Report for NCHOR on the North American Saliva Bank Workshop

Walter L Siqueira and Colin Dawes (organizers)

On June 1 and 2, 2015, in London, Ontario, at the Ivey Spencer Leadership Centre, a Workshop was held to discuss the creation of a North American Saliva Bank (NASB) (Appendix 1) and we had the presence of both American and Canadian researchers at this two-day event. In total there were more than 25 participants, representing the following dental schools: University of Alberta, Manitoba, McGill, Montreal, Toronto, and Western. In addition, NIDCR/NIH and CIHR representatives were also present, (either in person or by video) as well as researchers from Boston University and UCLA. (Appendix 2)

The conference had the special assistance of Bill All from "Unconference.net". Bill is an expert moderator of workshops of a similar size as those of the North American Saliva Bank Workshop.

On the first day the workshop had short presentations, for a maximum of 20 minutes each, followed by group discussion with questions created prior to the meeting by the organizers and moderator (Appendix 3). During the group discussion, all participants made significant contributions towards the realization of this unique initiative aimed at facilitating salivary research on both therapeutic and diagnostic levels (pictures of the event attached). On the second day, the workshop focused on the creation of work groups to develop plans for creation of a NASB.

As outcomes, several significant decisions were made, with the ultimate goal to further our knowledge related to all disciplines comprising saliva research. In these two days, it was very important that we initiated the creation of a steering committee and several sub-committees (ethics, SOP, clinical data, informatics and epidemiology) to develop solid plans on the most appropriate techniques for saliva collection, saliva storage, management of inventories etc.

In addition, we created a collegial environment among the top salivary researchers in Canada and the USA to work together for standardizing such procedures as collection of saliva samples over a wide age spectrum (infant to adult) and including samples representing differences in health status of the donors.

We plan to have the first conference call meetings of the several committees in the fall and we will keep NCHOR updated on the decisions and next steps of the NASB.

Thank you again for the financial support of this important initiative in oral health research.

Appendix 1 – Agenda of the Workshop.
Appendix 2 - List of participants.
Appendix 3 – Questions for the group discussions.
Appendix 4 – Pictures during the event.

Appendix 1

North American Saliva Bank Workshop
May 31, June 1 & 2, 2015
AGENDA

MAY 31	
	Arrival of delegates at the **Ivey Spencer Leadership Centre, 551 Windermere Rd** Western University, London, ON
6:00-8:00 pm	Dinner for Overnight Guests - Asher's Dining Room
JUNE 01	
7:00 am	Breakfast available [for overnight guests] - Asher's Dining Room
	JUNIPER ROOM – All Attendees
8:00 am	Welcome and Introduction
8:15 am	'Saliva and Biomarkers - An Overview' – Dr. Colin Dawes
8:45 am	'North American Saliva Bank - Vision, Challenges & Perspectives' and a Report on the March 11/15 Boston meeting – Dr. Walter L. Siqueira
9:15 am	'TBD' - Dr. Andrew Brooks (via skype)
9:35 am	'Biobank, Translational Research Centre' – Dr. Douglas Fraser
9:55 am	*Coffee break – South Wing*
10:25 am	Split into groups of 5-6 people for group discussions of the preceding presentations
11:25 am	Short reports from the individual groups and discussion
Noon	**Lunch - Asher's Dining Room**
1:00 pm	'Data Analytics @ Western - Research and Facilities' – Dr. Michael Bauer
1:20 pm	'Applied Diagnostic & Prognostic Research on Biomarkers: An orientation' – Dr. Igor Karp
1:40 pm	Group Discussion
2:35 pm	*Coffee break – South Wing*
2:50 pm	'Saliva Collection'– Dr. Colin Dawes
3:10 pm	'Whole Saliva Handling and Storage - Lessons learned in Boston' – Dr. Frank G. Oppenheim

Schulich MEDICINE & DENTISTRY

Réseau canadien de recherche en santé buccodentaire
Network for Canadian Oral Health Research

