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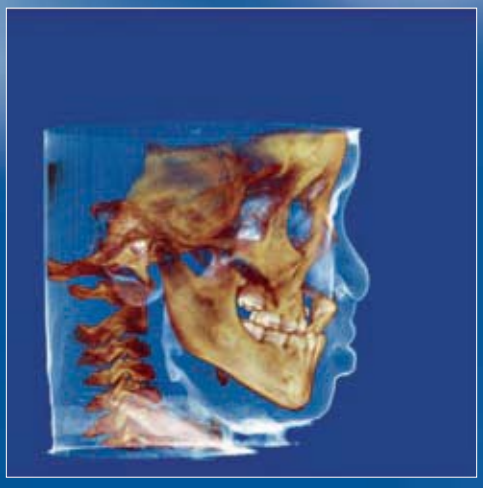

3D Imaging for Assessment and Management of the Craniofacial Complex

JANUARY 26, 2010

RESEARCH DAY 2010

To advance oral health through outstanding education, research, and community service.

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MESSAGE FROM THE DEAN

Welcome to the Third Annual Research Day at the UBC Faculty of Dentistry.

We have been very happy with the extremely positive responses to our previous Research Day events in 2008 and 2009. This year we continue the use of clinical scenarios to present the translational applications of advances that have occurred in basic science research. Research remains a critical goal in the Faculty's Strategic Plan and we hope that this event highlights the links between research and clinical dentistry.

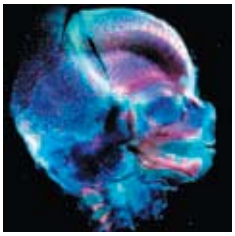
The overall theme for Research Day 2010 is "imaging". In dentistry it is critical to evaluate images of structures that are not visible to the naked eye. Many research advances have occurred to provide additional information to clinicians as they evaluate a patient's signs and symptoms and generate a list of differential diagnoses. New advances in imaging have provided clinicians with clinical data that would have been impossible to obtain only a few years ago. Use of the imaging data has also undergone rapid changes with three-dimensional evaluations that have only become possible with the enhanced computing power now available in clinical situations. The integration of advanced imaging techniques and evaluation of that imaging information are becoming commonplace in clinical care. Advances in imaging research are critical to the profession and focusing on this topic of research is particularly important for dentistry.

We are again delighted to have a distinguished alumnus present the keynote address. Dr. Ernest Lam is a graduate of the UBC Faculty of Dentistry class of 1989 and is widely recognized for his expertise in oral and maxillofacial radiology. He will be able to show how advances in oral radiology have changed diagnostic approaches and what the future holds for continued progress.

I hope you enjoy the program and gain additional insight into the research that has supported advances in imaging and the rapid alterations that will be occurring in the field. This is an area that has transformed greatly in just the past few years and there is little to indicate that the rate of change is slowing.

Thank you for your participation.

Charles F. Shuler, DMD, PhD
Professor and Dean, UBC Faculty of Dentistry

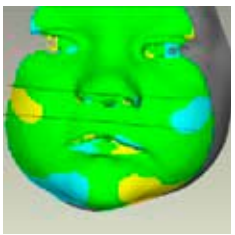
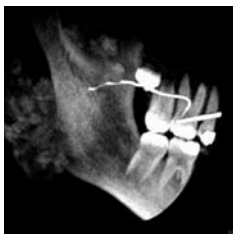


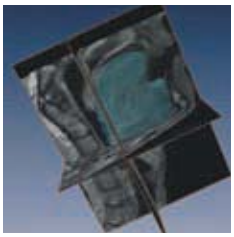

UBC Dentistry Research Day 2010
3D Imaging for Assessment and Management of the Craniofacial Complex

Tuesday, January 26, 2010 · 8:00 am - 3:00 pm
UBC Student Union Building Ballroom

8:00 - 8:30	**REGISTRATION & CONTINENTAL BREAKFAST**
8:30 - 8:50	**WELCOME** **Dr. Charles F. Shuler**, Professor and Dean **INTRODUCTION & OVERVIEW OF THE DAY** **Dr. Edward E. Putnins**, Professor and Associate Dean of Research & Graduate/Postgraduate Studies
8:50 - 9:10	**REVIEW OF FIBROUS DYSPLASIA (A DEVELOPMENTAL LESION)** **Dr. David MacDonald**, Associate Professor and Chair, Division of Oral & Maxillofacial Radiology "A systematic review of one developmental anomaly."
9:10 - 9:30	**NORMAL EMBRYONIC CRANIOFACIAL DEVELOPMENT** **Dr. Joy M. Richman**, Professor, Division of Pediatric Dentistry "What are the biological mechanisms that regulate facial development?"
9:30 - 9:50	**OVERVIEW OF CRANIOFACIAL MALFORMATIONS** **Dr. Edwin H.K. Yen**, Professor and Director, Graduate Orthodontics Program "What are the common craniofacial malformations affecting facial development?"
9:50 - 10:10	**THREE-DIMENSIONAL ANALYSIS OF FACIAL FORM** **Dr. Virginia M. Diewert**, Professor and Head, Department of Oral Health Sciences "How can three-dimensional imaging assist in the analysis of facial form?"
10:10 - 10:30	**SOFT TISSUE IMAGING AND NASOALVEOLAR MOULDING** **Dr. Angelina Loo**, Part-Time Clinical Assistant Professor "What immediate imaging modalities and treatment can be used to manage patients with craniofacial malformations?"





