

Establishment of a Multidisciplinary Dental Health Database and Biobank at Westmead Centre for Oral Health, Faculty of Dentistry, The University of Sydney

Annual report by Dr Shanika Nanayakkara (Bela Schwartz Postdoctoral Fellow)
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Objective

Dental health is closely linked to the state of our overall health and wellbeing. The primary objective of this research initiative is to establish a repository of clinical data and biological samples to facilitate research related to dental health. These research activities will help to identify the risk factors for dental health diseases and their association and interaction with systemic diseases, which will revolutionize our understanding of the place of dentistry in overall patient care, and our ability to manage and prevent diseases. Ultimately, evidence-based health policy and a whole-of-health disease prevention strategy will be developed to define benefits to individuals, the community and society.

Progress from July 2016

Over the past 12 months, the collection and storage of samples has been refined and protocols for sample collection and storage has been developed and implemented. Over 500 dental samples have been collected and a retrospective paediatric study has been completed investigating on characteristics of children receiving dental treatment under general anaesthesia, funding for a periodontal study has been obtained, an international study has commenced and the biobank has expanded to include two additional clinical sites.

ACTIVITY	STATUS	COMMENTS
Sample collection and storage protocol evaluation	Completed	Analysis completed, manuscript is under preparation
Development of a sample inventory database	Completed	Development of inventory system which records information related to the samples (e.g. reference ID, storage location, number of aliquots, etc.). This system is linked to the primary database that includes patients' information (e.g. demographic characteristics, clinical information) .
Retrospective study in paediatric dentistry	Completed	Data extraction and analysis completed. Manuscript has been submitted to BMC Oral Health and under review
Application for seed funding from Research Committee in Faculty of Dentistry	Completed	Seed funding application to start a pilot study on role of Apelin in chronic periodontitis was successful (\$9450) Apelin is a novel adipokine that is known to play an important role in tissue homeostasis and degradation, inflammation and obesity-

		related diseases. However, the presence and regulation of apelin in oral health and during oral tissue inflammation has not been clearly investigated yet.
Expansion of the project to all disciplines at Westmead Centre for Oral Health	Completed	Approval from the ethics committee and the research governance obtained to expand the project to all disciplines at Westmead Centre for Oral Health.
Sample collection	On-going	Currently, over 500 oral samples are available for researchers to use in oral health related research. Recently, a research team from the Discipline of Oral Pathology has applied for ethics approval to obtain samples from biobank for a research project investigating the effect of mechanical forces on teeth eruption.
Expansion of the project to Sydney Dental Hospital and Nepean Hospital where dental services are provided	In progress	Investigators from both centres joined the project, ethics approval obtained. Awaiting site specific approval for sample collection
Establishment of an interdisciplinary and international collaboration project using biobank resources	In progress	A new project was initiated with the discipline of periodontics and University of Bonn, Germany to investigate the role of Apelin on chronic periodontitis

Status of progress with the biobank strategic plan

1. Recruiting patients from all the dental disciplines at Westmead Centre for Oral Health

Research ethics approval has been obtained to recruit patients attending all clinics at Westmead Centre for Oral Health. Discussions with the Director (Dr Josephine Kenny) to recruit an oral health therapist to assist sampling was successful and we are now in the process of recruiting a suitable candidate. We plan to have this position filled by Early 2018.

2. Contribution by individual research projects

Essential information and guidance is provided to assist researchers to donate data and samples to biobank after completing individual research projects.

3. Encouraging researchers to use biobank resources

Dental Health Biobank is a vital resource for researchers, not only in dentistry but also in other health related disciplines. Due to the limited availability of oral bio-specimen repositories, this facility will help to strengthen research collaborations with other health related disciplines and to facilitate the investigations on associations between oral and systemic diseases.