Western

3:30 pm	Group Discussions - Split into groups of 5-6 people to discuss preceding presentations
4:20 pm	Short reports from the individual groups and discussion
4:30 pm	'The Advancement of Diagnostic-Accuracy and Treatment-Efficacy - The Critical Importance of Accurate Historical and Clinical Records' – Dr. Howard C. Tennenbaum
5:00 pm	'Establishing a Research Database: What is the REB's role' – Dr. Erika Basile
5:20-6:30 pm	Group Discussion
7:00-8:30 pm	**Dinner - Asher's Dining Room (ALL WORKSHOP ATTENDEES)**
JUNE 02	
7:00 am	Breakfast available [for overnight guests] - Asher's Dining Room
	JUNIPER ROOM
8:30 am	'North American Saliva Bank - Structural Organization, Leadership Issues and Funding Opportunities' – Dr. Walter L. Siqueira
9:00 am	Group Discussion
10:00 am	*Coffee break – South Wing*
10:30 am	Group Discussion
12:30	**Lunch - Asher's Dining Room**
1:30 pm	Further discussions, as needed

THANK YOU TO OUR SPONSORS

The Network for Canadian Oral Health Research (NCOHR)

Schulich Medicine & Dentistry

Trudell Medical International

Western Research

Appendix 2

NORTH AMERICAN SALIVA BANK WORKSHOP
MAY 31, JUNE 1 & 2, 2015

WORKSHOP PARTICIPANTS

IBTISAM AL-HASHIMI, BDS, MS, PhD
Professor & Director Salivary Dysfunction Clinic/ Baylor College of Dentistry, Texas A&M University
Ial-Hashimi@bcd.tamhsc.edu

Dr. Al-Hashimi is a Professor and Director of the Salivary Dysfunction Clinic and the Stomatology Research Laboratory in the Department of Periodontics. She received her Bachelor degree in Dental Surgery and Diploma in Oral Surgery from the University of Baghdad. She received her Master of Science degree in Oral Science and PhD from State University of New York at Buffalo. Dr. Al-Hashimi's clinical, laboratory research and work is directed towards improving the diagnosis and treatment of salivary gland dysfunction & Sjögren's syndrome, and better understanding the underlying cause(s) of multi-system exocrinopathy; i.e. mechanism(s) involved in the pathogenesis of multi-system exocrinopathy.

MARYAM AMIN, DMD, MSC, PHD
Division of Pediatric Dentistry, Division of Community Engagement, University of Alberta
Maryam.amin@ualberta.ca

Dr. Amin's research interests are in pediatric dentistry and oral health inequalities with a focus on psychosocial determinants of oral health and access to dental care using innovative qualitative, quantitative, and mixed methods.

ERIKA BASILE
Office of Research Ethics, Western University
ebasile@uwo.ca

The Office of Research Ethics, on behalf of Western University's Research Ethics Boards (REB), manages the approval and monitoring process for the use of humans in research at Western and its affiliated hospitals and research institutes. All research involving humans conducted by faculty, staff or students at Western or its affiliated hospitals or research institutes must be approved by a Western-sanctioned review board.

MICHAEL A. BAUER
Computer Science, Western University
bauer@csd.uwo.ca

Michael A. Bauer is a Professor of Computer Science at the University of Western Ontario, London, ON, Canada. His research interests lie in the fields of a) distributed systems, cloud computing, high performance and parallel computing where he focuses on performance analysis and mechanisms for automatic management; b) large scale data analytics in these computing environments, and the application of analytics, data mining methods for modeling in medical and health domains. He is the Scientific Director of SHARCNET (www.sharcnet.ca)—a multi-university high performance computing grid. He is also the principal investigator at Western Ontario for the SOSCIP (Southern Ontario Smart Computing Innovation Platform (www.soscip.org)) Data Analytics Cloud. He was Chair of the Computer Science Department at Western Ontario from 1991 to 1996 and from 2002 to 2007. From 1996 to 2001,

he was the Associate Vice-President Information Technology at the University of Western Ontario. He served on NSERC's (National Science and Engineering Research Council) Computer Science Grant review committee from 2005 to 2008 and was chair of the committee in 2008–2009.

