**UQ Summer Research Project Description**

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| **Project title:** | **Isolation and characterization of human dental stem cells and assess the biological activity of endodontic materials on them** |
| **Primary Supervisor & Email Address** | *Name: Sepanta Hosseinpour*  *Email:* [*s.hosseinpourdougolsar@uq.edu.au*](mailto:s.hosseinpourdougolsar@uq.edu.au) |
| **Description:** | **Isolation and characterization of human dental stem cells and evaluation of biological impacts of dental materials on these stem cells**  By introduction of new bioactive dental materials especially in the field of dentistry, there is an increasing need for *in vitro*testing of the biocompatibility of these novel materials and for these tests dental stem cells are great options due to the fact that there are commonly in direct contact with the materials and also their responses are imperative in terms of immunomodulation and regenerative purposes. The other important aspect is the biocompatibility and cytotoxic effects of dental materials on these cells which can profoundly affect treatment outcomes. In fact, *in vitro*tests with cell cultures are commonly used to understand the mechanisms involved in various biological responses and to evaluate cell behavior in contact with the materials. Although the findings of these *in vitro*studies cannot immediately translated to clinical conditions, they are fruitful to understand the clinical relevant situations and represents an appropriate model for screening dental materials biological activity as well as their potential health risk. In this study, we sought to isolate stem cells from apical papilla, dental pulp, and periodontal ligament, characterize them, and utilize them for biological testing of dental materials.  ***In vitro*bioactivity assessment of root canal filling materials using a customized tooth model set-up**  It has been shown that root canal filling materials can come in intimate contact with the preapical tissues especially after an extended period of time due to extrusion of degradation byproducts of the materials. *In vitro*investigations revealed that various dental filling materials can alter the expression of pro-inflammatory cytokines which may affect the success rate of the treatment in addition to raise safety concerns. Bioactivity and biocompatibility of the endodontic materials have been commonly evaluated using two-dimensional cell cultures. The main shortcomings of this evaluation method is just consists of monolayers of the cells and the extracellular matrix and cell to matrix interactions are not properly formed which decrease relevance to the clinical situations. In this regard, we previously presented a three-dimensional (3D) model that can mimic *in vivo*situation. This 3D cell model consists of a hanging tooth in a bioscaffold which supports cells growth and functions and allows to evaluate the cell morphology, metabolism, and cell to cell interaction more similar to *in vivo* condition. In this study, we want to evaluate novel dental materials bioactivity including cell viability and inflammatory impacts in 3D culture models. |
| **Project Duration** | **6 weeks from 13/01/2025 to 21/02/2025**  **Site (ie Herston): Herston**  **Hours of engagement: (ie. 36 hrs per week): 7-8 hours per week** |
| **Expected outcomes and deliverables:** | * Established human dental stem cell sources * Established and optimized a 3D biocompatibility model for endodontic materials testing |
| **Suitable for:** | *(eg. Bachelor Programs and specific topic areas)*  *DMD or BDSc students with research background* |
| **How many student positions available** | 2-3 student(s) |
| **Further info:** | *(Provide any further info/comments)*  Applicants are required to have experience in cell culturing, cellular and molecular testing, and preferably lab experiments with flow cytometry and RT-PCR. Fundamental training and lab inductions will be provided during the project. |