10:30 - 11:00	**COFFEE BREAK**
11:00 - 11:20	**MANAGEMENT OF PEDIATRIC SLEEP APNEA** **Dr. Alan A. Lowe**, Professor and Chair, Division of Orthodontics "What is the impact of craniofacial characteristics on pediatric airway size?"
11:20 - 11:40	**MANAGEMENT AND IMAGING OF ADULT AIRWAY OBSTRUCTION** **Dr. Fernanda R. Almeida**, Clinical Assistant Professor, Division of Oral & Maxillofacial Radiology "How do we assess three-dimensional tongue and airway size?"
11:40 - 12:00	**RESEARCH POSTER AWARDS PRESENTATION (UNDERGRADUATE & GRADUATE STUDENTS)**
12:00 - 1:00	**LUNCH (BOX LUNCH PROVIDED) & RESEARCH POSTER VIEWING** Posters by undergraduate students, graduate students, post-doctoral fellows, research associates, visiting scientists, and faculty members.
1:00 - 1:20	**OVERVIEW OF CFI-FUNDED CENTRE FOR HIGH THROUGH-PUT PHENOGENOMICS** **Dr. Edward E. Putnins**, Professor and Associate Dean of Research & Graduate/Postgraduate Studies "What upgrades are occurring at Dentistry's research imaging centre?"
1:20 - 2:40	**ADVANCES IN 3D CRANIOFACIAL IMAGING (KEYNOTE ADDRESS)** **Dr. Ernest W.N. Lam**, Associate Professor and Head, Discipline of Oral and Maxillofacial Radiology, Faculty of Dentistry, University of Toronto "Recent advances in craniofacial imaging."
2:40 - 3:00	**DISCUSSION**

UBC Dentistry Thanks the Following Research Day Sponsors:

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MESSAGE FROM THE ASSOCIATE DEAN OF RESEARCH

Welcome to the Third Annual UBC Dentistry Research Day.

The 2009-2010 academic year arrived with significant excitement. The Faculty of Dentistry has begun to implement new graduate programs and has recently received significant research infrastructure support. Specifically, the Divisions of Orthodontics and Pediatric Dentistry have new specialty training programs beginning in September 2010 and the federal government has approved $9.4 million dollars to renovate, replace, and significantly expand our basic sciences imaging facility. Research Day 2010 is pleased to highlight the exciting research being done by several members of these divisions, is delighted to have presentations from the Division of Oral & Maxillofacial Radiology, and is proud to have our alumnus speaker, Dr. Ernest Lam, provide the keynote address on advances in 3D imaging. Once again we are honoured to include presentations from a diverse but complementary group of full-time faculty, part-time clinical faculty, and distinguished alumni. Collectively, pathological and developmental anomalies affecting the craniofacial complex will be the clinical focus of the day.

The craniofacial complex is a highly-structured organization of hard and soft connective tissues and airway space. Developmental and pathological anomalies in these areas can dramatically impact function and esthetics and 3D imaging is revolutionizing how these tissues are assessed and ultimately managed. Research Day 2010 is focused on the assessment and management of hard and soft connective tissues and the airway of patients with developmental and pathological anomalies, the innovative research at the basic science level that is being undertaken to understand the biology of development, and will be introducing exciting new imaging infrastructure that the Faculty is putting into place to ensure that it has the state-of-the-art equipment required to remain at the forefront of craniofacial research.

Please read through this program booklet and discover the exciting research work that is being undertaken, not only by these individuals, but by other members of the Faculty as well. In closing, on behalf of the Research Day 2010 Organizing Committee, I would like to thank all of the participants for their hard work, their contributions, and especially for their dedication to research and teaching. These unique characteristics in each of the participants helped to define this day and will make it a success. Lastly, I would like to thank the members of the Research Day Organizing Committee (Theresa Burns, Clare Davies, Ingrid Ellis, Alison Kovacs, Jane Merling, Sylvia Stephens, and Terry Wintonyk) who worked tirelessly to arrange this day.

To all, please enjoy Research Day 2010.

Edward E. Putnins, DMD, PhD, DipPerio
Professor and Associate Dean of Research
& Graduate/Postgraduate Studies

PRESENTERS
BIOGRAPHIES AND SYNOPSES

- DAVID MACDONALD
- JOY M. RICHMAN
- EDWIN H.K. YEN
- VIRGINIA M. DIEWERT
- ANGELINA LOO
- ALAN A. LOWE
- FERNANDA R. ALMEIDA
- EDWARD E. PUTNINS
- ERNEST W.N. LAM

DAVID MACDONALD, BDS, BSc(Hons), LLB(Hons), MSc, DDS(Edin), DDRRCR, FDSRCPS, FRCD(C) *Dr. David MacDonald trained in Oral and Maxillofacial Radiology (OMFR) with the Royal College of Radiologists (UK). He has published extensively principally on the radiological aspects of the epidemiology of disease affecting the face and jaws, particularly of the Hong Kong Chinese—a distinct subgroup of the Han Chinese. In 2007 he graduated with a DDS by dissertation from the University of Edinburgh (this resulted in 10 full papers and two editorials) and passed the fellowship examination in OMFR of the Royal College of Dentists of Canada.*

REVIEW OF FIBROUS DYSPLASIA (A DEVELOPMENTAL LESION)

Fibrous dysplasia (FD) is an important developmental lesion. Formerly considered to be a hamartoma, my recent systematic review (SR) revealed it recurred or became reactivated in 18% of cases. Cases of FD arising within the jaws rarely affect the orbit to such a degree so as to affect vision. The SR revealed the radiological criterion of a poorly defined margin was reliable and permitted distinguishing it from the ossifying fibroma, another lesion with a similar fibro-osseous histopathology. Nevertheless the need to identify features, which would predict the likelihood of recurrence or reactivation of a particular case, has largely been thwarted by the literature's poorer reporting both of the radiology and the clinical outcomes. Computed tomography may reveal some potentially useful features.

