

# Periodontal ligament cell population: the central role of fibroblasts in creating a unique tissue

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## Abstract

**Background:** Fibroblasts are the predominant cells of the periodontal ligament (PL) and have important roles in the development, function, and regeneration of the tooth support apparatus. Biological processes initiated during the formation of the PL contribute to the long-lasting homeostatic properties exhibited by PL fibroblast populations.

**Development:** The formation of the PL is likely controlled by epithelial-mesenchymal and epithelial hard tissue interactions, but the actual mechanisms that contribute to the development of cellular lineages in the PL are unknown. Fibroblasts in the normally functioning PL migrate through the tissue along collagen fibres to cementum and bone and in an apico-coronal direction during tooth eruption. ADULT TISSUE: Cell kinetic experiments have shown that PL fibroblasts comprise a renewal cell system in steady-state and the progenitors can generate multiple types of more differentiated, specialized cells. Progenitor cell populations of the PL are enriched in locations adjacent to blood vessels and in contiguous endosteal spaces. In normally functioning periodontal tissues, there is a relatively modest turnover of cells in which apoptotic cell death balances proliferation. Large increases of cell formation and cell differentiation occur after application of orthodontic forces or wounding. As PL cells comprise multiple cellular phenotypes, it has been postulated that after wounding, the separate phenotypes repopulating the site will ultimately dictate the tissue form and type.

**Conclusions:** PL fibroblasts play an essential role in responses to mechanical force loading of the tooth by remodelling and repairing effete or damaged matrix components. In consideration of the important roles played by fibroblasts in PL homeostasis, they could be described as "the architect, builder, and caretaker" of the periodontal ligament.