



# Winners of the 2009 Table Clinic Competition

Each year, the California Dental Association invites dental, dental hygiene and dental assisting students and military residents from across the state to enter the Table Clinic Competition held during *CDA Presents* in Anaheim. Blue-ribbon winners from the May 15-17 contests were invited to write an abstract of their work to appear in the *Journal of the California Dental Association*.

## CLINICAL DENTAL STUDENT WINNERS



From left, Jerhet Ask, Stuart Seheult, and Nicholas Marongiu are all smiles after winning first place in the clinical category during the annual table clinic competition. The Loma Linda University dental students are flanked by Jeffrey J. Brucia, DDS, and Carol G. Summerhays, DDS, with Dennis D. Shinbori, DDS, at top, reviewing his notes.

### Gow-Gates Target Area and Maxillary Artery Anatomical Relationship

*N. Marongiu, S. Seheult, J. Ask, M. Lu, DDS, MS, PhD, and B. Krall, DDS, Loma Linda University, School of Dentistry*

**OBJECTIVE:** To evaluate the location of the maxillary artery to the target area of the Gow-Gates injection, the neck of the condyle.

**METHODS:** Twenty-eight adult de-identified neck cerebral computed tomography angiograms were obtained in DICOM file format. Using Keystone EasyGuide viewer, measurements were recorded in millimeters and were based on closest proximity of the maxillary artery to the neck of the condyle. Data were analyzed using t-distribution.

**RESULTS:** Range: 4.12-23.75 mm, average 11.24 mm, sample error: 0.80 mm, 95 percent confidence interval: 9.60-12.88 mm.

**CONCLUSION:** There is a significant distance in the Gow-Gates injection target area from the course of the maxillary artery. However, a misaligned needle, especially inferomedially, may result in vascular trauma that may pose a serious complication in the coagulopathic patient.

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## SCIENTIFIC DENTAL STUDENT WINNERS (TIE)



Deema M. Saad, left, and Rana Mehr, both of University of California, Los Angeles, School of Dentistry, take a moment with Jeffrey J. Brucia, DDS, and Carol G. Summerhays, DDS.

### Biomechanical Maturity Mapping of Murine Incisors

*Rana Mehr and Deema M. Saad, University of California, Los Angeles, School of Dentistry; Michael L. Paine, Malcolm L. Snead, and Rodrigo S. La-cruz, University of Southern California, School of Dentistry; and Shane N. White, PhD, MS, MA, University of California, Los Angeles, School of Dentistry*

**INTRODUCTION:** The components of murine enamel are almost entirely identical to those of human teeth, making the mouse incisor an appealing model for studying human tooth development. A key difference is that active ectodermal and ectomesenchymal stem cells at the murine incisor apex have the ongoing potential to become ameloblasts and odontoblasts thus generating the continuously erupting mouse incisor. Therefore, it is possible to study ameloblasts and odontoblasts through their entire life cycle in a single tooth at one time. Mouse ameloblasts have different histomorphometric landmarks along the rostral-caudal axis of the tooth that correspond to their state of differentiation. The incisor can be divided into enamel formation cohorts that have been previously described as Kallenbach zones. The authors sought to relate these previously described histological zones to biomechanical function.

**OBJECTIVES:** This study aims to map the biomechanical properties of enamel

and dentin along the length of the murine incisor in the rostral-caudal axis.

**METHODS:** The lower left incisors of seven 12-week old C57/B6 mice were surveyed for hardness using Vickers microhardness testing. Freshly extracted incisors were embedded in epoxy resin. The teeth were ground and sequentially polished longitudinally in the sagittal plane. Indentations were made at the center of the enamel and dentin thickness in the sagittal plane along the length of the incisor. Loads of 225 g and 100 g were used for enamel and dentin, respectively. Mechanical properties were plotted against the distance to the incisal edge. Biomechanical zones were defined by change in slope.

**RESULTS:** For enamel, the overall mean hardness and associated (standard deviation) were 2.5 (0.6) GPa. However, three distinct zones were discerned. The midzone of enamel, 0.5 to 8 mm from the incisal tip, had the least slope,  $m=-0.01$ ; the highest mean hardness, 2.6 GPa; and the lowest SD, 0.4 GPa. Interestingly, enamel toughness varied much less than hardness along the length of the tooth; discrete zones were not identified within the testable area. The overall mean toughness was 1.0 (0.2) MPa·m<sup>1/2</sup>, with a slope,  $m=-0.004$ .

For dentin, the overall mean hardness was 0.7 (0.2) GPa. Three distinct dentin hardness zones were discerned. The midzone of dentin, 1 to 6 mm from the incisal tip, had the least slope,  $m=-0.001$ ; the highest mean hardness, 0.8 GPa; and the lowest SD, 0.2 GPa.

The most incisal zones of enamel and dentin, corresponding to the erupted functional part of the tooth, decreased in hardness. The most apical immature zones of enamel and dentin decreased in hardness. Enamel reached full maturity much earlier than the corresponding adjacent dentin.