JOY M. RICHMAN, DMD, MDentSc, PhD, MRCD(C) *Dr. Joy Richman received her DMD degree from the University of Manitoba, then her Master of Dental Science degree and specialty in Pediatric Dentistry from the University of Connecticut. She was awarded the Canadian Institutes of Health Research (CIHR) Dental Fellowship to take her PhD in Developmental Biology with a focus on craniofacial development at the University of London, UK. Her first academic position was at the University of Manitoba and then she joined the Faculty at the University of British Columbia in 1994. Dr. Richman has been both a CIHR Clinician Scientist and a Michael Smith Foundation for Health Research Distinguished Scholar. Her work is funded by grants from the CIHR and the Natural Sciences & Engineering Research Council of Canada (NSERC).*

NORMAL EMBRYONIC CRANIOFACIAL DEVELOPMENT

Craniofacial abnormalities are due to the disruption of normal development. This talk will provide the foundation knowledge necessary to understand the genesis of facial malformation. The most sensitive periods of embryogenesis will be reviewed as well as the origins and fates of the facial tissues. The development of the skull will be discussed as well as some of the common causes of facial abnormalities. Finally some of the experimental models for clefting used in the Richman lab and elsewhere will be presented.

EDWIN H.K. YEN, DDS, Dip Ortho, PhD, FRCD(C) *Dr. Edwin Yen's interest in craniofacial abnormalities started with his PhD research in connective tissue remodeling in periodontal and sutural sites and continued during clinical treatment at the cleft palate program at the University of Manitoba where he was Director of the Graduate Orthodontics Program. Dr. Yen will be Program Director of the new Graduate Orthodontics Program at the University of British Columbia, which will include a clinical and research component in conjunction with the Cleft Palate and Craniofacial Program at BC Children's Hospital. Dr. Yen is a Distinguished Honorary Member, UBC Alumni Association.*

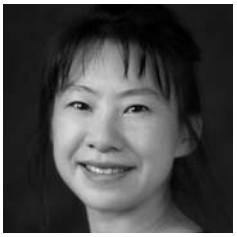
OVERVIEW OF CRANIOFACIAL MALFORMATIONS

The most common craniofacial challenges facing the interdisciplinary team that includes general dentists and dental specialists are the variations of cleft lip and cleft palate and hemifacial microsomia. Societies with well developed health care systems can provide the extensive infant surgery, followed by extensive orthodontic care, dental prosthetic fabrication, speech therapy, psychological counseling, auditory support, and plastic surgical revisions from birth to adulthood. The challenge is not only to reconstruct the missing hard and soft tissues but to maintain a semblance of normal growth and development while the individual confronts the demands and pressures of peers and society. Embryological research has described the abnormal developmental stages *in utero* and the roles of key contributing cell populations that lead to these congenital abnormalities.

VIRGINIA M. DIEWERT, DDS, MSc, Cert Ortho *Dr. Virginia Diewert is Professor and Head of the Department of Oral Health Sciences and a Certified Specialist in Orthodontics. She received her dental degree from the University of Alberta and her graduate orthodontics education at Northwestern University. Her research in craniofacial development focuses on analysis of how disruption or delay of critical events during face formation can lead to malformations such as cleft lip and palate.*

THREE-DIMENSIONAL ANALYSIS OF FACIAL FORM

The etiopathogenesis of craniofacial anomalies is complex because of the numerous developmental factors involved and the three-dimensional nature of craniofacial anatomy. Although facial defects are known to involve the genetic and/or environmentally-induced disruptions of developmental processes, how these affect the facial structures remains difficult to assess. Recent advances in 3D imaging and application of 3D morphometrics enable rigorous analyses of size and shape variation associated with genotype. In collaborations with Dr. Hallgrímsson at the University of Calgary, geometric morphometric tools are used to characterize shape variation in the midface and heads of mouse embryos, neonates, and adults. These 3D methods are now being used to study human craniofacial morphology.



ANGELINA LOO, DMD, MSc, FRCD(C) *Dr. Angelina Loo received her dental degree from the University of British Columbia in 1985, and her Master of Science degree and specialty in Orthodontics at the University of Manitoba in 1989. Dr. Loo maintains a private practice in Vancouver and since 1990 has been notably involved as an orthodontist member of the BC Children's Hospital Cleft Palate and Craniofacial Program team. Her research interest is focused on the clinical use of three-dimensional imaging to evaluate facial symmetry in children with cleft deformities. Dr. Loo is a distinguished alumna of UBC.*

SOFT TISSUE IMAGING AND NASOALVEOLAR MOULDING

Nasolabial deformities affect not only the physical appearance of children with craniofacial malformations, but also their social acceptance. Primary surgeries begin at the age of three months, and are followed by secondary repairs to address residual deformities consequential to growth restricted by scar tissue. The objective of early management with presurgical nasoalveolar moulding (PNAM) is to restore facial balance in preparation for surgical corrections that would least interfere with facial growth. This presentation will review the clinical application of 3D soft tissue imaging as an evidence-based measure of treatment success, both with respect to the surgical procedure and the associated PNAM therapy. Assessment of longitudinal data with sequential images helps to forecast the growth pattern for a particular child, and the timing for future surgical procedures.

ALAN A. LOWE, DMD, Dip Ortho, PhD, FRCD(C), FACD *Dr. Alan A. Lowe is Professor and Chair of the Division of Orthodontics in the Faculty of Dentistry at the University of British Columbia. His research contributions on the use of oral appliances for the treatment of snoring and Obstructive Sleep Apnea and their effects on airway size and tongue muscle activity have been recognized worldwide. In addition, he holds Canadian, USA and worldwide independent patents for three technologies related to his research endeavours. Dr. Lowe is an internationally renowned alumnus of UBC.*

MANAGEMENT OF PEDIATRIC SLEEP APNEA

A funded clinical trial has been underway for the last two years to develop clinical protocols for the application of Klearway™ appliance therapy to sleep disordered breathing in a child population. By evaluating orthodontic records (questionnaires, x-rays and dental study models) together with overnight sleep studies before and after Klearway treatment, new applications for Klearway use and new protocols for therapy in children have been defined. A total of 20 Class II, Division 1 children were recruited based on a questionnaire to detect evidence of sleep disordered breathing. Patients wear the Klearway appliance only at night and are seen approximately monthly for the 18 month test period. The project is designed to compare before and after therapy orthodontic and sleep records and to correlate the upper airway changes with baseline facial type and sleep parameters.

