

Evaluation of Caries Activity by ORATEST

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ABSTRACT

Aims & Objectives – To evaluate caries activity by a simple, chair side caries activity test, the Oratest, which provides an estimate of oral microbial levels based on the rate of oxygen depletion in expectorated milk samples.

Materials & Methods – The study sample consists of 90 students, out of which 30 had caries, 30 were children with special health care needs and 30 children were caries free (control group). Sampling of expectorated milk sample was done following the method advised by Tal & Rosenberg. Time taken for change of blue color to white was noted for each group. High statistical significance was found when the means of these three groups were compared.

Conclusion – The test proved to be a simple, inexpensive and rapid technique for assessing caries activity since statistically highly significant correlation was observed among the three groups.

Keywords – Dental Caries Activity Test, Health care needs, Bacterial Count, Oratest.

INTRODUCTION

Dental caries is one of the most common microbial infection^[1]. Caries is characterised by a localized, transmissible, microbial infectious process that ends up in the destruction of dental hard tissues^[2].

To assess an individual's risk of developing caries, it is important to evaluate the composition of oral flora and the amount of caries causing bacteria. For this purpose, a plethora of caries activity tests have been developed to predict the susceptibility to caries. The tests form an essential part concerning with the study or treatment of dental caries.

The evaluation by caries activity tests is based on the concept of a specific odontopathic infection i.e. dental caries, the chief causative organism being *Streptococcus mutans*.

Microbiological caries activity tests mainly follow two principles,

1. Estimation of bacterial counts expressed as colony forming units (CFU).
2. Qualitative estimation of products of bacterial metabolism^[3].

Many caries activity tests have been proposed to find relevant micro organisms causing caries, both quantitatively and qualitatively. But to date, the ideal method to evaluate in terms of sensitivity, specialization and reliability has not been found^[4]. Also many of these caries activity tests require extensive work up time and additional equipment. Simple, inexpensive techniques, which do not demand, sophisticated skills or consume much time are required.

Also, individuals with Special Health Care Needs are at an increased risk for oral diseases throughout their lifetime^[5]. The AAPD defines special health care needs as “any physical, developmental, mental, sensory, behavioral, cognitive, or emotional impairment or limiting condition that requires medical management, health care intervention, and/or use of specialized services or programs^[6].” These patients do not have the ability to understand, assume responsibility for, or cooperate with preventive oral health practices and hence, are susceptible to oral ailments such as dental caries. Oral health is an inseparable part of their general health and well-being. Thus, a simple, inexpensive technique, which does not demand sophisticated skills or consume less chair side time will serve to be an appropriate caries activity test for routine clinical practice^[7].

A simple, chair side, non-invasive test, the Oratest, was proposed by Rosenberg and Tal, which provides an estimate of oral microbial levels based on the rate of oxygen depletion in expectorated milk samples^[8]. They reported that the time

taken for the indicator dye methylene blue in the milk expectorated after rinsing of the mouth was inversely proportional to the number of organisms in the expectorate^[9].

Later, in 1996 Patalay, *et al.* attempted to use Oratest as a method to assess caries activity since dental caries has been currently accepted to be a specific microbial disease^[10]. This study was designed to evaluate the efficiency of Oratest, to assess the oral microbial levels, in normal as well special health care need children.

PRINCIPLE OF ORATEST

Oratest is based on the rate of oxygen depletion by micro organisms. Under aerobic conditions the bacterial enzyme, aerobic dehydrogenase transfers electrons or protons to oxygen. Once oxygen gets utilized by the aerobic organisms and an anaerobic environment is attained, methylene blue (redox indicator) acts as an electron acceptor and gets reduced to leucomethylene blue. The metabolic activity of the aerobic microorganism is reflected by the reduction of methylene blue to leucomethylene blue^[7].

The test is based on rinsing the mouth with sterile milk which dislodges the micro-organisms and also produces a substrate for their further metabolism. The formation of leucomethylene blue can be easily observed because of the white color of milk^[11].

MATERIALS AND METHODS

The present study was conducted on 90 children who were divided into 3 groups:

Group I consisting of 30 children with dental caries.

Group II consisting of 30 children with special health care needs.

Group III consisting of 30 children free from caries, gingivitis and plaques score of zero as per modified Silness and Løe plaque index. (Control group)

The criteria for selection of subjects in group I was, children with dental caries involving one or more teeth and Gingival index score of Zero (Løe and Silness index).

The armamentarium [Figure 1] used in the study were:

- Sterile beakers
- Sterilized milk (double-toned cow milk, 3% fat, pH 6.5)
- Test tubes
- 0.1% aqueous solution of methylene blue
- 10 ml disposable syringes
- Pipette, mirror, stopwatch and test tube stand.

The subjects were examined and consent was obtained from the parents. All subjects were taken for the study after a lapse of 90 minutes since the last consumption of food or drink.

The children included in the study were given 10 ml of ultra-high-temperature sterilized cow's milk and each child was asked to rinse his/her mouth vigorously for 30 seconds. The expectorate was collected in the same beaker and 3 ml of this was transferred to the screw cap tube with the help of a disposable syringe. To this, 0.12 ml of 0.1% methylene blue was added, thoroughly mixed and then placed on a stand in a well-illuminated area. The tubes were observed every 10 min for any color change at the bottom that would easily be discernible in the mirror at room temperature. The time required for a color change from blue to white within a 6-mm-diameter circle on the bottom of the test tube was recorded.

