

# **Molar Incisor Hypomineralization**

## **Morphological and chemical aspects, onset and possible etiological factors**

Akademisk avhandling

som för avläggande av odontologie doktorsexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentligen försvaras i föreläsningssal 9, Institutionen för Odontologi, Medicinargatan 12E, Göteborg, fredagen den 2 december 2011, kl. 13.00

av

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Avhandlingen är av sammanläggningstyp och baseras på följande fem delarbeten:

- I. Fagrell TG, Dietz W, Jälevik B, Norén JG. Chemical, mechanical and morphological properties of hypomineralized enamel of permanent first molars. *Acta Odontol Scand.* 2010;68:215-22.
- II. Fagrell TG, Lingström P, Olsson S, Steiniger F, Norén JG. Bacterial invasion of dentinal tubules beneath apparently intact but hypomineralized enamel in molar teeth with molar incisor hypomineralization. *Int J Paediatr Dent.* 2008;18:333-40.
- III. Fagrell TG, Dietz W, Lingström P, Steiniger F, Norén JG. Effect of ozone treatment on different cariogenic microorganisms in vitro. *Swed Dent J.* 2008;32:139-47.
- IV. Fagrell TG, Ludvigsson J, Ullbro C, Lundin SA, Koch G. Aetiology of severe demarcated enamel opacities--an evaluation based on prospective medical and social data from 17,000 children. *Swed Dent J.* 2011;35:57-67.
- V. Fagrell TG, Salmon P, Melin L, Norén JG. Onset of Molar Incisor Hypomineralization (MIH). Submitted for publication.

# Molar Incisor Hypomineralization

## Morphological and chemical aspects, onset and possible etiological factors

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### ABSTRACT

**Overall aim:** The general objective of this thesis was to enhance the understanding of Molar Incisor Hypomineralization (MIH) in areas of the histological, chemical and mechanical properties of the hypomineralized enamel, objective and subjective clinical symptoms in relation to bacteria findings. Further, to estimate a time for onset of the disturbance and investigate possible etiological factors. **Material & Methods:** 22 teeth diagnosed with MIH were used in the histological and chemical studies. A number of analytical methods were used; Light microscopy, Polarized light microscopy, Scanning electron microscopy, X-ray microanalysis, Vickers hardness test and X-ray Micro Computed Tomography. Decalcified sections were stained with bacterial staining. An ozone device was tested for the ability to kill strains of oral bacteria. In collaboration with the prospective ABIS study, 17.000 individuals were examined and possible etiological causes of severe demarcated opacities were tested. **Results & Conclusions:** The hypomineralized enamel was mainly located in the buccal enamel of the teeth and had a high degree of porosity extending from enamel-dentin-junction with a distinct border to the normal cervical enamel. Teeth diagnosed MIH had lower hardness values in hypomineralized enamel and differences in the chemical composition. Bacteria were observed in the enamel and deep into the dentin. Ozone treatment for 20 seconds or more was effective to kill oral microorganisms. Significant relations were found between MIH in first molars and breast feeding more than 6 months, late introduction to gruel and infant formula (later than 6 months). The onset for the hypomineralized enamel was estimated to around 200 days from start of the enamel mineralization.

**Keywords:** Enamel, etiology, lactobacillus, light microscopy, molar incisor hypomineralization, oral streptococci, ozone, polarized light microscopy, scanning electron microscopy, X-ray microanalysis, X-ray micro-computed tomography.

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