TEMPOROSPATIAL LOCALIZATION OF ACETYLCHOLINESTERASE ACTIVITY IN THE DENTAL EPITHELIUM DURING MOUSE TOOTH DEVELOPMENT

SO Ko, TH Kim, JC Lee, and ES Cho

Laboratory for Craniofacial Biology, Institute of Oral Bioscience, Chonbuk National University, Jeonju 561-756, Republic of Korea

INTRODUCTION: Acetylcholinesterase (AChE), a principal modulator of cholinergic neurotransmission, also has been demonstrated in non-neuronal cells. Furthermore, AChE has been shown to be associated with the developmental processes of non-neuronal tissue such as bone and cartilage [1-2] and is suggested to be a multifunctional molecule with morphogenetic properties during development. To date, although the morphogenic potential of AChE has been postulated in the various tissues, little information is available on its morphogenic roles in the tooth development. Recently, cholinesterase activity has been identified in the enamel organ of continuously erupting teeth of the guinea pig [3]. However, it is not clear whether AChE is actually involved in the morphogenic process during tooth development. Therefore, we followed the temporospatial appearance of AChE activity in the developing mouse tooth.

MATERIALS & METHODS: To identify the AChE activity, direct coloring method [4] was performed on the mouse embryos (E13, E14, and E18) and on the incisors and molars of the neonatal mouse (P10). For blocking the other esterase activities, iso-OMPA, BW248C51 and eserine were added in the substrate medium, respectively.

RESULTS: In the developing mandibular first molar of mouse embryos, AChE activity was not found in the dental epithelium at E13 (bud stage). AChE activity was first appeared in the developing cervical loops of enamel organ at E14 (cap stage), but was not found in the enamel knot (Fig. 1A). At E18 (bell stage), AChE activity was restrictedly localized in the inner enamel epithelium except cervical loop area (Fig. 1B). In the incisors and molars of neonatal mice (P10), AChE activity was exclusively localized in the inner enamel epithelium of cervical loop (Fig. 1C) and the cells of enamel-free area (Fig. 1D), respectively.

DISCUSSION & CONCLUSIONS: We have shown that AChE activity is temporospatially localized in the differentiating dental epithelium during mouse tooth development. The results suggest that AChE may regulate the histo- and cytodifferentiation of the enamel organ into the inner enamel epithelium and presecretory ameloblasts.


ACKNOWLEDGEMENTS: This work was supported by grant from the Korea Science and Engineering Foundation grant funded by the Korea government (MOST) (M1064601000306N460100310).