ANDREW BROOKS, PH.D.
Rutgers University Cell and DNA Repository (RUCDR), Bionomics Research and Technology Center (BRTC)
Environmental and Occupational Health Sciences Institute
Department of Genetics, Robert Wood Johnson Medical School, Rutgers University
Brooks@dls.rutgers.edu

Dr. Brooks is a molecular neuroscientist whose research focuses on deciphering the molecular mechanisms that underlie memory and learning. These studies investigate gene-environment interactions in the context of aging, neurodegenerative disease and neurotoxicant exposure. Dr. Brooks is a well-recognized genomicist and has been involved in the development and implementation of cutting edge molecular based technologies for nucleic acid and protein analyses. He has worked to automate the RUCDR and build the service entity that provides high throughput sample management and analysis for DNA, RNA and protein-based technologies to hundreds of labs globally. Research Highlights: Enhancing basic and clinical science programs by providing high throughput genomics-based technologies.

COLIN DAWES, BSc, BDS, PhD
Dept of Oral Biology, Faculty of Dentistry, University of Manitoba
Colin_Dawes@umanitoba.ca

I have officially retired but I still try to keep up to date on many aspects of saliva. Over the years, I have extensively investigated the physiological factors which influence salivary flow rate and composition, with a particular interest in salivary proteins. I have also developed a model of oral clearance which has been widely accepted and in which oral clearance can be represented by the action of an incomplete syphon. Subsequently I realized that saliva is present in the mouth as a thin film (mean thickness 0.1 mm) and developed ways of estimating the salivary film velocity in different regions of the mouth. The results were incorporated into mathematical models of the depth and duration of the Stephan curve in dental plaque. More recently I have worked with a group, primarily with oral medicine expertise, on the multitude of problems for patients with salivary gland dysfunction, especially xerostomia. I previously showed that xerostomia is experienced when the salivary flow rate is reduced to 40-50% of normal for a given individual.

LUDA DIATCHENKO, MD, PhD
Department of Anastasia, School of Medicine, School of Dentistry, McGill University
Luda.diatchenko@mcgill.ca

Dr. Diatchenko is a Canada Excellence Research Chair in Human Pain Genetics, Professor, Faculty of Medicine, Department of Anesthesia, and Faculty of Dentistry, at McGill University, Alan Edwards Centre for Research on Pain. She earned her MD and PhD in the field of Molecular Biology from the Russian State Medical University. Dr. Diatchenko started her career in industry; she was a Leader of the RNA Expression Group at Clontech, Inc., and subsequently, Director of Gene Discovery at Attagene, Inc. During this time, Dr. Diatchenko was actively involved in the development of several widely-used and widely-cited molecular tools for the analysis of gene expression and regulation. Dr. Diatchenko's academic career started at 2000 in the Center for Neurosensory Disorders at the University of North Carolina. Her research since then is focused on determining the cellular and molecular biological mechanisms by which functional genetic variations impact human pain perception and risk of development of chronic pain conditions, enabling new approaches to identify new drug targets,

treatment responses to analgesics, and diagnostic. Multiple collaborative activities allow the Diatchenko group to take basic genetic findings all the way from human association studies, through molecular and cellular mechanisms, to animal models, and ultimately to human clinical trials. She is a member and an active officer of several national and international scientific societies, including the International Association for the Study of Pain, the American Pain Society, and the American Society of Human Genetics.

JEFF DIXON, DDS, PhD
Physiology & Pharmacology, Schulich School of Medicine & Dentistry, Western University
jeff.dixon@schulich.uwo.ca

Dr. Dixon is a Professor of Physiology and Pharmacology and of Dentistry at Western University. Dixon's research focuses on mechanisms underlying the formation and destruction of bone. Goals are to understand the regulation of these processes in health and disease, and to identify therapies to inhibit bone loss and stimulate bone formation. Dixon is a member of the Advisory Board of the CIHR Institute of Musculoskeletal Health and Arthritis. From 2001-2009, Dixon served as Director of the CIHR Group in Skeletal Development and Remodeling, an interdisciplinary team focusing on musculoskeletal and dental health research.

