

## A sight set on periodontitis: establishment of a periodontal progenitor cell line and its behaviour testing on dental materials

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**INTRODUCTION:** Periodontitis is an infectious disease causing loosening of the periodontal ligament (PDL) attachment and often it can lead to tooth loss. PDL is easily obtainable from patients and it contains progenitor cells that can be expanded and differentiated towards several mesenchymal lineages [1]. Furthermore, PDL-derived cells have been shown to generate bone- and PDL-like structures in vivo [2]. Thus, PDL cells, combined with suitable biomaterials, represent a promising tool for therapy of periodontitis and dental tissue engineering.

The aim of this study was to create a stable PDL cell line and to test its behaviour on two different titanium scaffolds.

**METHODS:** The topography of machined (MA) and sandblasted/acid-etched (SLA) titanium scaffolds was analysed by confocal and atomic force microscopy. Human telomerase reverse transcriptase (hTERT) was delivered in PDL cells using lentivirus. PDL-hTERT cells, alone or in combination with the titanium scaffolds, were analysed by population doubling calculation, PCR, histology, live-dead and osteogenic differentiation assays.

**RESULTS:** The topographical analysis showed a pronounced difference in the surface organization of the scaffolds. MA titanium displayed smoother and more organized surface than SLA titanium.

HTERT-expressing PDL cells exhibited similar morphology and population doubling time but an extended lifespan in comparison to the primary cells. In addition, PDL-hTERT cells expressed several characteristic genes and upon osteogenic stimulation produced a calcified matrix in vitro.

Next, when cultivated onto the two scaffold types PDL-hTERT cells spread out and reached significantly higher cell numbers on the MA titanium.

Finally, a quantitative analysis of osteogenic differentiation demonstrated that on the MA scaffold PDL-hTERT cells differentiated to a 4-times higher extent than on the SLA scaffold.

**DISCUSSION & CONCLUSIONS:** Here, PDL cells were successfully immortalized via lentiviral transfer of hTERT. These cells equally share characteristics with previously described immortalized PDL cells [3]. However, an advantage of our cell line is the use of lentiviral vectors which are less prone to insertional mutagenesis.

With regards to the behaviour of PDL-hTERT cells on the two different scaffolds, it was observed that this cell type behaved differently to osteoblast-like cells [4]. In brief, we concluded that PDL cells favoured the smoother MA surface because of their improved spreading, actin organization, vitality and matrix calcification. This indicates that there is a pronounced difference in the way cell types respond to the same biomaterial. Therefore, it is of great importance to pre-test the behaviour of the cells involved in each individual set up for tissue engineering.

Taken together, we can suggest PDL-hTERT cell line as a suitable model system for periodontitis-related research, as well as, for the development and testing of novel applications for dental regeneration.

**REFERENCES:** [1] Nagamoto K et al., *J Periodontal Res.* 2006; 41:303-10. [2] Fujii S et al., *J Cell Physiol.* 2008; 215: 743-9. [3] Fujita T et al., *J Oral Sci.* 2005; 47: 177-84. [4] Boyan BD et al., *Calcif Tissue Int.* 2002; 71: 519-29.

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