

Salivary Urea and Uric Acid Levels as Biomarkers in Dental Caries

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Abstract

Aim: Role of ureases and uric acid levels in saliva and its correlation with dental caries status.

Material and Methods: Saliva Samples were collected from 20 Caries free individuals and 20 Caries active individuals. These samples were estimated for urease and arginine deiminase levels and results were further subjected to statistical analysis.

Control Group: 20 Caries Free Individuals (DMFT = 0)

Test Group: 20 Caries Active Individuals (DMFT = => 3)

Unstimulated Saliva Samples were collected (5 ml) and evaluated for urease levels by Berthelot method and Uric acid levels by UV spectrophotometry (395nm). Statistical analysis is done by Independent sample t test.

Results: Urea levels in saliva of caries free individuals are significantly higher compared to caries active individuals. Uric acid levels in both the groups are not statistically significant.

Key Words: Urea; Uric acid; Saliva; Dental caries

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Introduction

Dental caries is the most prevalent oral disease, comprising almost 100% of the world population generating an epidemiological problem in all countries. The transition from oral health to such Disease is characterized by compositional and metabolic changes of the oral biofilm. [1] A strong correlation is evident between the compositional and metabolic changes of the dental Biofilms and the transition from oral health to disease states. In the case of caries, frequent acidification of dental biofilms favors the emergence of an acidogenic and aciduric micro flora, including mutans streptococci and Lactobacillus spp., which ferment dietary carbohydrates rapidly and lower the pH to values that accelerate tooth demineralization. [2]

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A new approach in caries research is focused on the fact that alkali generation from salivary Substrates, like urea and arginine, may play an important role in biofilm pH, homeostasis and in inhibiting dental caries .The primary source of alkali generation in dental plaque and saliva is through the hydrolysis of urea by urease enzymes¹.Urea is present in saliva and clevicular fluids at 3-10mM in healthy individuals and it is hydrolyzed by ureases to generate 2 molecules of ammonia and one molecule of Co₂. Ammonia can neutralize acids generated from bacterial glucolysis, inhibiting the inhibition and progression of tooth decay. Uric acid is end product of purine metabolism, also reported to act as an antioxidant [11].

In this study the role of ureases and uric acid levels in saliva is evaluated in relation to caries status. This information will facilitate the rationale design of strategies that rely on alkali production of caries risk assessment and interventions also formulating probiotic applications to enhance oral ureolysis and development of carious lesion and role of uric acid as an antioxidant in saliva.

Methods and Materials

After obtaining the institutional ethical clearance the study was conducted among the subjects reporting to the Out Patient Department of A.B. Shetty Memorial Institute Of Dental Sciences, Deralkatte Mangalore. Saliva Samples were collected from 20 Caries free individuals and 20 Caries active individuals. These samples were estimated for urease and arginine deiminase levels and results were further subjected to statistical analysis.

Inclusion Criteria:

1. Caries free and Caries active individuals under the age group of 20-50 yrs.
2. Subjects those who are willing to consent to be a part of the study.

Exclusion Criteria:

- Subjects with history of long term medication.
- Subjects with history of systemic or local diseases which affects salivary secretion.

Subjects those who fulfill the inclusion criteria, under the age group of 20-50 years are selected among the patients reporting to the OPD of A.B. Shetty Memorial Institute of Dental Sciences. Informed Consent is duly signed by the patient and case history is recorded Caries status is assessed according to WHO recommendations to calculate dental caries index, Oral Health Survey 2013.

Control Group: 20 Caries Free Individuals (DMFT=0)

Test Group: 20 Caries Active Individuals (DMFT= => 3)

Unstimulated Saliva Samples were collected (5 ml) and evaluated for urease levels by Berthelot method and Uric acid levels by UV spectrophotometry. (395 nm).

Statistical analysis

The data were analyzed using the Statistical Package for Social Sciences (SPSS Inc. Released 2009. PASW Statistics for Windows, Version 18.0. Chicago: SPSS Inc., IL, USA). Statistical analysis is done by Independent sample t test. Comparison between the groups is done by Pearson correlation test. All values were expressed as mean \pm S.D. P < 0.05 was considered statistically significant.

