The Relationship between the Caries Activity Test (Snyder) and Salivary IgA Level

by

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(Received 25 March 1986)

Key words: caries susceptibility, Lactobacillus, Snyder test, immunodiffusion, salivary IgA

Summary

In this study, the relationship between the results of the caries activity test (Snyder) and salivary IgA level were investigated statistically.

There was no significant difference between caries-resistant and slightly caries-active groups (p>0.05), although there were significant differences between moderately active and slightly active and between moderately active and caries-resistant groups at the level of p<0.05.

There were statistical relationships between caries-active and moderately active groups, moderately active and slightly active groups, and between slightly active or caries-active and caries-resistant groups at the level of p<0.01.

Introduction

The microbiology of plaque, connections between immunoglobulin levels in saliva and serum and caries prevalence, specific antibodies against cariogenic streptococci and immunization experiments with oral microbiota have been closely studied by various researchers (BROWN et al.[1], EVERHART et al.[2], EVERHART et al.[3], FERGUSON[4], LEHNER et al.[5], LEHNER et al.[6], MICHALEK et al.[9], MICHALEK et al.[10], SHKLAIR et al.[12], ZENGO et al.[15]).

Immunological studies of lactobacilli have shown that the surface antigens are not tightly bound to bacteria, but are readily liberated by autohydrolysis with the acids produced by the organism's metabolism (McKAY[8]). Lactobacillus and Streptococcus mutans show a similar correlation with dental caries activity. Such activity is more frequent when both organisms are present and more infrequent when both are absent. The Snyder test is a means of estimating viable lactobacilli in a given volume of saliva (SNYDER[14]). The rapidity of color change in the Snyder test is indicative of the magnitude of the potential for producing dental caries. A positive result means that the necessary conditions for producing dental caries exist in a

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patient's mouth (Nolte[11], Sims[13]). For this reason, it may be useful to determine the salivary immunoglobulin level at the time of measuring the potential for producing dental caries in a given mouth.

In the present study, we tried to determine statistically whether any correlation exists between the caries activity test (Snyder) and salivary IgA level.

**Materials and Methods**

Whole salivary samples (5 ml) were collected without stimulation from 107 healthy individuals after they had eaten breakfast. The subjects were living in a non-fluoridated area and their ages ranged from 21 to 38 years. Salivary immunoglobulin concentrations were determined by the radial immunodiffusion technique described by Manzini et al.[7] using IgA plates (ICL Scientific).

Then another portion of each sample was homogenized in a Thomas vertical vibrator for 5 minutes (1,000 cycles/min), and 0.2 ml of this homogenized saliva was inoculated into Snyder agar (45°C) and incubated for 72 h at 37°C.

The color change in Snyder agar from green to yellow was evaluated for 24, 48 and 72 h according to the norms described by Nolte[11], Sims[13] and Snyder[14]. The caries activity of samples was evaluated and individuals were grouped according to their activity as caries-resistant (no color change), slightly active (color change in 72 h), moderately active (color change in 48 h), or caries-active (color change in 24 h). IgA concentrations were assessed for each individual. All of the results were grouped and tabled. The relationship between the result of the caries activity test and immunoglobulin level was evaluated statistically by analysis of variance and Duncan test.

**Results**

The results are presented in the Table.

Generally, it was found that significant differences existed between the groups (F = 10.896, p < 0.01). When the Duncan test was used for different groups, there was no difference between the caries-resistant and slightly active groups (p > 0.05), although there were differences between the moderately active and slightly active groups and the moderately active and caries-resistant groups at the level of p < 0.05. There were also relationships between the caries-active and moderately active, moderately active and slightly active or caries-active and caries-resistant groups at the level of p < 0.01.

<table>
<thead>
<tr>
<th>Caries activity</th>
<th>n</th>
<th>$\bar{x}$ ± Sx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caries-resistant</td>
<td>12</td>
<td>39.117±3.045</td>
</tr>
<tr>
<td>Slightly active</td>
<td>34</td>
<td>19.299±2.070</td>
</tr>
<tr>
<td>Moderately active</td>
<td>37</td>
<td>29.374±2.182</td>
</tr>
<tr>
<td>Caries-active</td>
<td>22</td>
<td>39.102±4.224</td>
</tr>
</tbody>
</table>

$\bar{x}$ = mean  
Sx = standard error of mean.
Discussion

Experiments have shown that antibodies might be of value in preventing dental caries (BROWN et al.\[1\], EVERHART et al.\[2\], EVERHART et al.\[3\], FERGUSON\[4\], LEHNER et al.\[6\], LEHNER\[5\], MICHALEK et al.\[9\], MICHALEK et al.\[10\], SHKLAIR et al.\[12\], and ZENGO et al.\[15\]). Modulation of immune responses by bacterial products has received considerable attention in recent years. The special structure of teeth and the location of enamel outside the body do not permit classical immune reactions to operate. A number of salivary defence factors, constituents that can effect bacterial proliferation and plaque ecology, may contribute to caries resistance. Three possible immune mechanisms have been shown to be involved in the pathogenesis of caries: salivary IgA and antibodies, serum antibodies and cell-mediated immunity. Salivary IgA could play a part in caries prevention. LEHNER et al.\[5\] have reported higher immunoglobulin levels in the whole saliva of caries-free subjects than in caries-active individuals. SHKLAIR et al.\[12\], on the other hand, found no differences in the amount of IgA in the parotid and whole saliva between caries-free and caries-active individuals. ZENGO et al.\[15\] found significantly higher IgA levels in the submaxillary saliva of caries-resistant persons when compared to caries-susceptible subjects. BROWN et al.\[1\] found that salivary IgA level was inversely related to increased numbers of cariogenic microorganisms and DMFS increments. EVERHART et al.\[2\] found a negative correlation between DMF surfaces and IgA/100 ml saliva in the 20-to-29 age group. Decayed surfaces were negatively correlated to IgA/minute in the 10-to-19 age group and in a black sample, while the 30-to-39 age group showed a positive correlation between decayed surfaces-IgA/minute and DMF surfaces-IgA/100 ml saliva. FERGUSON\[4\] found that patients with a higher DMF score had significantly lower salivary concentrations of gamma-globulins than patients with a low DMF score. Higher serum and lower salivary concentrations of IgA occurred more in caries-prone than in caries-resistant patients. According to the above author, this may have been due to reduced salivary secretion of antibody or its rapid combination with antigen.

Lactobacilli are thought to be involved in the initiation of dental caries, although they comprise only a small proportion of the total microflora. One might suppose that the antigenic stimulation produced by this organism might be negligible. However, in practically all situations in nature where lactobacilli are found, streptococci are also present. Such lactobacilli only become prominent in these situations when the acid conditions created by streptococci selectively favor them. In order to produce oral conditions which are sufficiently acid to favor lactobacilli, high concentrations of streptococci are required. The Snyder test indicates the number of areas of stagnation in the mouth where thick plaque has formed and where acid conditions of sufficient degree to favor lactobacilli are periodically, or continuously, occurring. The Snyder test measures the potential for producing dental caries prevailing in a given mouth. It may therefore be valuable to determine the salivary immunoglobulin level at the same time as caries activity, so that the antigenic stimulation can be confirmed.

A person cannot be classed as caries-immune or caries-prone on the basis of
the number of carious teeth present without some knowledge of the degree of his exposure to caries-producing conditions.

We therefore consider that it may be valuable to estimate the salivary immunoglobulin levels present when caries-promoting factors are prevalent.

References