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ODONTOBLASTS AS SENSOR CELLS

H. Magloire[1], B. Allard[2], ML. Couble[1], B. Thivichon-Prince[1], JC. Maurin[1] and F. Bleicher[1]

[1]*University of Lyon, Institut de Genomique Fonctionnelle, UMR CNRS 5242, Equipe « Odontoblaste et et Régénération des Tissus Dentaires», Faculté d'Odontologie, Lyon F-69008, and INSERM/ERI 16, Lyon F-69008, France.* [2]*University of Lyon 1, Physiologie integrative, Cellulaire et Moléculaire, Villeurbanne F-69100, The UMR CNRS 5123, Villeurbanne F-69100, France*.

Odontoblasts are post-mitotic cells involved in the dentine formation throughout the life of the tooth and suspected to play a role in tooth pain transmission. They are organized as a single layer of specialized cells along the interface between dental pulp and calcified dentinal tubules into which run a cellular extension (odontoblast process) bathed in a liquid phase. . Interestingly, a primary cilium in the vicinity of the Golgi apparatus has been regularly described at the ultrastructural level and recently antibodies directed against detyrosinated α tubulin specifically identified this structure in human odontoblasts (1). The role of this primary cilium remains unknown but it was suggested that it could constitute, when deflected, a critical link between the transfer of fluid, molecules or ions from dentinal tubules to pulp tissue and odontoblast response to stimuli. Dense sensory unmyelinated nerve fibres surrounded the odontoblast bodies, coiled around the cell processes and give to this complex (nerve/odontoblast) a fundamental role as an active barrier between dentine and pulp following external stimuli (mechanical thermal, electrical, osmotic shock…). Thus, this unique spatial situation of odontoblasts closely related with nerve endings and fluid movements suggest that odontoblasts could convert pain-evoking fluid displacement within dentinal tubules into electrical signals *via* at least mechanosensitive ion channels and bending of the primary cilium. Along this line, two kinds of mechanosensitive K^+ channels have been identified in human odontoblasts: I- TREK-1 channels

belonging to the two-pore-domain potassium channel family and expressed in the plasma membrane of coronal odontoblasts; II- high-conductance Ca^{2+} -activated potassium channels (K_{Ca}) activated by stretch of the membrane as well as osmotic shock (2,3). These findings strengthened by the recent evidence for excitable properties of odontoblasts, concentration of mechanosensitive channels in the borderline between cell extension and bodies and clustering of key molecules at the site of odontoblast-nerve contact strongly suggest that odontoblasts may operate as sensor cells (4).

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