As the first step to encourage the researchers to use collected data and samples in research activities, a new interdisciplinary and international collaboration project has been initiated. Researchers from Discipline of Periodontics and University of Bonn, Germany (collaboration

with Prof James Deschner, the Noel Martin Visiting Chair in 2017) collaborate in the project (Title: *Role of apelin in chronic periodontitis*). We were successful in securing funding to support this investigation through a competitive funding process of the Research Committee in the Faculty of Dentistry.

4. Involvement in Westmead Precinct Biobanking Consortium activities

Westmead Precinct Biobanking Consortium was established few years ago with the participation of the established biobanks at Westmead Precinct. Dental Health Biobank is working closely with this consortium to make sure that the dental health database and biobank comply with the required standards. Currently, we are actively involved in the biobank mentoring program organized by the consortium to provide guidance on biobank activities.

5. Expansion of the project to university dental clinics in Sydney Dental Hospital and Nepean Hospital

Ethics approval to expand the project to dental clinics in Sydney Dental Hospital and Nepean Hospital has been obtained. Sample collection will be started early next year once the site-specific approval is received.

6. Coordination with the new Centre for Translational Data Science regarding the linkage between Biobank data and e-record systems to-be implemented throughout NSW Health

Achieving research excellence across the university is a main focus-area in the “Strategic plan 2016-20” of the University of Sydney. Launch of the Sydney Centre for Translational Data Science is one of the initiatives to strengthen the research output and the positive impact of our research on community [1].

In addition, a new e-record system will be implemented throughout NSW Health to facilitate the patient data management in the hospitals. Close coordination of the activities of the Dental Health Biobank with these initiatives will facilitate data linkage between these databases and big data management which will help in achieving research goals and ultimately delivering the best output to our community.

Research Excellence being one of the main goals in the strategic plan of Faculty of Dentistry, Dental Health Biobank plays a substantial role to strengthen the research output of the faculty to achieve this goal.

7. Publications

Manuscripts under review and under preparation

- Retrospective paediatric study:
This was a part of the development of a multi-disciplinary patient database in parallel with the biobank. The objectives of the study were to evaluate the clinical and demographic profile of children receiving dental treatment under general anaesthesia at Westmead Centre for Oral Health, and to identify any complications occurring during waiting time to receive treatment. There have been no reports on this population for the last 15 years even though the number of paediatric patients who received dental

treatment under general anaesthesia has gradually increased from 744 to 1168 during the last decade. A manuscript based on this study has been submitted to BMC Oral Health for publication.

- Regulation of Ghrelin receptor by periodontal bacteria in vitro and in vivo. Mediators of Inflammation (accepted for publication)-Collaboration with University of Bonn
- Evaluation of the impact of storage conditions and DNA extraction methods on the microbiota profile of human dental plaque (Co-author, under preparation)
- Effectiveness of using instructional videos to teach practical dental anaesthetic skills (Co-author, under preparation)
- A Hidden ground water patch with high PFOS levels in Australia- a case study in southern hemisphere water environment (co-first author, under preparation)
- Heavy metals in pathogenesis of chronic kidney disease of unknown ethology in Sri Lanka (First author, under preparation)-Collaboration with Kyoto University, Japan and University of Peradeniya, Sri Lanka
- Effect of periodontal inflammation on Ghrelin receptor regulation in human gingival fibroblast and periodontal ligament cell in vitro (co-author, under preparation)-Collaboration with University of Bonn

Teaching

Research Unit of Study in Doctor of Dental Medicine (DMD) course and Research Methods unit of study for postgraduate students help to nurture research skills in newly graduating dentists. Further, evidence based dentistry sessions within these units help the students to appreciate the importance of clinical research in patient care and to nurture their skills in critical thinking and application of research evidence in clinical practice.