**DISCUSSION:** Somewhat surprisingly, the previously defined histological zones, as measured by distance from the incisal edge in the rostral-caudal axis, did not directly overlap with the zones defined by biomechanical function. The under-

standing of the relationships between histomorphometric landmarks and biomechanical performance metrics is incomplete. Hardness measures the amount of mineralization, a functional surrogate for wear resistance. Toughness measures the 3-D organization of enamel, a functional surrogate for fracture resistance.

The apical zones displayed decreased hardness due to immaturity and incomplete mineralization. Although dentin begins to form before enamel, enamel matured or increased in hardness in a much shorter distance, or time, than corresponding dentin. The softer incisal zones in both

dentin and enamel could be attributed to dissolution in the oral environment.

For each biomaterial, a zone existed where data points could be predictably measured. To ensure testing of histologically similar tissues, biomechanical testing should take place in zones from 1-6 mm and 0.5-3 mm from the incisal edge for enamel and dentin, respectively.

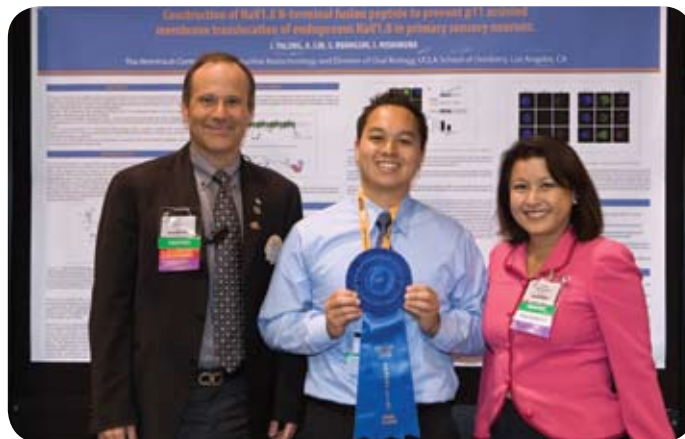
Enamel toughness did not vary substantially, suggesting that enamel organization occurs early, and that cellular migratory pathways giving rise to rod interweaving, or decussation, contribute more to toughness than the amount of mineralization.

**CONCLUSION:** A model for tooth formation, relating previously described histological zones to biomechanical function of enamel and dentin was presented. These data enable the use of the continuously erupting mouse incisor as an experimental model to study the impact of both genetic and environmental factors on tooth formation and function, as well for the future engineering of tooth enamels.

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## SCIENTIFIC DENTAL STUDENT WINNERS (TIE)

Jelson Yalung, a student University of California, Los Angeles, School of Dentistry, is congratulated by Jeffrey J. Brucia, DDS, and Carol G. Summerhays, DDS, for the scientific table clinic category.



### Construction of NaV1.8 N-Terminal Fusion Peptide to Prevent p11-Assisted Membrane Translocation of Endogenous NaV1.8 in Primary Sensory Neurons

*J. Yalung; A. Lin, PhD; S. Ruangsri, DDS; I. Spigelman, PhD, and I. Nishimura, DDS, DMSc, DMD, University of California, Los Angeles, School of Dentistry*

Chronic orofacial pain is a rare condition that is often caused by injury of peripheral sensory neurons. This damage can result in sensory abnormalities and can manifest in dental patients as severe symptoms that include burning sensations, exaggerated responses due to

noxious stimuli (hyperalgesia), pain sensation due to innocuous stimuli (allodynia), and spontaneous pain episodes. NaV1.8 is a voltage-gated sodium channel that predominantly contributes to Na<sup>+</sup>-current in nociceptive neurons and has been suggested to be involved in the pathogenesis of painful neuropathy. In order to become a functional sodium channel, the NaV1.8 channel complex must be inserted into the neuronal membrane. It has been shown that molecular association between NaV1.8 and an associated protein, p11, plays a critical role in the membrane translocation of NaV1.8. Therefore, the authors have hypothesized that disrupting binding of p11 to NaV1.8 can be a potential therapeutic treatment for peripheral neuropathy.

**OBJECTIVE:** The amino (N)-terminal cytoplasmic domain of NaV1.8 has been shown to bind p11. To address this hypothesis, the objective of this study was to design and synthesize a short polypeptide encoding NaV1.8 N-terminal sequence, and to test its competitive binding to p11 in cultured rat dorsal root ganglion (DRG) neurons.

**METHODS:** The N-terminal cytoplasmic domain of rat Nav1.8 was synthesized using reverse-transcriptase polymerase chain reaction, and cloned in a plasmid for sequence confirmation. A lentivirus-based

expression vector was constructed carrying 3xFLAG-NaV1.8 N-terminal fusion peptide. Rat DRGs were harvested and acutely dissociated to maintain neuronal cells in vitro. NaV1.8 N-terminal fusion peptide was introduced to cultured neurons through lentivirus-mediated gene transduction. The treated DRG neurons were subjected to immunoprecipitation and immunocytochemistry assays to test for the postulated interference of p11 binding to NaV1.8.