ELHAM EMAMI, DDS, MSc, PhD
Faculty of Dentistry, Université de Montréal
Elham.emami@umontreal.ca

Dr. Emami is specifically interested in looking at the different factors affecting oral health in the context of general health and public health to see how best to implement evidence-based approaches and translate knowledge into informed decision-making. To achieve this, her research program is deliberately multidimensional and collaborative, with the ultimate goal being to decrease the burden of poor oral health at the individual, community and population levels. Broken down into her three research themes, her separate goals are:

- Intervention: testing prosthetic treatments to improve oral health and quality-of-life of toothless people;
- Access: addressing social and distance barriers in access to dental care services;
- Impact: discovering how poor oral health can affect general health.

She explains, "In the intervention theme, I am conducting clinical trials to test the effectiveness of prosthodontic interventions in promotion of oral health, general heath and quality of life for edentate individuals, especially elders. Through this theme, currently I am leading the CIHR-funded randomized control trial to the test the effect of wearing the prosthesis at night on sleep and quality of life of elders. Through the access theme my research helps to better understand the social/spatial pathways of oral health disparities. I have established a strong partnership with rural/remote stakeholders and developed a series of ongoing collaborative community-based projects to develop and implement innovative strategies targeting oral health prevention and promotion. Recently CIHR funded our knowledge synthesis project on the integration of oral health in primary health care. Finally, the impact theme provides causal explanations on the role of oral health in general health. In our ongoing research project on this theme, we are investigating the role of poor oral health in the risk of sporadic colorectal cancer."

DOUGLAS D. FRASER, MD, PhD, FRCPC
Physiology & Pharmacology, Schulich School of Medicine & Dentistry, Western University
douglas.fraser@lhsc.on.ca

Dr. Fraser is a Consultant in Paediatric Critical Care/Trauma Medicine and Acquired Brain Injury (Western University). He is Director of the London Translational Research Centre and Co-Chair of the Biobanks group at NIH/NICHD. He received his MD/PhD in Neuroscience, Physiology and Biophysics at the University of Calgary (funded by the MRC, NSERC and AHFMR). He subsequently trained in Paediatrics at Queen's University, and then he received clinical fellowship training at the University of Ottawa in Critical Care Medicine. Dr. Fraser is a Fellow of the Royal College of Physicians and Surgeons of Canada and has been the recipient of prestigious research training awards from the American Academy of Pediatrics, the Society for Pediatric Research and the Canadian Institutes of Health Research. Dr. Fraser's research is focused on the epidemiology and cellular mechanisms of acquired brain injury, including if/how systemic inflammation causes breakdown of the blood brain barrier and subsequent brain dysfunction.

IGOR KARP
Epidemiology & Biostatistics, Western University
igor.karp@schulich.uwo.ca

Igor Karp is an Associate Professor in the Department of Epidemiology and Biostatistic, Schulich School of Medicine & Dentistry, Western University. Dr. Karp received an MD from Astana State Medical Academy in 1997, an MPH from the University at Albany, SUNY, in 2000, and a PhD in Epidemiology from McGill University in 2005. His research interests include the theory of epidemiology and applied health research, pharmacoepidemiology, cancer epidemiology, prognostic modeling.

GOMAA NOHA, BDS, MSC
Faculty of Dentistry, University of Toronto
noha.gomaa@mail.utoronto.ca

Noha Gomaa is a PhD student at the Faculty of Dentistry, University of Toronto, Discipline of Dental Public Health. Her research lies at the social-biological interface of disease, where she is interested in how the social and psychosocial environment alter immune responses. Her work examines the effect of socioeconomic position, psychosocial stress and related stress hormones on innate immunity in saliva and blood samples. This interdisciplinary work will have important implications for public health policies and addressing the social determinants of health.

SAHZA HATIBOVIC-KOFMAN, DDS, MDSc, PhD, FRCD(C)
Division of Orthodontics & Paediatric Dentistry
Schulich School of Medicine & Dentistry, Western University
sahza.kofman@schulich.uwo.ca

Dr. Hatibovic-Kofman's research is focused on investigation of pit and fissure sealants in laboratory and clinical settings. Laboratory study was done with Poonam Sekhon (DDS candidate), and is ready to be submitted for publication. Long term clinical study is going (started 2013) on at the Children's clinic at WU and three private offices (Dr. Schnider-Friedman, Dr. G. Richmond and G. Payne). The group has more than 500 patients; two students will start collecting and analyzing data this summer.