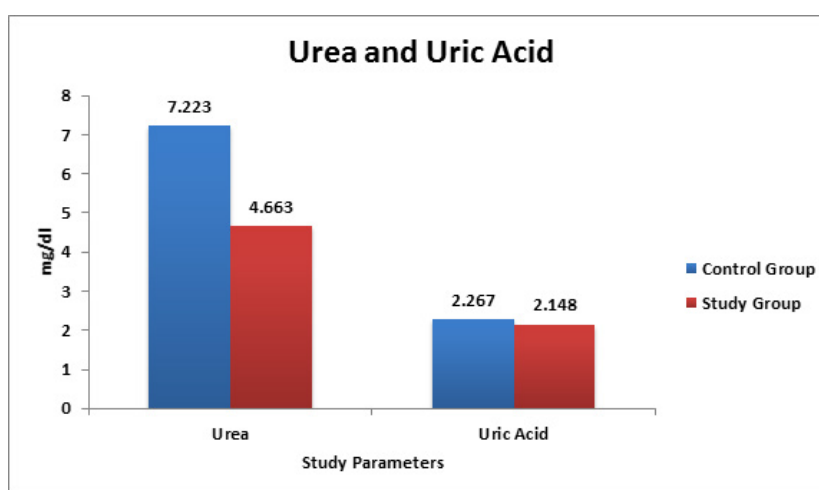
Results

Urea levels in saliva of caries free individuals are significantly higher compared to caries active individuals. (Table 1). Uric acid levels in both the groups are not statistically significant.

	Group	N	Mean	SD	p-value
Urea mg/dl	Control	20	7.223	1.125	< 0.001*
	Study	20	4.663	1.060	
Uric acid mg/dl	Control	20	2.267	0.397	.48 (NS)
	Study	20	2.148	0.396	

Table 1: Urea and Uric Acid Levels in Caries Free (Control) Caries Active (Study).

*P < 0.05 statistically significant



Graph 1: urea and uric acid levels in caries active and caries free group.

Discussion

The biofilms colonizing the tissues of the mouth are continually subjected to fluctuations in Environmental conditions. The environmental factors that have been shown to have the most profound influence on the composition and biochemical activities of oral biofilms, and thus on their pathogenic potential, are pH and source and availability of nutrients. variety of sources that indicates that the capacity of oral biofilms to generate alkali, which can neutralize acids and prevent the emergence of a cariogenic micro flora, is a critical factor in prevention of initiation or inhibition of progression of caries. [3] Composition and metabolic changes in oral biofilm may generate an acidification that favors the growth of an acidogenic and aciduric micro biota, with the presence of *Streptococcus mutans* and *Lactobacillus spp* that are associated with an increase in caries susceptibility [1].

This study shows significantly higher levels of urea levels in caries free individuals may be attributed to generation of ammonia which favors the equilibrium between mineralization and demineralization, playing a key role in plaque pH homeostasis, preventing the emergence of a cariogenic micro biota, which could be a major impediment to the development of dental caries.

Which consistent with similar studies conducted by Evelyn Reyes., *et al.* (2014) Nascimento., *et al.* (2009) and Gordan V., *et al.* (2010). The association between caries-free subjects and a higher ammonia generation as obtained in our study, in saliva may inhibit the development of a pathogenic microbiota, in an acidic oral environment [1]. Alkali generation is important in the physiology, ecology and pathogenicity of dental biofilms. A substantial body of evidence from microbiological, genetic, and biochemical analyses and clinical studies has suggested that the alkaliogenic potential of dental biofilms may be used as a strategy for caries control [10]. There was no significant change in uric acid levels in comparison between the groups, which may be attributed to the minimal inflammatory condition in the oral cavity. Further studies in various stages of carious and larger sample size may help in better understanding of role of uric acid as antioxidant.

Conclusion

This study supports the theory that increased caries risk is associated with reduced Alkali-generating capacity of the bacteria colonizing the oral cavity; providing compelling evidence to further our understanding of oral alkali-generation in health and disease.

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