FERNANDA R. ALMEIDA, DDS, MSc, PhD *Dr. Fernanda Almeida is currently a Clinical Assistant Professor at the University of British Columbia, where she teaches dental radiography. She has been involved in oral appliance research and the treatment of patients with Obstructive Sleep Apnea since 1996. Her research is focused on oral appliance side effects, compliance, titration modalities, imaging, and treatment outcome. She is on the editorial boards of the Journal of Clinical Sleep Medicine, Sleep & Breathing, and the International Journal of the Science & Practice of Sleep Medicine. Dr. Almeida is a distinguished alumna of UBC.*

MANAGEMENT AND IMAGING OF ADULT AIRWAY OBSTRUCTION

Obstructive Sleep Apnea (OSA) is a common adult disease characterized by recurrent collapse of the upper airway during sleep. The disease has important health consequences including daytime sleepiness, motor vehicle crashes, reduced quality of life, and cardiovascular disease. There are two main therapies, continuous positive airway pressure (CPAP) and oral appliances, used to treat sleep apnea with different costs, efficacies, and side effects. Acquiring insight into the interactions between tongue and airway could help to predict treatment outcomes. Three-dimensional (3D) computer simulation of human anatomy is an increasingly useful tool in medical research. A 3D computer model of the upper airway being developed at UBC might elucidate the interactions between the airway and soft tissues in patients with OSA and might help in planning or developing new treatments.

EDWARD E. PUTNINS, DMD, Dip Perio, MRCD(C), MSc, PhD *Dr. Edward Putnins received his undergraduate and periodontal training at the University of Manitoba. He completed his PhD at the University of British Columbia where he is now a Professor and the Associate Dean of Research, Graduate and Postgraduate Studies at the Faculty of Dentistry. His research interests lie in the areas of epithelial response to chronic inflammatory challenge and potential use of bone marrow mesenchymal stem cells for periodontal regeneration. Dr. Putnins is a distinguished alumnus of UBC.*

OVERVIEW OF CFI-FUNDED CENTRE FOR HIGH THROUGH-PUT PHENOGENOMICS

For the past 25 years, the Faculty of Dentistry has run a successful advanced imaging facility with extensive experience in hard tissue and biomaterial imaging. In 2009 the Canadian Foundation of Innovation (CFI) approved a $9.4 million dollar update and expansion of its capabilities to become the Centre for High Through-Put Phenogenomics. This new centre will include new scanning and transmission microscopes, three new micro CT machines, optical projection tomography capabilities, and a MALDI mass spectrometer. We will review and demonstrate how this highly innovative core facility will support researchers in dentistry, medicine, and pharmacy such that collaborations across disciplines will advance scientific discovery in the areas of developmental deformities and bone degenerative diseases.

KEYNOTE ADDRESS

ERNEST W.N. LAM, DMD, MSc, PhD, Cert OMR, Dip ABOMR, FRCD(C) *Dr. Ernest Lam is an Associate Professor at the University of Toronto, and Head of the Discipline of Oral and Maxillofacial Radiology. Dr. Lam is also the Program Director of the Oral and Maxillofacial Radiology Graduate Program. After completing his BSc, DMD and MSc degrees at the University of British Columbia, Dr. Lam spent two years in private dental practice in Vancouver before enrolling at the University of Iowa where he completed specialty training in Oral and Maxillofacial Radiology and a PhD in Radiation Biology. After seven years on the faculty of the University of Alberta, Dr. Lam was recruited to the University of Toronto in 2005. Dr. Lam is primarily involved in graduate teaching and supervision, and clinical research in the Faculty related to topics in Oral and Maxillofacial Radiology. Dr. Lam is a Fellow of the Royal College of Dentists of Canada in Oral and Maxillofacial Radiology and a Diplomate of the American Board of Oral and Maxillofacial Radiology. Dr. Lam is a distinguished alumnus of UBC.*

ADVANCES IN 3D CRANIOFACIAL IMAGING

Imaging research can mean different things to different people. To the medical physicist who may be on the "ground floor" of development, imaging research may mean the creation of an entirely new image receptor system. At the opposite end of the spectrum, the clinician, who may be the end-user of imaging technology, may have a more applied approach related to a particular clinical dilemma.

Over the past several years, some of the most significant developments in dentistry have centered around the introduction of digital imaging technologies, in particular 3D cone beam imaging systems. As we have seen with the introduction of other new technologies, without an evidence base supporting their utilization, the end result may be nothing more than the production of useless but pretty pictures. Therefore, the utilization of this new technology requires us to be able to define clinically-relevant research questions that have a foundation in our understanding of disease and its management in the face and jaws. To this end, we will illustrate the application of 3D cone beam imaging in dentistry, and present the results of our recent work that involves the utilization of this technology to answer clinical questions in implant and salivary gland imaging research, two areas of focus in our current research program.

POSTER ABSTRACTS

Poster Competition Judges

- DR. FERNANDA ALMEIDA
- DR. DIETER BRÖMME
- DR. GEORGINA BUTLER
- DR. JEFFREY COIL
- DR. MARKUS HAAPASALO
- DR. ALAN LOWE
- DR. ANTHONY MCCULLAGH
- DR. KATHLEEN MILLS
- DR. CHARLOTTE MORRISON
- DR. CLIVE ROBERTS
- DR. RAVINDRA SHAH (CHAIR)
- DR. DAVID SWEET
- DR. J. DOUGLAS WATERFIELD
- DR. KEISUKE YAMASHIRO

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Aletomeh M*, Brondani MA
Faculty of Dentistry, The University of British Columbia, Vancouver, Canada

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[1]Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada; [2]Cancer Control Research, BC Cancer Agency, Vancouver, Canada

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[1]Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada; [2]Merck Frosst Centre for Therapeutic Research, Kirkland, Quebec, Canada

5 **Oral Health Promotion in the Community: The PACS Module**
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Faculty of Dentistry, The University of British Columbia, Vancouver, Canada

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Healthy Teeth Healthy Families Research Group, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada

