Abstract

The vertebrate oropharyngeal cavity is a complex organ system housing food intake apparatus that is composed of hard-structured elements, the teeth. This apparatus is built upon mutual interactions between the epithelium and the underlying mesenchyme, which, however, take place only after the establishment of boundaries between the ectoderm and endoderm within this epithelium. Although possibly stereotypically positioned within the mandibular arch, our comparative morphogenetic survey identified that boundaries between ectoderm and endoderm are a result of different development in different vertebrate clades due to formative and constraining events taking place at early embryonic period. Dissimilar morphodynamics of ectoderm and endoderm are subsequently mirrored in the epithelial derivation of respective teeth in such a way that, e.g. in the Mexican axolotl, the oral teeth eventually display ectodermal, endodermal and ecto-endodermal derivation. Moreover, the ecto-endodermal boundary could have a tooth-inductive role, as suggested by the pattern of sequential initiation of individual tooth germs in this species. Our comparative analysis of several odontogenic genes in axolotl found predominantly shared expression profiles with no difference accountable for the germ layer derivation of these teeth. This implies that a shared molecular toolbox drives formation of teeth irrespective of their epithelial origin and indicative of a common dental gene regulatory network. Further research in non-model species should aim at identifying players of this network, whose interactions drive development and evolution of teeth in vertebrates.