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"MINERAL COMPOSITION AND CHEMICAL PROCESSES OF DENTAL ENAMEL"

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Abstract

Dental enamel is the hardest tissue in the human body, and its chemical composition and stability are vital in the prevention and treatment of dental diseases, particularly caries and enamel erosion. In modern dentistry, thorough chemical analysis of demineralization and remineralization processes improves the effectiveness of preventive and therapeutic measures. Therefore, the study of the mineral phases that compose tooth enamel, their chemical reactions, and their correlation with clinical processes is highly relevant.

Keywords:

tooth enamel, hydroxyapatite, demineralization, remineralization, fluoroapatite, acid effects, caries chemistry, mineralization process, acid-base balance (pH), chemistry in dentistry

OBJECTIVE

To scientifically analyze the mineral composition of tooth enamel and the chemical mechanisms of demineralization and remineralization processes.

TASKS

Study the chemical properties of the main mineral substances in enamel
Analyze the effect of acids on enamel from a chemical perspective
Determine the influence of fluorides on the enamel structure
Elucidation of chemical reactions occurring during remineralization

MAIN PART

1. Composition of tooth enamel

Tooth enamel consists of 96% mineral substances, 3% water, and 1% organic matter. The main mineral component is hydroxyapatite:

Hydroxyapatite crystals provide mechanical strength, durability, and acid resistance to tooth enamel.

2. Chemical mechanism of demineralization

In the oral cavity, microorganisms break down sugars to form organic acids (lactate, acetate). Demineralization begins when these acids lower the pH of the enamel surface below 5.5.

As a result, calcium and phosphate ions are washed away from the enamel surface.

3. Chemistry of remineralization

When there are sufficient calcium and phosphate ions in the oral fluid, the enamel is restored:

This process is enhanced by the salivary bicarbonate buffer system.

4. Chemical effect of fluorides on enamel

Fluoride ions interact with hydroxyapatite to form fluoroapatite:

Fluoroapatite (Ca10 (PO4) 6F2) is more resistant to acids, therefore it prevents caries.

5. Chemical changes occurring in enamel erosion

Under the influence of citric acid, carbonated drinks, and gastroesophageal reflux HCl, the following process occurs:

If the acidity is high, recovery slows down.

CONCLUSION

The stability of tooth enamel depends on its chemical structure. The reaction of hydroxyapatite with acids is the starting point of caries. Fluorides make enamel more chemically stable. Maintaining the balance between demineralization and remineralization is the most important factor in dental prevention.

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