As the coordinator of these two units, the modifications that I introduced over the last few years have significantly improved the students' learning experience and research involvement which is evident by the dramatically improved students' feedback. I have got over 40 potential supervisors from both the University of Sydney and NSW Health on-board to supervise DMD student research projects improving research opportunities for students. I have developed assessment rubrics and a research project manual to guide the students in preparation of the research reports and have I have been actively involved in improving the EBP approach in clinical care for final year DMD students through my involvement in re-designing the curriculum and as an assessor in EBP oral presentations and through development of an archive of Critical Appraised Topics (CATs) in Dentistry.

The future goal is to direct student research projects either to contribute to the biobank or to utilize stored samples and data to accelerate research output of the Faculty.

Research supervision

- Student Research Supervision-Doctor of Dental Medicine Research Projects (The association between periodontal disease and chronic kidney disease, Co-supervisor: Dr Xiaoyan Zhou)

Other teaching related activities

- Conduct an annual session on “Evidence based practice in clinical decision making” at a continuous professional development organized by Royal Australasian College of Dental Surgeons. This session was introduced in 2016 and based on the positive feedback received from the candidates and the improvement in their performance, this session has now been included as an annual event.
- Conduct Evidence Based Dentistry sessions for the visiting International dental students.

Services

- Academic Board member to represent the Faculty of Dentistry
- Westmead Precinct Biobanking Consortium member to represent Dental Biobank
- Guide and assist in statistical analysis of data and development of study designs to colleagues and students
- Attend Learning and Teaching meetings to support learning and teaching activities in the faculty
- Member of Australasian Biospecimen Network Association
- Reviewer for Environmental Health and Preventive Medicine journal and BMC Medical Education

Professional development of the biobank leader

1. Completion of the learning modules in NSW Pathology Biobank Certification Program (ongoing)

These education modules are part of the biobank certification program and provides information on best practices in biobanking

2. Involvement in Westmead Precinct Biobanking Consortium mentoring program (ongoing)

Mentorship is provided to Dr Nanayakarra by A/Prof Daniel Catchpoole who is leading the Paediatric Cancer Biobank at Westmead.

3. Memberships

Joined Australasian Biospecimen Network Association (ABNA) which is a network of Australian scientists engaged in biobanking activities and provides opportunities for sharing of information and practices [<http://abna.org.au/>].

4. Participation in workshops and seminars

- 13/9/2016 Westmead Precinct Biobanking Consortium meeting
- 28/9/2016 Westmead biobank certification program pilot
- 19/10/2016 Sydney Health Partner (SHP) Thematic Steam Workshop
- 10/05/2017-12/05/2017 (5 workshops) Grant writing workshops
- 29/6/2017 Canvas (eLearning platform) workshop

5. Completion of online learning modules

- Work health and safety induction
- Code of conduct
- Privacy
- Reporting wrongdoing
- Achieving an equitable workplace
- Navigating your Sydney Career
- Human ethics health and medical
- Journey of self-discovery (cultural competence)
- What do you mean by "cultural competence"?
- Racism runs deep (cultural competence)
- Know your world. See my world. (cultural competence)

6. Conference presentation

- Invited guest speaker at Kyoto global conference for rising public health researchers (6th to 7th December 2017)
Title: Genetic and environmental determinants of chronic kidney disease of unknown aetiology in Sri Lanka
- iPURSE 2017 (University of Peradeniya annual research sessions)-24th November 2017- Abstract submitted
Title: Retrospective study for investigating the past exposure to hantaviruses among CKDu hotspots in Sri Lanka (co-author)

Biobank Team

Dr Xiaoyan Zhou- research associate

Dr Zhou is a dentist and a molecular biologist graduated from Guanghua School of Stomatology, Sun Yat-sen University in China and completed the PhD at the University of Sydney in 2015. Dr Zhou's knowledge and skills in clinical sample collection handling and management as well as her experience in molecular biology applications are assets for the biobank.

Reference

1. The University of Sydney 2016–20 Strategic Plan
(<http://sydney.edu.au/dam/intranet/documents/strategy-and-planning/strategic-plan-2016-20.pdf>)

Figure 1: Timeline demonstrating the milestones and future goals

