



## The Indicators of Molar Coefficients of the Chemical Elements in Dentin and their Correlation with Enamel

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### Research Article

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### ABSTRACT

**Objectives:** Determination of molar coefficients of the chemical elements in dentin, their possible correlation with tooth enamel.

**Material and Methods:** There were examined 29 clinically extracted teeth of both jaws and their longitudinal sections (12 clinically intact teeth, 10 teeth with wedge-shaped defects, 7 teeth with cervical caries) of the patients aged 25 to 54 with the help of JSM-6490 LV focused beam electron microscope (scanning) with system of energy-dispersive X-ray microanalysis. We have determined the chemical composition of 290 enamel areas and 235 dentin areas in the incisal region (tubercle), equator, cervical area as a percentage of the weight amounts of carbon, oxygen, calcium, phosphorus, sodium, magnesium, sulfur, chlorine, zinc, potassium, aluminum, we have identified their molar coefficients.

**Results:** The chemical composition of dentin differed in the values of Na/Mg, Al/Zn, Mg/Ca, K/Na ( $p \leq 0.05$ ) in all studied topographical regions of the samples. Higher values of Na/Mg and lower values of Al/Zn were identified in the teeth with cervical caries ( $p \leq 0.05$ ). Correlation was found in dentin: inverse - between Ca/P and P/Ca, Mg/Ca and Na/Mg, Ca/Mg and Mg/Ca, Mg/P and Na/Mg, Mg/P and Ca/Mg, direct - between Ca/Mg and Na/Mg, Mg/P and Mg/Ca ( $p \leq 0.05$ ). High correlation was determined between molar coefficients in enamel and dentin: Mg/Ca and Mg/P (direct), Ca/P and P/Ca (inverse),  $p < 0.0001$ .

**Conclusions:** The differences in the indicators of molar coefficients in dentin, their correlation with enamel are probably associated with the peculiarities of the pathological processes in the cervical region and it requires further study.

**Key words:** Teeth, Enamel, Dentin, Chemical Elements, Cervical Caries.

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### Introduction

The onset of the pathology of dental hard tissues is generally considered that the lesions don't result from a single factor but they may be caused by a combination of some factors.<sup>1</sup> The effectiveness of its prevention depends on understanding the risk factors and how they interact and change in specific patients in course of time.<sup>2</sup> The content of the chemical elements in hard dental tissues is not a constant value but it dynamically changes under the influence of various reasons, one of which is damage of carious and non-carious genesis.<sup>3,4</sup> Dentin permeability can be increased because of the changes to the integrity of enamel and dentin through processes of trauma, decay and toothwear.<sup>5</sup> The amount of calcium has significant differences both in the structure of enamel and dentin in different types of pathology and it determines their development.<sup>6</sup> Dentin also had the characteristics of microwear which were more consistent with wear types than enamel.<sup>7</sup> Chemical dissolution of the components of both organic and inorganic matrix happens during an acidic attack or a typical demineralization regime. It is

come about by the water content of enamel and dentin that facilitate acid diffusion in and mineral content out of the tooth. The areas of structural weakness which have been demineralized are also the objectives for the formation of caries. Bacteria can colonize tooth demineralized areas easily and, with a combination of their own acid formation, they can penetrate into dentin.<sup>8</sup> Previous studies confirmed the assumptions about the differences in the inorganic composition of enamel and dentin at various levels.<sup>6,9,10</sup> Significant differences were found in the content of sodium and zinc in dentin of the incisal region (tubercle) (IR), equator (E), cervical area (CA) depending on the presence and type of the pathology.<sup>9</sup> But taking into account the widespread occurrence of the coordinated effects of some chemical elements it is necessary to pay attention not only to their amount but also to the ratios that have a synergistic and antagonistic impact on various physiological parameters.<sup>11</sup> We have hypothesized that molar coefficients in dentin, their possible correlation with enamel may influence the