EVA HELMERHORST, MS, PhD
Henry M. Goldman School of Dental Medicine, Boston University
helmer@bu.edu

Research by Helmerhorst and coworkers is focusing on the role of the microbiome of the upper gastro-intestinal tract, the oral cavity, in the digestion of dietary gluten. Dietary gluten comprises a family of proteins that are abundantly present in the Western diet. Gluten proteins are fairly difficult to digest because of their unusual amino acid content and -sequence. In genetically predisposed individuals, gluten proteins elicit an auto-immune response leading to the destruction of the villi of the small intestine thus interfering with efficient uptake of nutrients causing celiac disease. The predominant amino acids in the gluten sequences are proline (Pro) and glutamine (Gln). Our recent investigations indicate that human saliva contains unique enzymes that can cleave the peptide bond C-terminal to the Xaa-Pro-Gln sequence. This tripeptide is prevalent in T-cell stimulatory gluten domains. While the human digestive enzyme system apparently lacks the capacity to neutralize essential immunogenic gluten domains implicated in celiac disease, such activities are naturally present in the oral microbial proteasome. These novel findings offer clinical insights as well as therapeutic perspectives for the treatment of celiac disease.

LESLIE P. LAING, BSc, BEd, MSc, PhD, DDS, MSc, FRCD(C), FAP
Discipline of Prosthodontics, Faculty of Dentistry, University of Toronto
leslie.laing@dentistry.utoronto.ca

Dr. Laing currently holds a full-time position at the Faculty of Dentistry, University of Toronto, where she teaches undergraduate Prosthodontics at both a didactic and clinical level. In addition, she has a clinical private practice where the majority of patients require complex full-mouth Prosthodontic rehabilitation, many of whom suffer from dry mouth, and in particular from Sjögren's Syndrome (SS), an auto-immune disorder that affects over 430,000 Canadians, the majority of whom are post-menopausal women. She is currently conducting and/or initiating numerous studies of SS patients: oro-facial altered sensation, quality of life, the effect of various oral moisturizers, the effect of catechins on salivary stimulation, the ancient technique of oil-pulling with Virgin Coconut Oil, the microbiome profile of plaque, the psychology of males having SS, and the prognosis of dental implants in SS patients. She is on the Board of Directors and the Medical Advisory Board of the Sjögren's Society of Canada.

AMANDA MELILLO, PhD
Director, Salivary Biology and Immunology Program, DER, NIDCR, NIH
amanda.melillo@nih.gov

Dr. Melillo is the program director for the Salivary Biology and Immunology Program at the National Institutes of Health (NIH), National Institute of Dental and Craniofacial Research (NIDCR). This program supports extramural basic and translational research on saliva, salivary gland biology, Sjögren's syndrome, and immune aspects of oral diseases such as caries and periodontal diseases including host responses to microbes, immunology of biofilms, oral inflammation, immunotherapy, immune-pathologies, and host susceptibility to infection.

FRANK OPPENHEIM, DMD, CAGS, PhD
Henry M. Goldman School of Dental Medicine, Boston University
fropp@bu.edu

General: Structure and Function of Proteins. Regulation and control of exocrine processes. Identification, isolation and characterization of functionally important salivary and gingival fluid

proteins. Oral host defense mechanisms in oral and systemic diseases. Development of salivary diagnostics.

Specific: Research in salivary biochemistry and physiology has resulted in discoveries which contributed significantly to our understanding of oral host defense mechanisms in the oral cavity. Work conducted in this area led to the recognition that salivary components can modulate the most prevalent oral diseases, tooth decay, gingivitis and periodontitis. The major focus of this research was on the structure and function of salivary proteins and their interactions with oral soft and hard tissues. Early work led to the recognition that specific salivary proteins have a high selectivity for hydroxyapatite surfaces and are the principal precursor molecules forming the acquired enamel pellicle. This pellicle structure is a protein film covering tooth surfaces exerting important functions with respect to enamel remineralization and bacterial colonization. In pursuing pellicle research, the first major and hitherto unknown proline-rich salivary protein family was isolated and these proteins were named PRPs recognizing the significance of their unusual composition and possible role in tooth integuments. Isolation and characterization of these proline-rich phosphoproteins made it feasible to understand the mechanisms by which the inorganic crystalline enamel is maintained over a life time and this led to the recognition that salivary secretions are vital for the protection of the dentition. Recent proteomics approaches have allowed the direct identification and characterization of pellicle formed in vivo supporting and expanding the knowledge base created by the earlier classical biochemical characterization conducted in our laboratory. This basic science work contributed significantly to the clinical practice of dentistry by changing the approach to treatment of early caries lesions. The pellicle precursor proteins isolated from saliva were found to be critical for maintaining saliva supersaturated with respect to calcium and phosphate salts thus allowing early caries lesions or “white spot enamel” to undergo repair. This has led to a major change in the practice of pediatric dentistry by not penetrating incipient caries lesions during diagnostic procedure to permit remineralization to occur.