7 **Unique FISH Patterns Associated With Poor Outcomes of Oral Lesions**
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[1]Oral Cancer Prevention Laboratory, BC Cancer Research Centre, Vancouver, Canada; [2]Department of Biomedical Physiology & Kinesiology, Simon Fraser University, Burnaby, Canada; [3]Faculty of Dentistry, The University of British Columbia, Vancouver, Canada

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[1]Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada (UBC); [2]Electrical & Computer Engineering, UBC; [3]Department of Oral Biological & Medical Sciences, Faculty of Dentistry, UBC

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Division of Endodontics, Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada

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Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada

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Laboratory of Periodontal Biology, Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada

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Choi M[1]*, Owen GR[1], Häkkinen L[1], Wu C[2], Larjava H[1]

[1]Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada; [2]University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania, USA

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Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada

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Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada

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Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada

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Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada

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Fan CY*, Richman JM

Department of Cell & Developmental Biology, Faculty of Science, Life Sciences Institute, The University of British Columbia, Vancouver, Canada

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Department of Oral Health Sciences, Faculty of Dentistry, Life Sciences Institute, The University of British Columbia, Vancouver, Canada

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Firth JD[1]*, Ekuni D[2], Putnins EE[1]

[1]Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada; [2]Preventive Dentistry & Pathology & Pathobiology, Okayama University Graduate School of Medicine, Dentistry & Pharmaceutical Sciences, Okayama, Japan

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Geetha-Loganathan P*, Nimmagadda S, Fu K, Whiting CJ, Richman JM
Department of Oral Health Sciences, Faculty of Dentistry, Life Sciences Institute, The University of British Columbia, Vancouver, Canada

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Gibson TL*, Cariño KMG, Harrison R
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Gu Y[1]*, Durham JS[2], Berean KW[3], Zhang L[1,3], Poh CF[1,2,3]
[1]Faculty of Dentistry, The University of British Columbia, Vancouver, Canada (UBC); [2]Department of Otolaryngology, Faculty of Medicine, UBC; [3]Department of Pathology & Laboratory Medicine, Faculty of Medicine, UBC

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Higashihori N[1]*, Lehnertz B[2], Rossi FM[2,3], Richman JM[1]
[1]Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada (UBC); [2]The Biomedical Research Centre, Faculty of Medicine, UBC; [3]Department of Medical Genetics, Faculty of Medicine, UBC

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Huh M*, Reynolds C, Craig BJ
Faculty of Dentistry, The University of British Columbia, Vancouver, Canada

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[1]Department of Biochemistry & Molecular Biology, Faculty of Medicine, The University of British Columbia, Vancouver, Canada (UBC); [2]Laboratory of Periodontal Biology, Department of Oral Biological & Medical Sciences, Faculty of Dentistry, UBC

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50 **Evaluation of Canal Instrumentation Using GT Series X™ versus Prosystem GT™**

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Wiens E[1]*, Lam S[2], MacAulay C[2], Poh CF[1,2]

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Wong ATT[1]*, Tong NR[2], Wyatt CCL[1]

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58 **Craniofacial Defect Regeneration Using Engineered Bone Marrow Mesenchymal Stromal Cells**

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RESEARCH CLUSTERS

- COMMUNITY & EDUCATIONAL RESEARCH CLUSTER
- iMATRIX RESEARCH CLUSTER
- CLINICAL RESEARCH, TECHNOLOGY TRANSFER & DENTAL MATERIALS SCIENCES RESEARCH CLUSTER

COMMUNITY & EDUCATIONAL RESEARCH CLUSTER

The research in this cluster relates to three of the four Canadian Institutes of Health Research themes: health services research; social, cultural, environmental, and population health; and clinical research–and to a range of educational studies. These domains are loosely interconnected and employ various quantitative and qualitative research methods and knowledge transfer. Our members conduct studies on diverse topics such as healthcare promotion, oral implants, dental caries, systematic literature reviews, and community service learning.

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To advance oral health through outstanding education, research, and community service.

iMATRIX RESEARCH CLUSTER

iMatrix is an interactive research cluster combining the research interests of 11 highly-active laboratories in oral and biomedical sciences. We conduct basic science research in areas such as cancer, cell behaviour, craniofacial development, integrins, molecular biology, periodontal disease, proteases, proteomics, and wound healing. Highly-motivated undergraduate and graduate students, post-doctoral fellows and other trainees, as well as interested collaborators, are welcome to contact our member laboratories.
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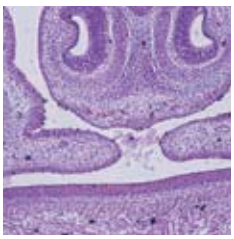
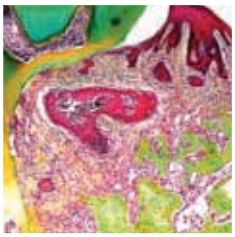
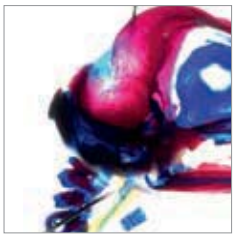

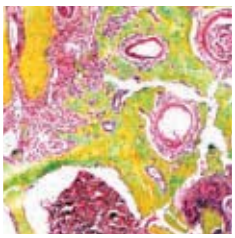
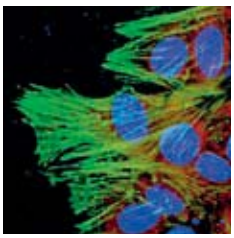

CLINICAL RESEARCH, TECHNOLOGY TRANSFER & DENTAL MATERIALS SCIENCES RESEARCH CLUSTER

This cluster encompasses groups engaged in research on cancer diagnosis and prevention, dental biofilms, dental hygiene, dental instruments and materials, dental sleep medicine, forensic dentistry, and interactive dental anatomy. Our areas of expertise include biomaterials, dental morphology, obstructive sleep apnea, oral cancer, and root canal irrigation. We study matters such as bacterial eradication, cellular interactions, cephalometrics, community outreach programs, computational fluid dynamics, diagnostic tools, DNA analysis, fracture mechanisms, molecular markers, novel disinfection strategies, oral care products, surface characterization, and treatment strategies.

