontal disease and a clay-pipe facet.

Co-researcher Prof Eileen Murphy, from the School of Natural and Built Environment at Queen’s, believes the research is important as it adds to the current clinical knowledge of how smoking affects oral health, since this is not yet fully understood. “The study also gives us a unique insight into the living conditions of the working classes in Victorian Irish society at the time of the Great Famine,” she said.

According to the study findings, 80 per cent of the adult remains showed evidence of dental caries and over half had missing teeth, indicating that most of the famine victims had poor oral health. There were also signs of pipe smoking marks on their teeth.

Co-researcher Dr Jonny Geber, from the Department of Anatomy at Otago, said: “We believe the bad condition of the teeth studied was because of widespread pipe smoking in both men and women, rather than their diet of potatoes and milk, as a comparative study of the 20th century population on the same diet didn’t have the same evidence of poor oral health.” Geber went on to say that the Kilkenny study shows that it is not only diet that affects oral health.

“The high frequency of clay-pipe facets or marks from clenching a pipe between the teeth in many of the skeletons was evidence of smoking in both males and females. The current study adds to the growing body of evidence that demonstrates that smoking is not only bad for your health, it is also bad for your teeth,” said Geber.

The study titled ”Dental markers of poverty: Biocultural deliberations on oral health of the poor in mid-nineteenth-century Ireland”, was published in the American Journal of Physical Anthropology on 3 October 2018.
Brisbane dentist highlights importance of oral health during pregnancy

By DTI

BRISBANE, Australia: Pregnancy is a unique experience in a woman’s life; however, it may significantly affect her own and her child’s oral health. Studies have shown that links exist between poor oral health and low birth weight or pre-mature birth. According to a Brisbane dentist, as pregnancy is associated with compromised oral health due to hormonal effects, expectant mothers should be warned that poor oral health during pregnancy can adversely affect their infants’ health.

Dr Ellie Nadian, who is a general dental practitioner and runs Pure Dentistry, a practice in Brisbane, believes that pregnant women should receive specific information for the management of changes in their oral health conditions during pregnancy. During the phases of pregnancy, a woman undergoes many hormonal changes in the body and because of these, dental and gingival deterioration may be rapid. For this reason, Nadian also highlights the particular importance of having good oral health prior to conception.

With various pregnancy-induced growth factors, such as a change in the physiological condition and female hormones, there can be an increase in the activity of bacteria in the oral cavity and increased risks to a pregnant woman’s oral health. In a study of pregnant Japanese women, researchers reported that oral bacteria significantly increase in the early pregnancy period. Therefore, pregnancy, especially in the early stages, can promote the proliferation of bacteria in the oral cavity and facilitate colonisation by periodontal pathogens. However, according to the results of a separate study, proper oral hygiene during pregnancy can partially neutralise hormonal effects on oral tissue.

According to American guidelines on oral health during pregnancy and early childhood, preventative dental care should be provided as early in pregnancy as possible. In a study by scientists at the Harvard School of Dental Medicine in Boston in the US, that may help highlight the importance of good oral health during pregnancy. These researchers studied 1,635 pregnant women regarding periodontitis and its relation to preterm birth. According to the results, periodontitis is an independent risk factor for poor pregnancy outcomes among some women.

Editorial note: The references can be obtained from Dr Ellie Nadian.