Another major research focus was the first isolation and full characterization of salivary histatins, a unique family of small molecular weight cationic proteins only present in human parotid and submandibular secretions. The elucidation of the full amino acid sequences of these proteins allowed an in depth investigation of their broad-spectrum antimicrobial activities and mechanisms of action. These characteristics include direct microbicidal effects as well as indirect antimicrobial properties such as neutralization of toxins and enzymatic inhibition. The dual function of these peptides discovered make them attractive candidates as templates for the development of second generation antibiotics lacking the side effects commonly encountered with artificial and non host-derived antibiotics. Interestingly, this work revealed that histatins contain a functional domain with antimicrobial activities equal to or in excess of those of native histatins. This led to several patents aimed at the exploitation of such histatin-based peptides for preventive or therapeutic approaches not just in the oral cavity but also in several medical applications. The clinical implications of this work has already led to approaches exploring the utilization of such anti-microbial peptides by direct applications such as mouth rinses as well as gene therapy approaches in the management of oral bacterial and fungal infections. Such anti-bacterial approaches are of interest in combating caries, gingivitis and periodontal disease. The antifungal activity of such histatin peptides has also led to evaluate the clinical use of such peptides in therapeutic regimens used against Candida albicans infection, commonly found in immuno-suppressed patients such as subjects afflicted with HIV.

The fundamental quest of salivary protein characterization is of interest for the development of clinical means to help patients suffering from hyposalivation or “dry mouth syndrome”. This work has led to the elucidation of functional domains within the structure of a number of salivary proteins. These functional domains exhibited biological activities and in some cases activities surpassing that of the native protein. This discovery has resulted in promising tools to use these functional domains for therapeutic applications designed for host protection.

Another focus of our work is the use of saliva as a diagnostic tool for disease detection, monitoring disease progression and identification of patients at risk to develop disease. Over the last 15 years our laboratory has been interested in developing methods suitable for using salivary samples for the diagnosis of oral as well as systemic medical conditions. These studies involve state-of-the-art

bioengineering technologies and involve close collaboration with medical subspecialties to compare "salivary patterns" of healthy individuals with those of patients displaying well defined clinical phenotypes. Such studies were conducted with NIH support provided by 2 U01 grants between 2003 and 2013 representing a team effort comprising expertise in various areas of science and engineering. Our first significant result comprised renal patients resulting in a saliva based test-strip assay to assess end stage renal patients for the need of dialysis treatment. Ultimately these efforts led to the development of a miniaturized integrated platform for the diagnosis of respiratory diseases containing all the necessary reagents and components required for saliva analysis with respect to specific proteins and peptides. The ready access to saliva, the non-invasive nature of sampling, and the availability of adequate amounts make this body fluid very attractive to be used for diagnostics employing fully automated lab-on-a-chip point of care devices.

Overall, both the therapeutic as well as the diagnostic potential of saliva constituents promise to be of significant importance for a variety of oral disease manifestations such as caries, periodontal disease and Sjogren's syndrome as well as oral cancer and other conditions caused by hyposalivation and xerostomia. Treatment formulations exploiting host derived salivary functional proteins or peptides may also provide new avenues for the large fraction of the elderly population who suffer from medication side effects reducing or suppressing their salivary flow.

