PHILIPS

Self-renewal and in vitro expansion of periodontal ligament-derived mesenchymal stem cells

Mr Mandeep Ghuman

The identification of mesenchymal stem cells (MSCs) in periodontal ligament (PDL) presents exciting possibilities for the application of tissue engineering in dentistry, potentially leading to the development of novel strategies for tooth and periodontal regenerative therapies. Although there are a number of studies which have investigated the use of dental pulp-derived stem cells, the potential development of PDL-derived stem cells is less well described and challenges are still faced before they can be clinically applied. At present, stem cell based therapies require large numbers of cells to be generated by extensive in vitro subculture. The optimal conditions for PDL MSC expansion and their long-term capacity to expand and still undergo differentiation into the necessary lineages are not known.

The aim of the proposed study is to establish the optimal conditions for isolation and in vitro expansion of human PDL-derived MSCs. It is aimed firstly to determine optimal methods of establishing PDL cell cultures for MSCs, and to derive stem cell enriched PDL cultures using fluorescence activated cell sorting (FACS) by MSC markers. Secondly, we will investigate self-renewal properties and in vitro expansion potential in long term MSC cultures.

The successful isolation of PDL MSCs has allowed a glimpse of the potential of their role in taking periodontal regenerative therapies to the next level. By carrying out these studies it is hoped the results will provide further insights into the properties and potential of PDL MSCs, and that the data obtained will form the basis of future studies to lead onto further developing the in vivo use of PDL MSCs in periodontal and dental tissue engineering applications.

These studies will be carried out in collaboration with Professor Giannobile's lab at the University of Michigan and will include visiting this lab to acquire the skills required to carry out the proposed studies.