

THE ROLE OF SALIVARY PARAMETERS IN ETIOLOGY OF DENTAL CARIES

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Abstract: Oral cavity: an extremely dynamic and unique environment, the only place in the body where mineralized tissues are exposed to external environment and that involve complex interactions between different surfaces, soft and hard host-tissue / food / air / microorganisms, constantly exposed in saliva, which tries to cope with an extremely dynamic environment.

Cuvinte cheie: calciul salivar, fosfați salivari, pH salivar, caria dentara

Rezumat: Cavitatea orala: mediu extrem de dinamic și unic, singurul loc din organism unde, țesuturile mineralizate sunt expuse mediului exterior și care implica interacțiuni complexe între suprafețe diferite, țesut-gazdă moale și tare / alimente / aer / microorganisme, scăldată permanent de salivă, care încearcă să facă față unui mediu extrem de dinamic

The hard structure of the tooth (enamel, dentine) acts as a permeable membrane in ion exchange and providing a permanent fluid between oral liquid and dental pulp. Ion exchanges, that occur in the enamel, allow substitution of ions in the crystal structure of hydroxyapatite, which may lead to changes of enamel resistance in acid environment.

Saliva: heterogeneous fluid composed of proteins, electrolytes, hormones and other compounds transported in blood, a lubricant and deposit of ions, buffer capacity system, and remarkable antioxidant, first defensive line to oxidative stress, fast collection, anywhere and anytime, high stability of the samples and the possibility of preserving their long, repeated tests can be done more easily, minimizing contamination of patients and medical staff, excellent concordance with blood level of almost all components of blood, sensitivity comparable to blood, and specificity higher in some cases, offers the possibility of study in dynamics, allows a close and constant collaboration with the patient; s not require special equipment; wonderfully suitable for screening, development of determining techniques with a high sensitivity concentration of salivary components is up to 100 times lower than in blood, saliva - widely recognized as a way of investigation and diagnosis in many medical areas: endocrinology, forensic medicine, toxicology, internal medicine, dentistry.

Salivary hypofunction causes the process of enamel demineralization and hyperfunction increases the potential of saliva in remineralization.

The chemical composition of oral fluid is complex, containing both organic and anorganic principles. Salivary **anorganic constituents** determine its osmotic pressure, the value of redox potential, pH, salivary buffer capacity, or they may be even enzyme activators or inhibitors. Variations values of anorganic components can influence, indirectly, the oral microbial flora Anorganic component is well represented by *salivary calcium*, phosphate and fluoride saliva. **Ionic content** of saliva is given by:

- cations: Ca, Na, K;
- anions: chlorides, fluorides, phosphates, sulphates, carbonates, nitrates, tiocyanats. Unlike blood plasma, the

dominant salivary cation is K and not Na, its increased value proves its glandular origin, mostly. Same phosphate ion is in saliva at a higher rate than in plasma.

Na and Cl ion concentration increases as fast as salivary flow rate, while the K's level varies slowly with salivary flow. Salivary phosphates can be combined with calcium and proteins in 10 -25% ratio or they can be found as pyrophosphate 10%, the latter being substances that prevent plaque formation by inhibiting calcium phosphate precipitation. Fluoride in salivary secretion represents 60 -70% of its level in blood; in areas where drinking water contains less than 0.2 ppm fluoride (10 uM), salivary concentration does not exceed 1 um. Salivary fluoride ions blocks calcium and magnesium ions. Calcium fluoride is insoluble on neutral pH due to the calcium phosphates.

When the pH value decreases to the value of 5, fluoride begins to release gradually.

1. Salivary phosphates have an important anticariogen role by participation in the composition of salivary buffer systems, maintaining stability of the mineral content of teeth in the process of permanent demineralization and remineralization in oral cavity, providing nutritional environment for bacterial glycolysis conduct. Salivary phosphate concentration depends on: salivary source, knowing that in parotidian saliva there is a concentration three times higher than in undermandibular gland saliva, and 18 times higher than the one derived from accessory salivary glands, salivary secretion rate, concentration being lower in stimulated saliva (2-3mmol/l) than in the rest one (5 mmol/l) salivary pH circadian rhythm, hormonal influences.

2. Salivary calcium

A particular interest presents the Ca and phosphate ions from saliva, due to their particular relations with dental tissues. Approximately 60% of salivary calcium is ionic form (free), the rest being chemical combined (protein bound). Total salivary calcium concentration is, on average, 1 -3 mM.

Ionized calcium has the most important functional role, as it occurs in determining the balance between calcium phosphates from the dental hard tissues structure and the ones from the oral fluid and plaque micobacterial.

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Its concentration increase once with minimizing oral pH. At neutral pH, ionized calcium represents 50% of total salivary calcium, but with values less than 4 of salivary pH, all salivary calcium is under ionized form. Thus, it interferes directly in triggering or stopping the development of the cavity lesion. Non-ionized calcium has a 10 -20% ratio in phosphates and bicarbonates, less than 10% is related to low molecular weight organic compounds, and approximately 10 -30%, linked to macromolecular organic compounds. A small portion of non-ionized calcium is related to salivary amylase as an enzyme co-factor. As the concentration of salivary calcium and anorganic phosphates varies a lot. Thus, their concentration is higher in unstimulated saliva. Na and Ca ion concentration of saliva decreases with age, while that of K ions increases. Decreasing Ca and Mg ions is strongly dependent of the increase of salivary flow. Calcium and anorganic phosphates are among the major salivary constituents involved in maintaining hard structures of dental health and not only. To determine the relationship between salivary calcium and these processes of outbreak cavity disease must be analysed appropriate to interface of micobacterial plaque-saliva, whereas, where there is plaque between saliva and dental surface, the pH decreases. Acids that are formed in micobacterial plaque are diluted and removed by their diffusion in salivary environment, or are transformed into weaker acids, being neutralized by salivary buffer systems: bicarbonates and calcium phosphates. They can be neutralized even at the plaque level through the protein and calcium phosphates. The micobacterian plaque acts as a barrier, retaining calcium ions, phosphate and fluoride released from enamel demineralization. Salivary calcium, especially non-protein, diffuse in the organic matrix of the mucobacterian plaque. There was found experimentally that dental plaque contains inhibitors of calcium phosphate precipitation.

The mechanisms that regulate salivary calcium depositing and phosphate ions, are directly dependent on pH. Critical pH appears when saliva is no more oversaturated with calcium ions and phosphates and the enamel becomes porous. A significant decrease in local pH changes the chemical balance of the tooth surface, increases solubility of hidroxiapatitis and disappears the oversaturation of saliva with calcium ions at this level.

Enamel fluid contains measurable amounts of calcium and potassium, they fulfilling several roles involves in maintaining metabolic processes fosters the exchange of minerals from the dentine and enamel, prevent microbial colonization of the tooth.

Between internal and external enamel there is an ionic balance that can be broken by applying an acid enamel surface. Calcium ions will be attracted to the superficial enamel. The degree of calcium ions migration depends on the level of pH intensity, the duration and frequency of acid attacks, and the ability of tooth to defend itself.

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