The Role of Prebiotics and Probiotics in the Oral Microbiota

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Abstract

It is well known that prebiotics and probiotics alter the human gut microbiota, which is linked to positive health outcomes. The aim of this systematic review was to evaluate whether prebiotics and probiotics have significant changes in the oral microbiota. This research examines and analyzes journal articles that discuss prebiotics and probiotics and their effects in the oral microbiota. PubMed and Academic Search Premier databases were used to search articles based on numerous criteria. 18 articles were found, and four studies of the 18 were used to analyze the results. Of the four studies, two found a significant reduction in streptococci mutans when a type of probiotic was taken. The other two studies, however, didn’t show a significant effect or a shift in the oral microbiota composition. Overall, more studies need to be done on the effect of probiotics and prebiotics in the oral microbiota, especially since it’s currently suspected that changes in the oral microbiota may decrease risk for chronic diseases including cardiovascular disease and cancer, and oral diseases such as dental caries and gingivitis.

Background

• The oral cavity is known to have the second most complex microbiota in the human body after the colon.¹
• There’s approximately 700 species that are present in the oral cavity.
• The human mouth contains microorganisms such as protozoa, bacteria, fungi, and virus.² They’re the cause of a variety of oral diseases such as dental caries, tonsillitis, and periodontitis.²
• The oral cavity consists of tissues and structures such as teeth, tongue, gingival sulcus (crevice), palate, cheeks, and lips.²
• The saliva in the mouth has a pH between 6.7-7.25, allowing microorganisms to grow easily in that environment.³

Why is the Oral Microbiota Important?

• The oral microbiota plays a crucial role in the development of many systemic and oral diseases such as heart disease and periodontal disease.

Oral Diseases:
• Periodontal diseases
• Dental caries

Systemic Diseases:
• Oral bacteria can easily have access into the bloodstream through the gingival crevice, which can cause a variety of infections throughout the body.
• Can be considered as a potential biomarker for diseases such as cardiovascular disease, diabetes, and cancer.

Prebiotic and Probiotic Definitions

• The term prebiotic is a non-digestible fermentable ingredient that can alter the composition of the gastrointestinal microflora.
• Probiotics come from the Greek word “for life” and is generally known as a living microorganism that has beneficial health effects on a host (human or animal) by improving the balance in the gut.⁴
• The term probiotic was used traditionally for the gut. Current studies, however, have now been proposed for use in other sites such as the oral cavity.⁵
• Prebiotics are also known as non-digestible oligosaccharides and have been shown to be beneficial when treating oral diseases.⁵
• Strains of probiotics such as Lactobacillus and Bifidobacteria are generally used to reduce gastrointestinal infections.⁶

Methods

• A search during the months of June and July was conducted using PubMed and Academic Search Premier databases.
• Keywords were “prebiotics,” “probiotics,” “oral/dental health,” and “oral microbiota”

Selected studies based on:
• English language
• Published studies or reviews within 20 years
• Healthy participants
• Human subjects. No animals.
• Duration: at least a week (7 days)

Excluded studies that didn’t directly relate to the topic.

Results

• A total of approximately 23 articles were identified, but after a close review of each article, it was reduced to 18 articles.

<table>
<thead>
<tr>
<th>Population</th>
<th>Test Strain/probiotic</th>
<th>Delivery Vehicle</th>
<th>Frequency</th>
<th>Study Design</th>
<th>Result</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 healthy women</td>
<td>Lactobacillus Reuteri</td>
<td>Lozenge</td>
<td>Once daily for 10 days</td>
<td>Randomized, double blind</td>
<td>Reduced salivary S. mutans</td>
<td>(7)</td>
</tr>
<tr>
<td>22 healthy adults</td>
<td>Lactobacillus casei Shirata</td>
<td>Milk</td>
<td>1 bottle (65 ml) per day</td>
<td>N/A</td>
<td>No significant effect</td>
<td>(8)</td>
</tr>
<tr>
<td>44 healthy adults</td>
<td>Lactobacillus Reuteri</td>
<td>Lozenge</td>
<td>Twice daily for 12 wks</td>
<td>Double blind, randomized</td>
<td>Induced a shift in the composition but no significant effect</td>
<td>(9)</td>
</tr>
<tr>
<td>43 healthy young adults</td>
<td>Lactobacillus haimnosus</td>
<td>Milk</td>
<td>Once daily for 4 wks</td>
<td>Double blind, randomized</td>
<td>Reduced S. mutans and total bacteria</td>
<td>(10)</td>
</tr>
</tbody>
</table>

Table 1: shows four different studies on probiotics and what each study used including subject group, type of probiotic, and duration of the studies. Table also shows the results of each of the four studies.

Conclusion

• The relationship between the oral microbiota and disease outcomes is an exciting and interesting new field with a promise on chronic disease prevention.
• For this review, two studies resulted in a significant reduction in streptococci mutans.
• Two other studies found no shift in the oral microbiota composition.
• Limited research exists on the effect of dietary exposures such as prebiotics and probiotics in the oral microbiome.
• More in-vivo studies need to be conducted on the oral microbiota to confirm the beneficial effect of prebiotics and probiotics.

References