

## U of T Student Triumphs in Dentsply Student Clinician Research Competition

The 2008 CDA/Dentsply Student Clinician Research Program took place on April 11 in Toronto in conjunction with the CDA Annual Convention and the Ontario Dental Association Annual Spring Meeting.

This national clinical research competition is open to one dental student from each accredited dental school in Canada. It is designed to stimulate ideas, improve communication and increase student involvement in the advancement of the dental profession.

This year, first prize was awarded to Audrey McNamara from the University of Toronto for her research project comparing the osteoinductive activity of bioimplants. As part of the award, Ms. McNamara will present her research project at the 2008 American Dental Association Annual Session in San Antonio, Texas.

"It is an honour to be recognized at a national research competition among dental students," says Ms. McNamara. "I am giving serious consideration to graduate research in dentistry and this award has certainly encouraged me even further."

"I am interested in research in the area of tissue grafts, tissue regeneration and tissue engineering, and I am looking forward to seeing the research presentations on these topics at the ADA conference," she continues.

Second prize, consisting of a \$1,000 cash award, went to Melanie McLeod of Dalhousie University for her project on the proper use of curing lights for composite resin restorations.

"Participating in this competition allowed me to have a first-hand opportunity to promote the importance of evidenced-based dentistry, or more specifically, clinical evidence-based dentistry," explains Ms. McLeod. "My investigation tried to bridge the gap between bench-top research and actual dental practice because it was a simple clinical idea that had a real-world application."

Now in its 38th year of existence in Canada, the Student Clinician Research Program was once again sponsored by Dentsply International and managed by CDA.

"CDA provides an outstanding venue for dental students to present their research and to meet the leaders of Canadian dentistry," says Dr. Linda Niessen, vice-president and chief clinical officer of Dentsply International. "What a wonderful opportunity for the current leaders of the dental profession to mentor the next generation of leaders through the Dentsply Student Clinician Research Program."

"Dentsply has been honoured to partner with CDA to support the Student Clinician Research Program for close to 40 years now," adds Dr. Niessen. "Dental schools play a significant role in conducting basic and clinical research which serves as the foundation for a strong profession. Encouraging dental students to conduct research serves as an important education experience."

Student clinicians provide a brief presentation of their research table clinic to a panel of qualified judges and winners are selected on a total points basis. Dentsply generously provide the prizes along with the airfare and travel expenses to the conference for the qualifying students.



Audrey McNamara and Melanie McLeod, first- and second-place winners.

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JCDA is pleased to publish condensed versions of the abstracts submitted for the CDA/Dentsply 2008 Student Clinician Research Program. To qualify, the study must fall under “clinical application and techniques” or “basic science and research.” Students must identify the purpose of the study, provide background information, outline how the study was conducted and report on the results of the study and its possible significance. The student, selected by his or her own faculty, must be an undergraduate at the time of the presentation, as well as a member of CDA. Eight dental schools participated in this year’s competition.

### 1st Place

#### Comparison of the osteoinductivity of bioimplants containing rhBMP-7 (OP-1) and rhBMP-2 (Infuse)

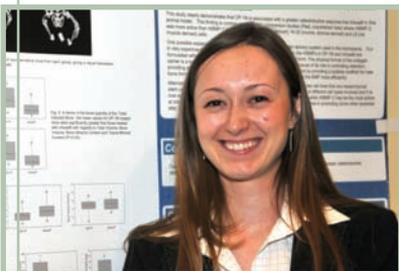
By Audrey McNamara, T. Barr, C.M.L. Clokie and S.A.F. Peel, University of Toronto

The researchers investigated whether a significant difference exists between the osteoinductive activity of 2 bone morphogenetic proteins (BMPs), called OP-1 (rhBMP-7) and Infuse (rhBMP-2). Both bioplasts are substitutes for autogenous bone grafts used in several bone reconstruction applications.

In this study, the bioimplants were surgically placed into male CD-1 mice ( $n = 10$  per group) and sham surgeries were also performed to serve as a control. After 28 days, the induced bone was analyzed using microcomputed tomography, a technique that allows for the evaluation of the induced bone via a 3D computer model.

In terms of quantity, the results indicated that the OP-1 group had significantly more total bone than the Infuse group. In terms of quality, no significant differences were observed between the 2 groups. These results show that in this animal model, OP-1 is associated with a greater osteoinductive response than

Infuse. This was contrary to findings from in vitro osteoinductive comparison studies using purified rhBMP-2 and rhBMP-7, which demonstrated that Infuse is more active than OP-1.



Audrey McNamara

The discrepancy between study results is most likely due to the difference in the physical format of the collagen carrier system used in these 2 bioimplants. The delivery vehicle is a key factor in the clinical performance because of its role in controlling retention, providing stability and localizing the activity of BMPs at the surgical site and its role in providing a suitable scaffold for new bone formation. •

### 2nd Place

#### How good is your aim?

By Melanie McLeod, C. Felix, R. Price, Dalhousie University

Would receiving instructions on the proper use of curing lights affect the amount of energy that a practitioner directs at composite resin restorations? In this study, the researchers hypothesized that less than the manufacturers’ specification ( $10\text{--}20\text{ J/cm}^2$ ) of energy is being received during most clinical practice applications.

