

Abstract

Signalling pathways play an important role in the development of organs and tissues in the body, including teeth. Signals are transmitted from one cell to another cell and generate signalling cascades. The signalling pathway starts by a ligand binding to a specific receptor protein. Interaction of the ligand with the receptor is responsible for expression of transcription factors and genes. The abnormalities in the signalling pathways lead to developmental disorders. The molecular mechanisms of these processes in the tooth development are investigated on the mouse dentition, because there is no difference in the basic stages of the dental development of mouse and humans.

The presented thesis focuses mainly on the Wnt signalling pathway and its relationship with other signalling pathways during dental development.

In human dentition, we differentiate temporary and permanent dentitions, whose correct normal development depends on the expression and interactions of signalling molecules. Signalling pathways Wnt, Notch, TNF, Bmp, FGF, Shh and TGF β are involved in the dental development. Signalling pathways interact with each other and their disruption can cause stopping the dental development or dental defects. The common dental pathologies in humans are dental agenesis, anomalies in the shape and size of the teeth or disorders of hard tissue formation. These disorders can exist as a part of syndromic diseases or as sporadic defects.

During the tooth formation Wnt signals appear at the stage of epithelial thickening and regulate the entire process of odontogenesis. The canonical signalling pathway is also responsible for the normal shape of teeth. The failure of Wnt signalling has been shown as a part of several syndromic diseases with dental pathologies presence, as for example mutation in *WNT10A* in patients with Schöpf-Schulz-Passarge syndrome or Odonto-onycho-dermal dysplasia. The presented literary survey shows that recently, the research on Wnt pathway and its components starts to be attractive also in the field of the dental development.