



PhD in Biomedical Sciences

Research Area: Orthodontics

Title: The Role of Matrix Metalloproteinases in Orthodontic Tooth Movement - *In Vitro* and *In Vivo* Studies

Orthodontic tooth movement (OTM) arises as a reflection of the periodontal remodelling process, being responsible for the displacement of teeth along the alveolar bone. In non-pathological conditions, it results from the coordination of bone formation and resorption, as well as of the development of an aseptic inflammatory cascade in response to the application of orthodontic forces to the teeth. During these processes, the extracellular matrix in the periodontal ligament (PDL), and in the bone, undergoes remodelling, which is influenced by different molecules, including matrix metalloproteinases (MMP). During orthodontic treatment, the variation in the expression of MMP gives these enzymes an indicator power of the biological phenomena that is taking place. Currently, the physiological mechanism through which remodelling occurs in PDL is unclear and, although it has been shown that MMP can be produced by various types of cells when under orthodontic forces, the relationship between the response of osteoblasts present in PDL to mechanical stress and MMP expression is still uncertain. For this reason, two types of studies were designed - an *in vitro* study and an *in vivo* study - with the aim of deepening the knowledge about the production of MMP in the PDL by osteoblasts and/or fibroblasts during the process of OTM. We expect to clarify the role played by these cells, when under the effect of tensile and compressive forces during orthodontic treatment, in inducing MMP production, in order to better understand their role in the remodelling of the extracellular matrix of PDL.

Keywords: Bone; Matrix Metalloproteinases; Orthodontic Tooth Movement; Orthodontics

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