To determine the critical amount of energy, the investigators used a quartz–tungsten–halogen (QTH) light for 10 repetitions and found that  $10\text{ J/cm}^2$  must be received by composite resin for the bottom surface to reach 80% of the maximum hardness of the top.

Data were collected before and after 20 volunteers (composed of dental assistants and dental students) received QTH curing light instructions. The primary variables were the amount of time spent curing the surface, the angle of the curing light and the distance away from the surface.

The results showed that proper curing light instruction made a significant difference ( $p = 0.004$ ) in the energy received by a Class I restoration ( $7.9\text{ mW/cm}^2 \pm 2.7, 10.0\text{ mW/cm}^2 \pm 1.4$ ).

The critical amount of energy failed to be delivered to a Class I restoration after instruction in 50% of the cases if the restoration was cured for 20 seconds. When the volunteers cured the surface for 40



Melanie McLeod

seconds, the  $10\text{ J/cm}^2$  level was achieved every time. In terms of angle and distance, if the angle was between  $0^\circ\text{--}15^\circ$ , and the distance away from the surface was between 0–5 mm, the  $10\text{ J/cm}^2$  level was attained. However, if over  $30^\circ$  and more than 6 mm away, the  $10\text{ J/cm}^2$  level was not achieved. •

## Expression of BMP-7 during regeneration and development of the axolotl limb

By Jérémie Berdugo, J.C. Guimond, P.L. Michaud and S. Roy, University of Montreal

Regeneration is playing an increasingly important role in biomedical sciences. The axolotl, a type of amphibian, is an interesting experimental model because it can regenerate multiple parts of its body.



Jérémie Berdugo

The limb is the most widely used structure for regeneration studies because of its ease of manipulation. Regeneration is controlled by genes such as bone morphogenetic proteins (BMPs), members of the

transforming growth factor beta superfamily.

Until now, BMP action mechanisms have never been well defined. They were thought to be mediators of the gene Sonic hedgehog (Shh) to define the anterior/posterior identity of the limb. Unlike amniotes, the expression of BMP-7 does not seem to follow the expression of Shh for the axolotl.

Our hypothesis is that BMP-7 does not define the anterior/posterior identity of the limb and does not mediate the action of Shh. Regeneration has many applications in dentistry, especially in periodontology for bone, connective tissue or gum grafting. Also, the development of the limb and the development of the tooth share many similarities. •

Calcium nitrate and triethyl phosphite sol-gel precursors were combined with an aqueous solution of polyvinylpyrrolidone and electrospun from a glass syringe equipped with an 18-gauge needle. The flow rate and voltage ranged between 0.05–0.2 mL/h and 17–25 kV, respectively. The collecting distance was constant at 8.4 cm. Fibres were



Wailan D. Chan

heat-treated and subsequently calcined at 600°C to obtain residual inorganic fibres. Fibres were characterized using scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR) and thermogravimetric analysis (TGA).

TGA of the fibres demonstrated 2 weight loss stages, with no further weight loss over 500°C, indicating removal of residues. A carbonate-substituted apatitic structure of the calcined fibres was suggested by FTIR. SEM revealed various fibre architecture ranging from hollow tubular fibres (17 kV, 0.05 mL/h), solid fibres (25 kV, 0.05 mL/h), and porous fibres (17 kV, 0.2 mL/h; 25 kV, 0.2 mL/h). The diameter of the calcined fibres ranged between 0.5–1.2 µm and 100–170 nm.

The results indicate that a simple and versatile approach to the fabrication of calcium phosphate fibres with controllable architecture is possible, including nanotubes and solid and porous fibres. •

## A comparison of brief screenings involving various dental team members within 2 independently run programs: a pilot study

By Ashley Dykun, D. Brothwell and C. Lekic, University of Manitoba

The objective of this study was to determine the reliability of brief screenings of children in Winnipeg's inner-city schools completed by dental students, dental assistants and dental hygienists compared to screenings completed by an experienced general dentist.



Ashley Dykun

Until September 2007, there were 2 children's

## Preparation of calcium phosphate fibres by electrospinning technique

By Wailan D. Chan and A.S. Rizkalla, University of Western Ontario

Electrospinning is a simple and versatile technique to produce submicron fibres. Electrospun inorganic fibres have potential biomedical applications in skeletal and dental health, such as tissue engineering scaffolds and dental composite materials.

The objective of this study was to investigate the effects of applied voltage and flow rate on the architecture of electrospun calcium phosphate fibres. An understanding of the factors that control fibre architecture will allow the custom fabrication of appropriate structures for specific biomedical applications.

dental screening programs operating independently in Winnipeg. The Winnipeg Regional Health Authority uses dental assistants and dental hygienists to identify children with dental treatment or prevention needs. The Variety Children's Dental Outreach Program, operated by the University of Manitoba's faculty of dentistry, uses general practitioners and dental students to screen children for specific types of dental problems, to provide dental students adequate exposure to pediatric dentistry.

