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Effect of pituitary adenylyl cyclase-activating polypeptide (PACAP) on tooth development in wild type and PACAP deficient mice

Sándor, B.^{1*}; Hóbor, D.¹; Kiss, P.²; Szabadfi, K.³; Brubel, R.²; Horváth, G.²; Lubics, A.²; Gábel, R.³; Szántó, I.¹; Nagy, Á.¹; Reglődi, D.²; Tamás, A.²

1: Department of Dentistry, Oral and Maxillofacial Surgery, Institute of Biology, Faculty of Science, University of Pécs, Pécs, Hungary

2: Department of Anatomy, Medical School, Institute of Biology, Faculty of Science, University of Pécs, Pécs, Hungary

3: Department of Experimental Zoology and Neurobiology, Institute of Biology, Faculty of Science, University of Pécs, Pécs, Hungary

PACAP is a pleiotropic neuropeptide with potent neuroprotective and neurotrophic effects. Tooth development shows similarities with the development of the nervous system, because teeth arise from the oral ectoderm and mesenchyme derived from the neural crest. PACAP plays a role in the development of the nervous system, and PACAP- immunoreactive fibers are found in the tooth pulp, but there is no data about the exact effect of endogenous PACAP on tooth development. Therefore, the aim of the present study was to compare the tooth development in 5-day-old wild type and PACAP deficient mice. On native histological sections, we measured the thickness of the forming dentin and enamel layers on first and second upper and lower molar teeth, and we examined the size of the entire dental sac of third upper and lower molar teeth. With immunohistochemistry we labeled the specific receptors of PACAP (PAC1 receptor) in the developing teeth. Our results show that the dental sac of third upper and lower molar teeth were smaller, and the dentin and enamel layers were thinner in teeth of PACAP deficient mice. Histological examinations showed PAC1 receptor immunopositivity in the odontoblastic and subodontoblastic layer, but it was more pronounced in wild type mice. These preliminary observations suggest that PACAP plays a role in tooth development, but further investigations are necessary.

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