



# 2010-2011 Research Synopses Biomedical and Tissue Engineering

The **Biomedical and Tissue Engineering Research Group** of the HKU Faculty of Dentistry aims to bridge the gap between basic science research and its clinical application in the field of bone induction (stimulation of bone formation) and dental biomaterials. Below is a selection of summaries of research findings published by the Biomedical and Tissue Engineering Research Group, with online links to abstracts or full papers in *Medline*.

**Prof Lim K Cheung,** [lkcheung@hkucc.hku.hk](mailto:lkcheung@hkucc.hku.hk), is the convenor of the Biomedical and Tissue Engineering Research Group at the HKU Faculty of Dentistry. A list of the group's members can be found at: <http://facdent.hku.hk/discovery/group/biomedical.html>

*Cheung LK, Chan YM, Jayaratne YS, Lo J.*

### ***Three-dimensional cephalometric norms of Chinese adults in Hong Kong with balanced facial profile.***

*Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2011;112:56-73.

<http://www.ncbi.nlm.nih.gov/pubmed/21665497>

■ By collecting and analysing 3-dimensional X-ray and photographic images of 50 men and 50 women from Hong Kong, these researchers created the first database of typical 3-D features of faces and skulls of Chinese adults. The 3-D reference database will be useful in assessing both facial deformities and treatment results.

*Nabil S, N Samman.*

### ***Incidence and prevention of osteoradionecrosis after dental extraction in irradiated patients: a systematic review.***

*Int J Oral Maxillofac Surg* 2011;40:229-43. <http://www.ncbi.nlm.nih.gov/pubmed/21115324>

■ This comprehensive review of past studies revealed that among a total of 828 patients who had received radiation therapy for head and neck cancer, 7% had unhealed bone in tooth sockets after tooth extraction. This condition indicated death of bone cells in association with radiation (osteoradionecrosis), with the risk being the highest when radiotherapy doses had exceeded 60 Gy. In addition, there was "weak evidence" of prevention of osteoradionecrosis by prior use of a pressurised (hyperbaric) oxygen chamber.

Chan B, Wong RW, Rabie B.

***In vivo production of mineralised tissue pieces for clinical use: a qualitative pilot study using human dental pulp cell.***

*Int J Oral Maxillofac Surg* 2011;40:612-20. <http://www.ncbi.nlm.nih.gov/pubmed/21353764>

■ Cells taken from the pulp from inside human teeth were inserted into a protein-based gel. After chemical treatment and transplantation into mice, the cells developed into mineralised tissue pieces that made proteins normally found in bone.

Matinlinna JP, Lassila LV.

***Enhanced resin-composite bonding to zirconia framework after pretreatment with selected silane monomers.***

*Dent Mater* 2011;27:273-80. <http://www.ncbi.nlm.nih.gov/pubmed/21122907>

■ In laboratory tests of bonding between pre-treated zirconia to resin-composite cement (two materials used in tooth restorations), each of five experimental silane coupling agents led to stabler bonding (greater shear bond strengths) between the two materials than a commercially available ready-to-use product.

Chau A.

***Comparison between the use of magnetic resonance imaging and conebeam computed tomography for mandibular nerve identification.***

*Clin Oral Impl Res* 2011 Feb 13. [Epub ahead of print] <http://www.ncbi.nlm.nih.gov/pubmed/21488971>

■ According to 12 dental postgraduates who were asked to identify one of the mouth's nerves (mandibular nerve) in 11 patients, the nerve was more readily visible with magnetic resonance imaging than with cone-beam computed tomography.

Hirashi N, Yiu CKY, King NM, Tagami J, Tay FR.

***Antimicrobial efficacy of 3.8% silver diamine fluoride and its effect on root dentin.***

*J Endod* 2010;36:1026-9. <http://www.ncbi.nlm.nih.gov/pubmed/20478459>

■ Laboratory studies on *Enterococcus faecalis*, a bacterium that can survive in treated root canals, showed that 3.8% silver diamine fluoride had a similar antibacterial effect to 5.25% sodium hypochlorite.

Omer RSM, Anthonappa RP, King NM.

***Determination of the optimum time for surgical removal of unerupted anterior supernumerary teeth.***

*Pediatr Dent* 2010;32:14-20. <http://www.ncbi.nlm.nih.gov/pubmed/20298648>

■ Some children have extra (supernumerary) teeth that remain buried inside the jaw and may lead to complications; however, exactly when these teeth should be surgically removed has been unclear. These researchers studied 126 southern Chinese children who had been referred for the surgical removal of unerupted extra upper-front teeth. Removal of these teeth up to the age of 6 or

7 years resulted in the fewest complications for the upper central incisors. Extraction after this age was associated with more complications, and waiting until after 10 years of age led to the most tooth development problems.

Ow A, Cheung LK.

***Bilateral sagittal split osteotomies and mandibular distraction osteogenesis: a randomized controlled trial comparing skeletal stability.***

*Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2010;109:17-23.

<http://www.ncbi.nlm.nih.gov/pubmed/19875317>

■ In this randomised controlled trial, 14 patients underwent one of two operations to move the lower jaw forwards. Both methods—bilateral sagittal split osteotomy (one-step repositioning) and distraction osteogenesis (daily step-wise advancement)—showed similar amounts of skeletal relapse during the 1-year observation period.

Chua HDP, Hägg MB, Cheung LK.

***Cleft maxillary distraction versus orthognathic surgery—which one is more stable in 5 years?***

*Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2010;109:803-14.

<http://www.ncbi.nlm.nih.gov/pubmed/20299247>

■ This randomised controlled trial compared 5-year effects after distraction osteogenesis (daily step-wise advancement) and conventional orthognathic surgery (one-step repositioning) to move the upper jaw forward by 4 to 10 mm in 47 patients with cleft lip and palate. Following conventional surgery, the upper jaw relapsed backwards and upwards. Following step-wise treatment, it moved further forwards and downwards, suggesting “better long-term skeletal stability”.

MacLaine JK, Rabie AB, Wong R.

***Does orthodontic tooth movement cause an elevation in systemic inflammatory markers?***

*Eur J Orthod* 2010;32:435-40. <http://www.ncbi.nlm.nih.gov/pubmed/19822530>

■ These researchers provided the first piece of evidence that orthodontic (tooth-straightening) therapy is not associated with a widespread defence (immune) response in the body. They performed orthodontic therapy on a group of 17 children and monitored their blood for indicators of general inflammation at months 2, 4, and 6. None of the three inflammatory proteins—C-reactive protein, tumour necrosis factor  $\alpha$ , and interleukin 6—showed any significant changes in concentration.

Ma L, Zheng LW, Sham MH, Cheung LK.

***Effect of nicotine on gene expression of angiogenic and osteogenic factors in a rabbit model of bone regeneration.***

*J Oral Maxillofac Surg* 2010;68:777-81. <http://www.ncbi.nlm.nih.gov/pubmed/20307763>

■ Noting that cigarette smoking reduces bone density and delays fracture healing, these researchers tested the effects of timed-release nicotine implants

in rabbits that had undergone lower-jaw surgery designed to promote new bone growth (distraction osteogenesis). Real-time polymerase chain reaction analysis revealed that nicotine reduced gene expression (mRNA levels) of transforming growth factor  $\beta$ 1, platelet-derived growth factor, and basic fibroblast growth factor. Because these growth factors are normally involved in blood vessel formation and bone regeneration, their altered expression “may be responsible for impaired bone healing” in the nicotine-treated group, the authors conclude.