To make effective use of scarce resources, a pilot joint-screening program was started in September 2007 to determine how effectively the Winnipeg Regional Health Authority could apply the screening criteria set out by the University of Manitoba faculty of dentistry to ensure dental students' clinical requirements were being met.

Two screenings were performed on each child. Children were then grouped into categories according to urgency and type of dental treatment needed. The study results provide early evidence that other members of the dental team could reliably screen school-aged children for dental treatment. These results will be used to improve the current screening programs in Winnipeg. •

### 3D comparison of cardiac development in Kyoto and Carnegie human embryos

By John Park and V.M. Diewert,  
University of British Columbia

The researchers wanted to compare the stages of cardiac development in Kyoto embryos versus Carnegie embryos. They reconstructed 3D images from normal serially sectioned Kyoto embryos of stages 16, 17 and 18.

The investigators studied photographs of serially sectioned Kyoto embryos of stages 16, 17 and 18 from the Diewert Collection. WinSURF software produced 3D models of selected serially sectioned Kyoto embryonic hearts. Fusion of atrioventricular (AV) cushions and the formation of the interventricular septum (IVS) were also assessed in histological sections and 3D reconstructed images.

For stage 16, 2 of the 6 specimens had fused endocardial cushions and divided AV canals. All showed evidence



John Park

of beginning stages of fusion and IVS development was slightly delayed. For stage 17, only 4 of the 13 specimens had fused cushions. The muscular IVS was more prominent but the muscular IVS was not fused to the cardiac cushions. Finally, in stage 18 all 4 specimens had fused AV cushions separating the AV canal. Incomplete closure of secondary interventricular foramen was noted in all specimens.

The researchers concluded that heart development in Kyoto embryos appears delayed at stage 17. The fusion of facial prominences to form the upper lip is delayed in Kyoto embryos. Although heart and face development were delayed in the stage 17 Kyoto embryos studied, by stage 18 normal Kyoto embryos were similar to Carnegie embryos, on which most of the documented literature is based. •

### Nonsurgical treatment of severe dento-skeletal Class III malrelationship in late adolescent patient

By Andrew Wong and T. El-Bialy,  
University of Alberta

The researchers presented a case study of an adolescent male who came to the graduate orthodontic clinic at the University of Alberta for a consultation to correct a severe Class III skeletal malrelationship. A combined comprehensive orthodontic treatment and orthognathic surgical approach is usually required



Andrew Wong

in patients with this condition. Protraction headgear is frequently used to improve facial proportion and to minimize the potential for future surgical intervention.

The patient had been previously advised to wait until he was 18 years old, at which time comprehensive orthodontic treatment as well as orthognathic surgery would be performed. The patient and his parents agreed to try the modified protraction headgear, even though another surgical treatment might be needed in the future.

The modified protraction headgear was selected to prevent the counterclockwise rotation of the maxilla while advancing the maxilla forward. The first stage of the treatment included a bonded rapid palatal expansion appliance together with the reverse headgear for 3 months. After this time, the patient's skeletal

malrelationship was improved to an acceptable Class I relationship. A comprehensive full fixed appliance was subsequently inserted, allowing for final detailing of the occlusion.

The patient's age was 13 years and 4 months when treatment was initiated; total treatment time was 2 years. The patient will be followed up annually to verify stability of the obtained results. •

### The effect of different training methods on colour selection

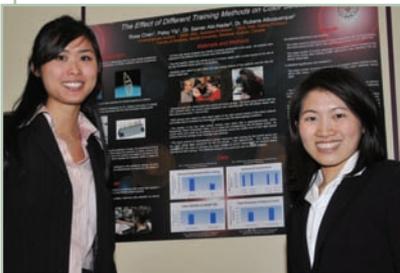
By Patsy Yip, Rose Chen, S. Abi Nader and R. Albuquerque, McGill University

**T**oothGuide Trainer (TGT) software was developed by Dr. Holger Jakstat of the University of Leipzig to train dental students to select colour more accurately with the Vita 3D-Master shade guide. The primary aim of this study was to evaluate whether practising with shade tabs or the TGT software results in a greater improvement in colour selection by dental students. A secondary aim was to investigate whether training improves colour selection on natural teeth.

Thirty-three third-year students were asked to select colour for the right central incisors of 4 patients using 5 Vita 3D-Master shade tabs. The students were then randomly divided into control and study groups. The study group trained with the TGT software while the control group practised colour selecting with Vita 3D-Master shade tabs. Each group was given 1 hour to train before making colour selections again on the same subjects and shade tabs to evaluate the outcome of training under the same lighting conditions. The shades of the 4 right central incisors were taken with a spectrophotometer to obtain the corresponding Vita 3D-Master shade.

Training with either the TGT software or the Vita 3D-Master shade tabs resulted in a statistically significant improvement in colour selection of natural teeth when comparing the mean number

of correct responses before (0.265, SD = 0.139) and after (0.341, SD = 0.137) training. The results of the study indicated that 1 hour of training on tooth colour selection, independent of the method used, improved the students' ability to properly select the colour of natural teeth. •



Rose Chen and Patsy Yip