Enamel of Primary Teeth – morphological and chemical aspects

AKADEMISK AVHANDLING

Som för avläggande av odontologie doktorsexamen vid Sahlgrenska akademin vid Göteborgs universitet kommer att offentligen försvaras i hörsal Arvid Carlsson, Medicinaregatan 3, Göteborg, fredagen den 2 mars 2012 kl. 9.00

av
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Avhandlingen är av sammanläggningstyp och är baserad på följande delarbeten:

I. Nina Sabel, Carina Johansson, Jan Kuhnisch, Agneta Robertson, Frank Steiniger, Jörgen G. Norén, Gunilla Klingberg, Sandor Nietzsche.
Neonatal lines in the enamel of primary teeth - a morphological and scanning electron microscopic investigation.
Archieves of Oral Biology (2008) Oct; 53 (10):954-63

II. Nina Sabel, Gunilla Klingberg, Sandor Nietzsche, Agneta Robertson, Hans Odelius, Jörgen G. Norén.
Analysis of some elements in primary enamel during postnatal mineralization.
Swedish Dental Journal (2009);33 (2):85-95

III. Nina Sabel, Gunilla Klingberg, Wolfram Dietz, Sandor Nietzsche, Jörgen G. Norén.
Polarized light and scanning electron microscopic investigation of enamel hypoplasia in primary teeth.
International Journal of Paediatric Dentistry (2010) Jan; 20 (1):31-6

IV. Nina Sabel, Agneta Robertson, Sandor Nietzsche, Jörgen G. Norén.
Demineralization of enamel in primary second molars related to properties of the enamel.
Accepted for publication in The Scientic World Journal, 2011

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ABSTRACT

Enamel is one of the most important structures of the tooth, both from a functional and esthetic point of view. Primary enamel carries registered information regarding metabolic and physiological events that occurred during the period around birth and the first year of life. Detailed knowledge of normal development and the structure of enamel is important for the assessment of mineralization defects. The aim of the thesis is to add more detailed information regarding the structure of primary enamel. The structural appearance of the neonatal line and the quantitative developmental enamel defect, enamel hypoplasia, was thoroughly investigated with a polarized light microscope, microradiography and scanning electron microscope. X-ray microanalysis of some elements was also performed across the enamel and the neonatal line. Postnatal mineralization of enamel at different ages and from different individuals was studied regarding the chemical content, by using secondary ion mass spectrometry. The enamel's response to demineralization was investigated in relation to the individual chemical content and the degree of mineralization of the enamel, by using polarized light microscope, microradiography, scanning electron microscope and X-ray microanalysis. The neonatal line is a hypomineralized structure seen as a step-like rupture in the enamel matrix. The neonatal line is due to disturbances in the enamel secretion stage. The enamel prisms in the postnatal enamel appeared to be smaller than the prenatal prisms. The hypoplasias showed a rough surface at the base and no aprismatic surface layer was seen in the defect. The enamel of the rounded border of hypoplasia appeared to be hypomineralized, with the bent prisms not being densely packed. Mineralization of enamel is a gradual process, still continuous at 6 months postnatally in the primary mandibular incisors. The thickness of the buccal enamel is reached at 3-4 months of age. Demineralization of enamel depends on the degree of mineralization and the chemical content of the enamel exposed. In a more porous enamel, deeper lesions will develop. The posteruptive maturation has a beneficial effect on the enamel's resistance to demineralization.

Keywords: Demineralization, enamel, enamel hypoplasia, microradiography, mineralization, neonatal line, polarized light microscopy, scanning electron microscopy, secondary ions mass spectrometry, X-ray microanalysis.

Swedish Dental Journal Supplement 222, 2012
ISSN: 0348-6672; **ISBN:** 978-91-628-8361-4; **GUPEA** http://hdl.handle.net/2077/28004

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