**RESULTS:** Immunoprecipitation using monoclonal antibody against 3xFLAG selectively isolated NaV1.8 N-terminal fusion peptide. Western blot analysis of 3xFLAG immunoprecipitates revealed the successful co-precipitation of p11. Immunocytochemistry of treated DRG neurons using monoclonal antibody against NaV1.8 showed a decrease in membrane localization of endogenous NaV1.8.

**CONCLUSION:** The authors' data suggest that the small peptide can interrupt the functional NaV1.8 expression on the neuronal cell surface membrane, which could potentially alleviate neuropathic pain.

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### MILITARY WINNER

Jeffrey J. Brucia, DDS,  
stops by the winning table  
clinic of U.S. Navy Lt.  
Rebecca A. Kromer, DDS.



### Orthodontically Uprighting a Mesially Tipped Molar

*U.S. Navy Lt. Rebecca A. Kromer, DDS, resident, Advanced Education in General Dentistry, Naval Medical Center, San Diego*

Loss of a first molar without timely replacement may result in unwanted shifting of adjacent or opposing teeth. Specifically, mesial tipping of the second and third molars is often seen. These occlusal changes can impact the periodontal health, arch integrity, and the restorative treatment plan. In response to these challenges, the general dentist must have a full understanding of treatment options in order to restore the patient to optimum oral health and function.

One treatment option consists of orthodontically uprighting the mesially tipped molar using a fixed appli-

ance and a helical uprighting spring. The procedure consists of bonding brackets from the affected molar to the cuspid on the affected side of the arch. A series of archwires are used to gently level and align the teeth; 0.016 NiTi (x four weeks), 0.018 NiTi (x four weeks), and 0.020 NiTi (x eight weeks).

Next, a 0.018 stainless-steel archwire and helical uprighting spring (17 x 25 TMA) is placed into the auxiliary tube of the molar bracket and latched onto the archwire. As a common side effect, distal tipping and extrusion of the molar(s) may necessitate occlusal adjustment. Once the molar has been uprighted to the desired position and any periodontal defects have been eliminated, stabilization is necessary for retention. Once there is an absence of mobility and a return of the lamina dura, the edentulous space can be restored with a single-tooth implant or a fixed partial denture with an acceptable path of draw that directs forces along the long axes of the teeth.

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## RDH STUDENT WINNERS

Lucy Halbasch and fellow dental hygiene student Christopher Nucho, represent West Los Angeles College well by winning blue in the RDH category. They were joined by Jeffrey J. Brucia, DDS, and Carol G. Summerhays, DDS.



### Ventilator-Associated Pneumonia

*Christopher Nucho and Lucy Halbasch, West Los Angeles College*

*Background:* Ventilator-associated pneumonia is a hospital-acquired respiratory infection that can occur after placement of a mechanical ventilator. VAP

is the second common iatrogenic infection with mortality rates up to 40 percent. The primary etiologic agent associated with VAP is periodontopathic bacteria.

*Method:* Review of current literature conducted analyzing the relationship between periodontal pathogens and VAP.

*Results:* Risk of VAP increases with the introduction of periodontal pathogens. VAP extends a hospital stay, increasing the overall treatment cost. Combination therapy consisting of systemic antibiotics, scaling, root planing, and chemotherapeutics reduces the risk of infection.

*Conclusion:* The risk of VAP is reduced with dental hygiene services in hospital settings. Further research is needed to determine how implementation of dental hygiene services will modify current protocol, length of stay, treatment cost, and mortality rate.

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## RDA STUDENT WINNERS

Citrus Community College dental assisting students, from left, Brooke Alva, Leana Seeker, Alyssa Maloney, and Jasmin Anne S. Honrado, pose postwin with Jon Roth, CAE, CDA Foundation executive director, and Lindsey A. Robinson, DDS, CDA Foundation chair.



### Beyond Fresh Breath

*Jasmin Anne S. Honrado, Brooke Alva, Alyssa Maloney, and Leana Seeker, Citrus Community College*

Chewing gum after a meal not only refreshes one's breath, but may also prevent the formation of caries. After sugars from food and liquids are metabolized in the mouth by bacteria, an

acidic environment is created that largely plays a role in tooth decay. The aim of the study was to analyze the effects of three types of chewing gum: sugar and sugar-free (sorbitol and xylitol).

A salivary diagnosis was performed as a specimen from each group was prepared and cultured at 37-degrees Celsius for 48 hours. Results revealed that xylitol-containing chewing gum showed to produce the least amount of bacteria in the oral cavity since no additional fermentable carbohydrates were introduced after a meal.

In conclusion, chewing xylitol-containing gum after meals may be a preventive method in maintaining good oral hygiene as the increased salivary flow in the mouth removes wastes, provides nutrients, remineralizes tooth enamel, and neutralizes plaque acids produced by bacteria that reduce the risk of tooth decay.

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