ZEESHAN SHEIKH, DipDH, BDS, MSc, PhD
Faculty of Dentistry, University of Toronto
zeeshan.sheikh@utoronto.ca

Dr. Sheikh is a post-doctoral fellow in the Department of Matrix Dynamics. He received his Diploma in dental hygiene (2001) and Bachelor's degree in dentistry, BDS (2004). He continued to work as a dental surgeon in hospitals and private practices for 2 years before proceeding to obtain an MSc degree in dental and biomaterials from Queen Mary, University of London (QMUL) in 2007 with distinction. During his MSc he worked on the synthesis and characterization of polymeric guided tissue regeneration (GTR) membranes for periodontal regeneration applications. He then joined Altamash Institute of Dental Medicine (AIDM) as Head of the Department of Dental Materials and Preclinical Dentistry (2007). He also continued to work as an Assistant Professor in the Department of Oral Anatomy. He then proceeded to obtain a PhD from McGill University, Faculty of Dentistry (2014). During his PhD his work was related to bone grafting and augmentation for dental and orthopaedic applications using synthetic bone replacement graft materials. His research expertise lies in the fabrication and characterization of bone graft substitutes.

WALTER SIQUEIRA, DDS, PhD
Departments of Dentistry and Biochemistry, Schulich School of Medicine & Dentistry, Western University
http://www.biochem.uwo.ca/fac/siqueira

Dr. Walter Siqueira, is one of the first and only dental clinician-scientists in Canada conducting salivary proteome research. His research has focused on how saliva could be used to improve the health of patients, both as a diagnostic tool and as a therapeutic one. His current interests focus on developing a synthetic protein or peptide with all the protective characteristics of acquired enamel pellicle (AEP), to use in a toothpaste or mouthwash to improve the protective outcome. He is also presently collaborating with Western's Faculty of Engineering, health science and Brazilian, Turkish and Americans researchers to develop a point-of-care, easy diagnostic tool for systemic disease such as dengue fever or pulmonary diseases. His research is funded by CIHR, NSERC and CFI grants and International grants from ITI foundation (Switzerland). In addition, Dr. Siqueira holds the prestigious title of CIHR New Investigator.

JASON SUGGETT, PhD
Group Director, Science and Technology, Trudell Medical International (TMI)
jsuggett@trudellmed.com

TMI develops and manufactures pharmaceutical aerosol drug delivery devices for human and animal health application. We supply the pharmaceutical and health care industry with branded and custom aerosol drug delivery devices and solutions to help ease the burden that respiratory challenges can inflict on patients and their caregivers. Medical researchers have come to recognize our technologies for pharmaceutical research and development applications.

NICOLE SZAJCZ-KELLER, MSc
Institute of Musculoskeletal Health and Arthritis (IMHA) - Canadian Institutes of Health Research (CIHR)
Nicole.Szajcz-Keller@umanitoba.ca

The CIHR is the Government of Canada's agency for health research. CIHR's mission is to create new scientific knowledge and to catalyze its translation into improved health, more effective health services and products, and a strengthened Canadian health care system. Composed of 13 Institutes, CIHR provides leadership and support to close to 10,000 health researchers and trainees across Canada.

The Institute of Musculoskeletal Health and Arthritis (IMHA) supports research to enhance active living, mobility and movement, and oral health; and addresses causes, prevention, screening, diagnosis, treatment, support systems, and palliation for a wide range of conditions related to bones, joints, muscles, connective tissue, skin and teeth.

HOWARD TENENBAUM, DDS, PhD, FRCD(C), FICD
Faculty of Dentistry, University of Toronto
Howard.tenenbaum@dentistry.utoronto.ca

Dr. Tenenbaum received his D.D.S. from the University of Toronto in 1978 and then completed his specialty in Periodontology as well as a Ph.D. in bone cell biology by 1982. This was followed by a 2-year post-doctoral MRC fellowship in Bethesda at the National Institutes of Health. In addition to his degrees, Dr. Tenenbaum has a Fellowship from the Royal College of Dentists of Canada, as well as the International College of Dentists and the Academy of Dentistry International.

