

Transient Receptor Potential channels in human Dental Pulp Cells in normal and inflammatory conditions

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Dental pulp contains various cell types like fibroblasts, odontoblasts, and dental pulp stem cells essential for regeneration of the dentin. These human dental pulp cells (hDPCs) are primarily affected by pulpitis and challenged to bacterial invasion and various pain evoking stimuli. Transient Receptor Potential (TRP) channels play a vital role in detecting an array of environmental stimuli including temperature. Mechanical forces and are crucial in the sensation of various forms of pain, including inflammatory pain. However, the list of non-sensory functions of TRPs also expanded in recent years. Our aim was to gather information about the expression and function of TRP channels in hDPCs in physiological and inflammatory conditions. Healthy cells were isolated from the pulp of human intact, impacted wisdom teeth, which were extracted in the Department of Dentoalveolar Surgery of Faculty of Dentistry of University of Debrecen.

Results: The expression of TRP channels was measured by quantitative real time PCR and their functionality was assessed by measuring changes in intracellular Ca²⁺ concentration upon stimulation by agonists using fluorescent Ca²⁺ sensitive dye Fura-2. We found that transcripts of several members of the vanilloid (TRPV), melastatin (TRPM), canonical (TRPC) and ankyrin (TRPA) subfamily were expressed, among which TRPV2 and TRPV4 was expressed at the highest level. Application of specific agonists and antagonist confirmed the functional presence of several TRP channel isoform in Ca²⁺ measurements. In our ongoing experiments we are investigating the effect of microbial inflammatory signals on the expression and activity of TRP channels.

Conclusions: Our preliminary results suggest that the activators of Toll-like receptors (TLRs) induce not only the production of inflammatory cytokines but also influences the expression of TRP channels, potentially contributing to the development of inflammation and related nociception. These results can broaden our knowledge about the molecular events of dental inflammation and might identify TRP channels as a potential drug targets in treating pulpitis and dental pain.

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