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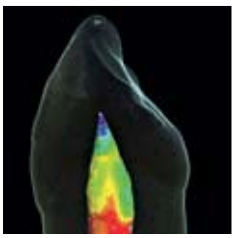
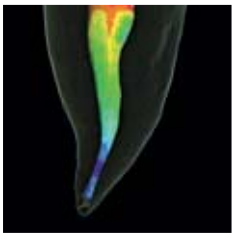
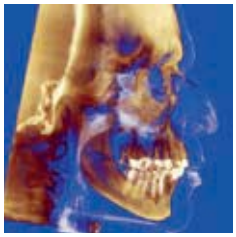
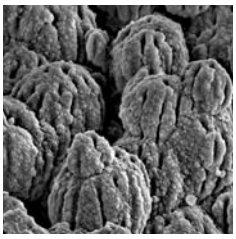








GRADUATE RESEARCH OPPORTUNITIES

PhD and MSc in Craniofacial Science

The UBC Faculty of Dentistry offers advanced study leading to a PhD or MSc in Craniofacial Science. The PhD program requires the successful completion of a research-specific curriculum, a comprehensive exam, and defense of a research-based thesis. A minimum of four years of full-time study is typically required. The MSc program requires successful completion of a research-specific didactic curriculum in conjunction with a research-based thesis. This program typically requires two years of full-time study; however, an extended part-time option for an MSc degree is available. Research options in one of the following three broad areas of study are available:

- Research in population health explores the complex interactions (social, cultural, environmental) that affect the oral health of individuals, communities, and populations.
- Oral health-related clinical research includes both interventional and observational studies focusing on the following: disease prevention, diagnosis, risk, treatment, prognosis, and health care.
- Basic science research in the areas of biomaterials, cell biology, developmental biology, microbiology, and molecular biology.

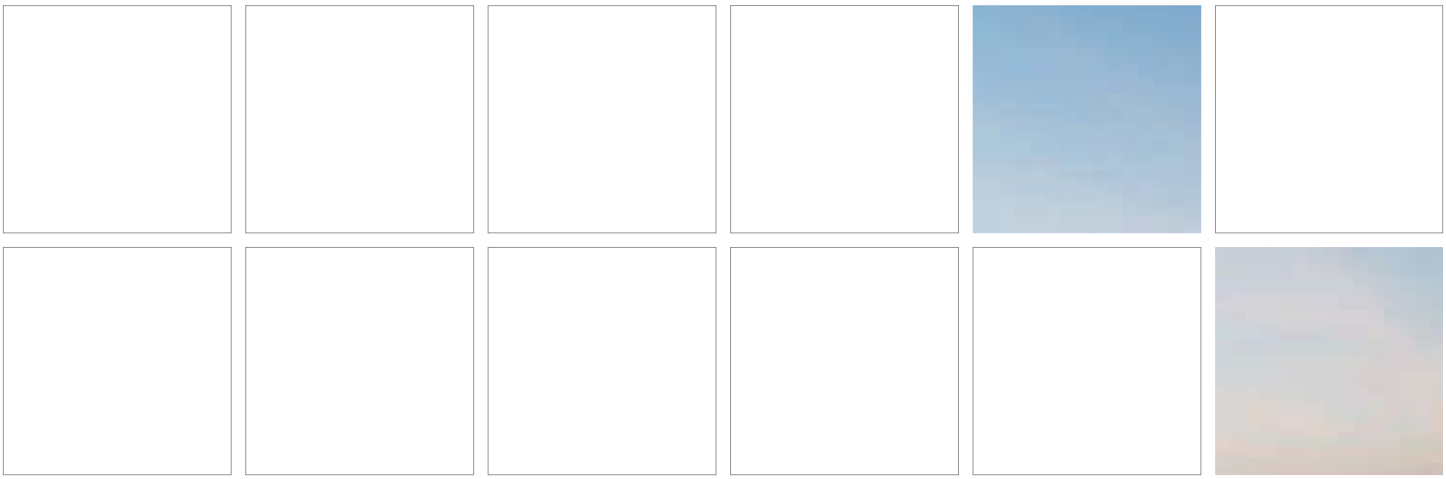
These graduate programs are available as stand-alone degrees or may be completed as a combined diploma in a clinical specialty with a PhD or MSc degree. Clinical specialty training options are available in Endodontics, Orthodontics, Pediatric Dentistry, Periodontics, and Prosthodontics. All programs are open to national and international applicants meeting appropriate admission and selection requirements. Combined degrees require a minimum of three years of full-time study if completed with an MSc or six years of full-time study if completed with a PhD. The following descriptions provide succinct overviews of the research conducted in the various graduate program areas.

Endodontics

The main focus of research in the Division of Endodontics is on eradication of microorganisms from the root canal system. Researchers in the Division have developed powerful and unique *in vitro* and *ex vivo* models for biofilms which simulate oral *in vivo* biofilms. These models are used to study the various ways of killing the infecting microbes and for developing new, synergistic ways of defending the resistant ecosystem against the established biofilms. As penetration of antimicrobial solutions into the peripheral parts of the root canal and also into the deeper layers of biofilm can be enhanced by a variety of mechanical (*e.g.* sonic and ultrasonic) means, endodontic researchers have initiated collaborations with industry to work on new devices intended to facilitate the performance of disinfecting agents in the challenging environment of the root canal. Instrumentation plays an important role in endodontic treatment by removing infected material from the root canal system and by creating space for effective delivery of disinfecting agents into the canal. One important line of research in the Division of Endodontics is studying the safety and effectiveness of different instrument systems currently on the market. The impact of file design on the eradication of root canal microbes is also studied.