Dr. Tenenbaum is a Professor of Periodontology, and was Head of that Discipline for 8 years (1997-2005), at the Faculty of Dentistry, University of Toronto. He was also is also Associate Dean for Biological and Diagnostic Sciences for 6 years. He is a cross-appointed as a Professor in the Department of Laboratory Medicine and Pathophysiology, Faculty of Medicine, University of Toronto and is the Head of the Division of Research in the Department of Dentistry at Mount Sinai Hospital. Dr. Tenenbaum also serves as an FDA panel member for Dental Devices and Drugs (USA) and is Vice-Chair of the Federal Dental Care Advisory Committee (Canada). Dr. Tenenbaum's laboratory also had the pleasure of sending bone culture experiments aboard the US Space Shuttle that were carried out by Astronaut and former Senator John Glenn.

DAVID WALTON, PT, PhD
Physical therapy, Western University
dwalton5@uwo.ca

Assistant Professor with the School of Physical Therapy at Western University, an Associate Scientist with the Lawson Health Research Institute, and Director of the Pain and Quality of Life Integrative Research Lab at Western. Research interests are focused on the prediction, prevention, and measurement of chronic pain and disability following musculoskeletal trauma (e.g. whiplash, low back injuries). He has recently switched from a focus on self-report and clinical signs to a more integrated focus on the connection between the psyche and soma with respect to their mechanistic roles in the development of chronic pain. Salivary markers of endocrine and immune/inflammatory activity are providing new evidence of stress-system dysregulation in the genesis of chronic pain.

DAVID WONG, DMD, DMSC
UCLA Center for Oral/Head & Neck Oncology Research (COOR)
UCLA School of Dentistry, Los Angeles
dwong@dentistry.ucla.edu

David TW Wong, DMD, DMSc is the Felix and Mildred Yip Endowed Chair in Dentistry and a Professor in the Section of Oral Biology in the Division of Oral Biology and Medicine. He is the Associate Dean of Research and the Director of the UCLA Center for Oral/Head and Neck Research. He is an active scientist in oral cancer and saliva diagnostics research and has authored over 230 peer reviewed scientific publications. He is a fellow of the American Association for the Advancement of Sciences (AAAS), past member of the ADA Council of Scientific Affairs and the past president of American Association of Dental Research (AADR).

THANK YOU TO OUR SPONSORS

The Network for Canadian Oral Health Research (NCOHR)
Schulich Medicine & Dentistry
Trudell Medical International
Western Research

Appendix 3

North American Saliva Bank Workshop
May 31, June 1 & 2, 2015

BioBanking:

1. How would a Saliva bank support work in your field?
2. What are the biggest opportunities and what are the biggest hurdles that we face getting started with a saliva bank?

Informatics/web platforms and Epidemiological interpretation:

1. What are the critical platforms (areas) and/or emerging considerations to support the saliva bank?

Collection and storage:

1. Who will be donating their saliva? How will subjects be recruited? Should all new and existing patients at a Dental School be encouraged to donate their saliva? How will this be promoted to the patients?

Clinical forms, Medical and Dental Questionnaire and Ethical considerations

1. What is the key learning about clinical forms, medical and dental Questionnaire?
2. What are the ethical concerns in relation to Saliva Bank?

Financial Support and Organization:

1. How we build a pilot for a success saliva bank?
2. How to make sure everyone is include and engage is this pilot?
3. Is the presence of a local mass spectrometer a necessity for a saliva Bank?
4. What else do you think is important to make this project a success?
5. What more we need to know to move this initiative forward?

General:

1. What do we know? And what more do we need to know from our various disciplinary perspectives?
2. What is the best rationale for the creation of a saliva bank?

Appendix 4

PICTURE 1: Drs. Dawes, Koffman, Amin and Basile, discussing elements required for clinical trials for salivary collection together with Karla Krosara (Master student).

PICTURE 2: Drs. Wong and Dixon discussing sustainability of a National Saliva Bank with the postdoctoral fellow Sheikh Zeeshan and the dental undergraduate student Yuliya Mulyar.

PICTURE 3: Drs. Dixon, Wong, Emami, Zeeshan, and Karp and Yuliya Mulyar discussing challenges faculties face in implementing a pilot study

PICTURE 4: Drs Walton, Laing, Diatchenko and Bauer, brainstorming options for obtaining volunteers in pilot studies

PICTURE 5: Drs. Siqueira, Oppenheim Tenenbaum, Helmehorst, and Al-Hashimi debating about the best method to collect saliva to the North American Saliva Bank