OBSERVATIONS AND RESULT

A total of 90 children were assessed for the present study out of which 30 were children with caries, 30 were children with special health care needs and 30 were children with no oral ailment, i.e. the control group.

The mean time taken for change of blue color to white for group I was 51.8 ± 2.43 min, group II was 20.8 ± 1.40 min and group III was 252.8 ± 1.46 min. [Figure 1].



Figure 1 – Armamentarium used

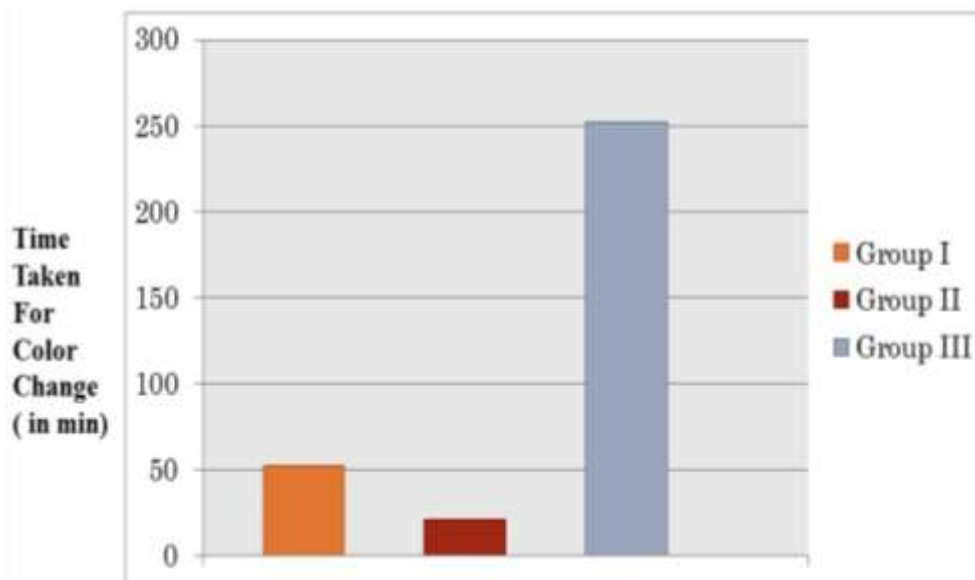


Figure 2 – Mean time for color change

Comparison among the means of these three groups was found to be statistically very highly significant [P=0.000].

Comparison of Oratest time between three groups was significant [P = 0.000] using paired t test. [Table 1].

Table 1 – Comparison of mean time taken for color change using paired t test.

	Mean	Std. Deviation	Sig. (2-tailed)
Group (I – II)	30.97000	2.57430	.000*
Group (II – III)	-231.99667	2.30135	.000*
Group (I – III)	-201.02667	3.07469	.000*

*p ≤ 0.01 = highly significant

DISCUSSION

The growing interest in the microbiological aspects of dental caries has led to the development of a variety of diagnostic procedures. A number of caries activity tests have been developed to help detect the presence of oral conditions associated with increased caries risk^[12]. Dental caries activity tests have been widely used in the assessment, monitoring and motivation of patients with dental caries. Since, many of these tests rely on the samples of salivary bacteria. The reliability of such tests is limited, because the bacteria that are free-floating in the saliva may not necessarily represent the bacteria in plaque and these tests, also need extensive working time and expensive armamentarium.

Moreover, the deteriorated oral health of children with special health care needs demonstrates the need for home and professional care for these children.

The caries activity tests are an optimum way to predict the clinical course of an individual's carious process.

A simple, in-expensive technique that does not demand sophisticated skills or costly chair side time, is required in order to expedite the diagnosis and appropriate management of dental caries.

In the present study, the mean time taken for color change from blue to white was 51.8 ± 2.43 min in group I, 20.8 ± 1.40 min in group II and 252.8 ± 1.46 min in group III [control group].

A significant difference is noted amongst the mean time taken for color change for the 3 groups and the maximum time taken for color change was noted in group III.

These findings were in agreement with the findings of Patalay *et al*, who performed Oratest on 50 children. They found the mean time taken for the color change was $279.9 \text{ min} \pm 89.74$ in the control group and $55.6 \text{ min} \pm 66.33$ for the test group. The difference between the 2 groups was highly significant.

Group II consisting of children with special health care needs showed the minimum time taken for color change proving the hypothesis that higher the infection, lesser was the time taken for the change in the color of the expectorate, reflecting higher oral microbial levels. This is in accordance with the findings of Rosenberg *et al*.

The minimum time taken in case of group II is also due to the fact that the Oratest gives positive observations in cases of gingival diseases, periodontal diseases, halitosis etc. Thus, this test lacks specificity, as it does not identify the source of micro organisms.

Oratest can be easily learnt and performed by the auxillary personnel and hence, can be used as a diagnostic tool in school health programs. The positive results can easily be visualized by the practitioner, child and the parent and thus, proves that this can be used to motivate and to monitor treatment progress. It can provide a baseline with which subsequent changes in clinical status and oral hygiene can be monitored in a chair side or even home environment^[13]. The results of this study proved the hypothesis that higher the level of infection, lesser was the time taken for the change in color of the expectorate, reflecting higher oral microbial levels. Thus, the test can be used as one of the tool, to estimate the activity of demineralization by the bacteria conducive to the suitable environment.

CONCLUSION

A caries activity test serves as an index to determine the need and extent of personalized preventive management. Oratest proves to be a simple, inexpensive and rapid determinant of caries causing bacteria. This method can be useful, both at individual and community level, to evaluate important caries risk factors and predict the course of clinical management.

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