

CUSP DEVELOPMENT IN THE MOUSE FIRST LOWER MOLAR

L. Viriot¹, H. Lesot², M. Peterka³ & R. Peterková³

¹ *iPHEP, CNRS UMR 6046, University of Poitiers, France*, ² *UMR S 595, Faculty of Medicine, Strasbourg, France*, ³ *Institute of Experimental Medicine, Academy of Sciences CR, Czech Republic*

INTRODUCTION: Within the mouse dentition, the first lower molar (M_1) is considered as a model for odontogenetic studies. Recently, investigations combining the use of very precise embryo staging [1] and high resolution 3D reconstructions made it possible to follow step by step the morphogenesis and to go into the minutest anatomical details of a tooth germ [2]. From the utilisation of these new techniques, numerous questions have been raised about the development of the dentition in mice. Peterková *et al.* [3] and Viriot *et al.* [2] discovered that many rudimentary dental elements appeared and regressed during early dental development in the diastemae of both upper and lower jaws, whereas diastemae are by definition areas where teeth are absent. At the transition between bud and cap stages, one of the rudimental tooth buds located just in front of the M_1 incorporated into the mesial extremity of the M_1 cap. From these latter observations, a scenario of heterogeneous origin for the M_1 germ has been proposed [4,5]. The aim of the present work is to evaluate the morphological consequences of this bud concrescence on the shape and inter-relationships of the seven cusps of the M_1 crown in the mouse.

MATERIALS & METHODS: The ontogeny of the M_1 was investigated in mouse embryos whose age was determined in embryonic days (ED) specified by the wet body weight. Females were mated overnight and the midnight before the morning detection of the vaginal plug was taken as ED 0. Harvested embryos were fixed in Bouin-Hollande fluid. Five micrometers thick frontal serial sections from paraffin embedded heads were stained with alcian blue-hematoxylin-eosin. The M_1 dental epithelium was reconstructed in 3D from ED 14 to 20. Complementary reconstructions of the dental papilla mesenchyme were made to visualize the occlusal shape of the crown. We adopted the Cope-Osborn cusp nomenclature [6].

RESULTS: The mouse M_1 is composed of three mesio-distal opposite pair of cusps which are forming transversal cusp rows. Presumptive cusps of the second row (Fig. 1: protoconid and

metaconid) rose first at about ED 14. Short after ED 15, presumptive regions for cusps of the first (anteroconids) and the third (hypoconid and entoconid) rows appeared quite conjointly. From ED 16 to ED 17, two mesial elements appeared and became integrated into the mesial extremity of the M_1 . Finally, the posteroconid appeared at about ED 17.5 (Fig. 1).

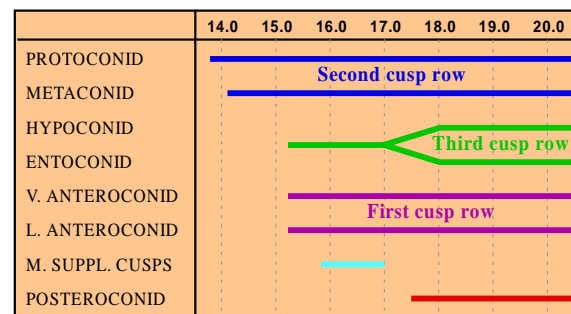


Fig. 1: Chronology of cusp development in the mouse first lower molar. V: vestibular, L: lingual, M: mesial, Suppl.: supplementary.

DISCUSSION & CONCLUSIONS: Contrary to what is generally supposed [7], the sequence of cusp development in mouse M_1 differs from the order of cusp appearance through evolution. Only the appearance of the five central and distal cusps follows the evolutionary sequence. The mesial part of the M_1 seems to develop independently to the rest of the molar. The very early appearance of the anteroconids, as well as the occurrence of supplementary mesial cusps could probably be related to the heterogeneous composition of the M_1 germ [4,5].

REFERENCES: ¹ M. Peterka, et al (2002) *Connect. Tissue Res.* **43**:186-190. ² L. Viriot, et al (2000) *Int. J. Dev. Biol.* **44**:233-240. ³ R. Peterková, et al (1998) *Eur. J. Oral Scpi.* **106**:667-670. ⁴ R. Peterková, et al (2002) *Connect. Tissue Res.* **43**:120-128. ⁵ L. Viriot, et al (2002) *Connect. Tissue Res.* **43**:129-133. ⁶ R. H. Biggerstaff (1968) *J. Dent. Res.* **47**:508. ⁷ P. M. Butler (1956) *Biol. Rev.* **31**:30-70.

ACKNOWLEDGEMENTS: Missions and investigations of the present work have been financially supported by the ANR 'Quenottes', the CNRS, the COST B-23 action, the GACR (304/05/2665) and the MSMT of the CR.