Orthodontics

The clinical specialty of Orthodontics is dependent upon research at both the macro and micro levels. At one end of the spectrum, research ranges from the study of the diversity of normal and abnormal craniofacial morphology and function in different populations, to the efficiency and efficacy of treatment modalities, to the societal and economic strategies that govern access to care. At the molecular and cellular level, control mechanisms which signal tissue development and remodeling that relate to craniofacial growth and change are explored. Embryological morphometrics of cranial structures are assessed in three dimensions in order to determine the influence of different genotypes and other cell signals on craniofacial development. Mandibular movement and dental occlusion are monitored in 3D to determine relationships between mastication, airway function, temporomandibular function, and normal and abnormal occlusion. Finally, the impact of biomaterials on delivering orthodontic mechanics to the underlying dental and periodontal tissues will create advances in treatment techniques. Because orthodontics has such an influence on the dynamics of social interaction and quality of life in our modern lifestyle, there are opportunities for scholarly activity at all levels. This will not only reward individual curiosity but can lead to improvements and changes in our society as well as our general health and well-being.



Pediatric Dentistry

Research in the graduate specialty program in Pediatric Dentistry is focused on the general areas of craniofacial development, clinical research, and population health. The laboratory of Dr. Joy Richman studies embryonic craniofacial development. Dr. Richman primarily uses the chicken embryo but recently has started work on snakes and lizards. The work covers three themes: cleft lip, jaw patterning, and tooth replacement. The chicken is an excellent model for teasing apart the molecules involved in cleft lip because it is possible to directly access the face at critical stages and change the molecular landscape. Clefts can either be induced or rescued in a controlled manner. The roles of individual genes or whole signalling pathways can be studied. The chicken embryo is also accessible at much younger stages when the identity of the upper and lower jaw is being established. The snake and lizard models have been developed because these animals replace their teeth many times during life and mirror many aspects of human tooth replacement. This basic science research is applied in the clinical setting at the B.C. Children's Hospital Dental Department with Program Director Dr. Douglas Johnston, who is interested in assessing facial symmetry for cleft lip and palate using a 3dMD stereo camera. Current projects of UBC Dentistry Professor Dr. Rosamund Harrison include a randomized controlled trial testing the effectiveness of a dental caries prevention program for Cree mothers and their infants, a survey of general dentists in B.C. about their daily challenges of treating young children, and an evaluation of the UBC Special Children's Dental Program. It is anticipated that students in the graduate specialty program in Pediatric Dentistry will work with Dr. Harrison on research focused on oral health promotion in disadvantaged children, improving access to care for low-income children, and program evaluation.

Periodontics

Research opportunities in Periodontics are focused broadly on the molecular pathology of periodontal disease, periodontal and skin wound healing, clinical aspects of tissue healing around implants, and stem cell mediated regeneration of lost tissues. Periodontal disease pathology is studied using animal models such as rats and mice, including transgenic mice with genetic defects associated with the periodontal disease process. Wound healing studies also utilize various model systems, both *in vitro* as well as *in vivo*. Wounds are created in cell cultures, mice, pigs, and human subjects to collect data for a better understanding of the molecular events leading to scarless wound healing in the oral cavity and quick epithelial cell migration over the wound. At the molecular level, the focus is on cell adhesion molecules, proteoglycans, oxidative stress, signaling molecules, and cytokines. Periodontal tissue regeneration is studied using *ex vivo* expansion and transplantation of bone marrow derived stem cells into experimentally-induced periodontal defects. Clinical studies are focused on understanding the reasons for successful or compromised soft and hard tissue healing around dental implants. There are opportunities for qualified MSc and PhD graduate students who are interested in working on these projects. For more information regarding the laboratory studies, please use the following link: http://www.dentistry.ubc.ca/research/periodontalbiology.

Prosthodontics

Research opportunities in Prosthodontics and Dental Geriatrics are broad and include community healthcare needs, psychosocial aspects of aging, caries, and clinical outcomes of implant prostheses. The ELDERS (Elders Link with Dental Education, Research and Service) group in the UBC Faculty of Dentistry (http://www.elders.dentistry.ubc.ca) works as a multidisciplinary team of researchers, teachers, and service providers from various UBC faculties. The team currently includes prosthodontists, dentists, dental hygienists, social workers, sociologists, psychologists, nurses, geriatricians, and statisticians from UBC. There are several MSc and PhD students supported by about 20 full- or part-time staff and several grants funded by the Canadian Institutes of Health Research held by the active researchers in the group. The group began in the 1980s to document the distribution of oral health problems in long-term care facilities, and to explore ways of managing the problems encountered among disabled elders. Since then it has amassed a growing base of epidemiological and health-service data on the healthcare status and needs of frail elders, and more recently on disparities in oral healthcare in British Columbia. The large database alone provides a rich source of research material for clinical studies of interest to prosthodontists. Moreover, the network of connections with clinicians, researchers, and policy-makers around the province and beyond offers a useful resource for research. Following the initial epidemiological and biomaterial studies, the group expanded the research agenda to include studies of oral implants and related prostheses, caries management, and delivery of healthcare to vulnerable populations. In summary, UBC Dentistry has a very active research program beyond the laboratory-based studies of biomaterials which have been the traditional research interest of prosthodontic programs. The broader-based research activities of the Faculty offer a focus on the healthcare and prosthodontic needs of an aging community, and of a community that is multicultural and socioeconomically diverse.

POSTGRADUATE OPPORTUNITIES

Oral Medicine and Oral Pathology

The Postgraduate Oral Medicine and Oral Pathology (OMOP) Residency Program offers specialist training in conjunction with UBC-affiliated teaching hospitals (BC Cancer Agency, Vancouver Hospital & Health Sciences Centre, and St. Paul's Hospital). The program consists of a three- to four-year hospital-based residency in one of three pathways: Oral Medicine (OM), Oral Pathology (OP), or both (combined OMOP). Completion of any of the three pathways leads to a certificate and eligibility to take the Royal College of Dentists (Canada) Fellowship examinations.

The program includes a clinical practice core curriculum supported by foundational knowledge. Training in the core curriculum includes diagnosis and management of oral mucosal disease; orofacial disorders arising from ageing, systemic disease, and medical therapies; diagnosis and management of non-surgical salivary gland disorders; and assessment and participation in the management of diseases of the jaws requiring surgical treatment. The OM pathway includes training in the oral/dental management of complex medically compromised patients and diagnosis and treatment of orofacial pain and other neurosensory disorders. The OP pathway includes additional training in surgical and anatomical histopathology and laboratory procedures, techniques, and diagnosis. Depending upon the chosen pathway (OM, OP, or the combined OMOP), clinical training will include rotations in Anesthesia, Internal Medicine, Rheumatology, Neurosciences, Dermatology, Diagnostic Pathology, Oncology, Otolaryngology, Surgical Pathology (including autopsy), Head and Neck Pathology, and/or Dermatopathology.

The didactic component of the program involves participation in seminars and case presentations at the postgraduate level, literature reviews, and teaching rounds. Teaching opportunities exist in the curricula of the undergraduate and graduate dental programs. In addition, residents will participate in ongoing basic and/or clinical research studies, and will be expected to contribute to at least one published article.

For more information concerning the OMOP Residency, please use the following link: http://www.dentistry.ubc.ca/education/postgrad/omop.

General Practice Residency

The University of British Columbia and three UBC-affiliated teaching institutions (BC Cancer Agency, BC Children's Hospital, and Vancouver Hospital & Health Sciences Centre) together offer eleven positions in a one- or two-year dental residency program beginning June 15 each year. One resident is appointed specifically to BC Children's Hospital, one resident to Geriatric Dentistry, while the other nine residents are rotated through the other teaching hospitals, St. Paul's Hospital, community clinics, and the Specialty Clinics at UBC Dentistry. To further expand the comprehensive training each resident receives, a variety of local, provincial, and international learning opportunities are available including the following.

The UBC Faculty of Dentistry Specialty Clinics is an additional site to which the General Practice Residents are rotated. In this modern, four-operatory clinic located in the dental school, assigned residents are exposed to one-on-one training in a variety of disciplines.

A rotation to the Skidegate Dental Clinic and Massett Dental Clinic in the Queen Charlotte Islands is provided for each resident. Care to the people of Haida Gwaii is provided and supports a community dental health strategy. Residents may also participate in rotations to Kelowna and Nisga'a Valley in Terrace.

Two residents per year are eligible to participate in the Vietnam rotation. This international experience is designed to broaden the scope of learning for dental postgraduate students to include an understanding of regional disease processes, treatment modalities, and cultural competency. Rotations are also available to Birmingham, UK.

During the course of the year, residents may also rotate to the Portland Community Clinic in the Vancouver Downtown Eastside. The mission of the Portland Community Clinic is to provide comprehensive oral health care to individuals on income assistance, job training, and other pre-employment programs.

A variety of community rotations to Victoria and Prince George are also available.

Applicants may choose to apply either to the Pediatric Residency, Geriatric Residency or to the General Practice Residency. All programs are approved by the Commission on Dental Accreditation of Canada.

For more information concerning the General Practice Residency, please use the following link: http://www.dentistry.ubc.ca/education/postgrad/gpr.

NOTES

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GRADUATE/POSTGRADUATE STUDIES

NEW CLINICAL SPECIALTY GRADUATE PROGRAMS

PhD or MSc combined with a DIPLOMA in ORTHODONTICS

This program will offer a minimum three year MSc degree or a minimum six year PhD degree combined with a Diploma in Orthodontics.
Applicants must hold a DMD or its equivalent.

PhD or MSc combined with a DIPLOMA in PEDIATRIC DENTISTRY

This program will offer a minimum three year MSc degree or a minimum six year PhD degree combined with a Diploma in Pediatric Dentistry.
Applicants must hold a DMD or its equivalent.

PhD or MSc combined with a DIPLOMA in PROSTHODONTICS*

This program will offer a minimum three year MSc degree or a minimum six year PhD degree combined with a Diploma in Prosthodontics.
Applicants must hold a DMD or its equivalent. * Pending UBC Board of Governors approval.

Applications are being accepted for September 2010 intake.

ADDITIONAL GRADUATE PROGRAMS

PhD or MSc in CRANIOFACIAL SCIENCE

These programs are research-oriented with no clinical components. The MSc degree normally requires two years full-time study and can also be taken part-time. The PhD degree requires a minimum of three years full-time study. Both offer research training in craniofacial sciences (cellular/molecular, clinical trial, or population health). **Application Deadline: January 31**

MSc combined with a DIPLOMA in PERIODONTICS

This program offers a dual MSc degree and Diploma in Periodontics. This three year program is recognized by the American Dental Association and the American Academy of Periodontology. The dual program will require a minimum of three years to prepare a student for clinical practice in periodontics and to provide research experience. Applicants must hold a DMD or its equivalent. **Application Deadline: October 1**

MSc combined with a DIPLOMA in ENDODONTICS

This program offers a dual MSc degree and Diploma in Endodontics. The dual program will require a minimum of three years to prepare a student for clinical practice in endodontics and to provide research experience. Applicants must hold a DMD or its equivalent. **Application Deadline: October 1**

For more information on graduate programs visit www.dentistry.ubc.ca
or contact: Viki Koulouris, vickybk@interchange.ubc.ca
T 604 822 4486 F 604 822 3562

POSTGRADUATE PROGRAMS

ORAL MEDICINE and ORAL PATHOLOGY RESIDENCY PROGRAM

This postgraduate residency training in Oral Medicine and Oral Pathology is offered in conjunction with University-affiliated teaching hospitals. It consists of a three- or four-year hospital-based, stipended residency in one of three pathways: Oral Medicine, Oral Pathology, or both specialties combined.

GENERAL PRACTICE RESIDENCY PROGRAM

In conjunction with University-affiliated teaching hospitals and community clinics, the Faculty offers positions in a one-year dental residency program beginning June 15. These residency positions **may** include pediatric or geriatric dentistry.

For more information on postgraduate programs visit www.dentistry.ubc.ca
or contact: Dorothy Stanfield, dstanf@interchange.ubc.ca
T 604 822 0345 F 604 822 4532



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