

Bacteria: A Blessing in Disguise

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Summary of Report

A clear majority of the population has experience with the epidemic that is dental caries. Most people know that preventing dental caries is possible, but a lot of them may not know that there are different ways to accomplish this goal. This research shows how amino sugars, probiotics, and arginolytic streptococcus species all can work in accordance with the oral microbiota to reduce and ultimately prevent the occurrence of dental caries. Since there is more research, there is also more hope that people will use this information to aid in dental, as well as their overall health.

Introduction

- Untreated “cavities” cause discomfort, pain, or eventually tooth loss.
- Cavities are preventable.
- Prevent cavity: good oral hygiene, low sugar diet, fluoride treatment, dental sealant, etc.
- Amino sugars and arginolytic *streptococcus* species work with oral microbiota to help with prevention of dental caries.
- Use of probiotic as alternative choice in prevention of dental caries.
- Effect of bacteria on oral health, benefit everyone especially high caries risk patients.

Body of Report, Graphs, Images

- Arginine deiminase system (ADS) helps fight caries
- ADS increases the pH levels of the biofilm in the mouth
- Inhibits loss of tooth structure and encourages remineralization



S. sanguinis



S. gordonii

- Amino sugars work alongside *S. sanguinis* & *S. gordonii*
- Commensal bacteria feed off of amino sugars more readily
- Cariogenic bacteria have less chance to feed off the sugars
 - Probiotic benefit: caries management, Candida species management, periodontal disease, halitosis (Alok et al., 2017)
 - *Lactobacillus*: *L. rhamnosus* GG & *L. casei* - inhibit the growth of *Streptococci*. *S. mutans* (Figure 2)

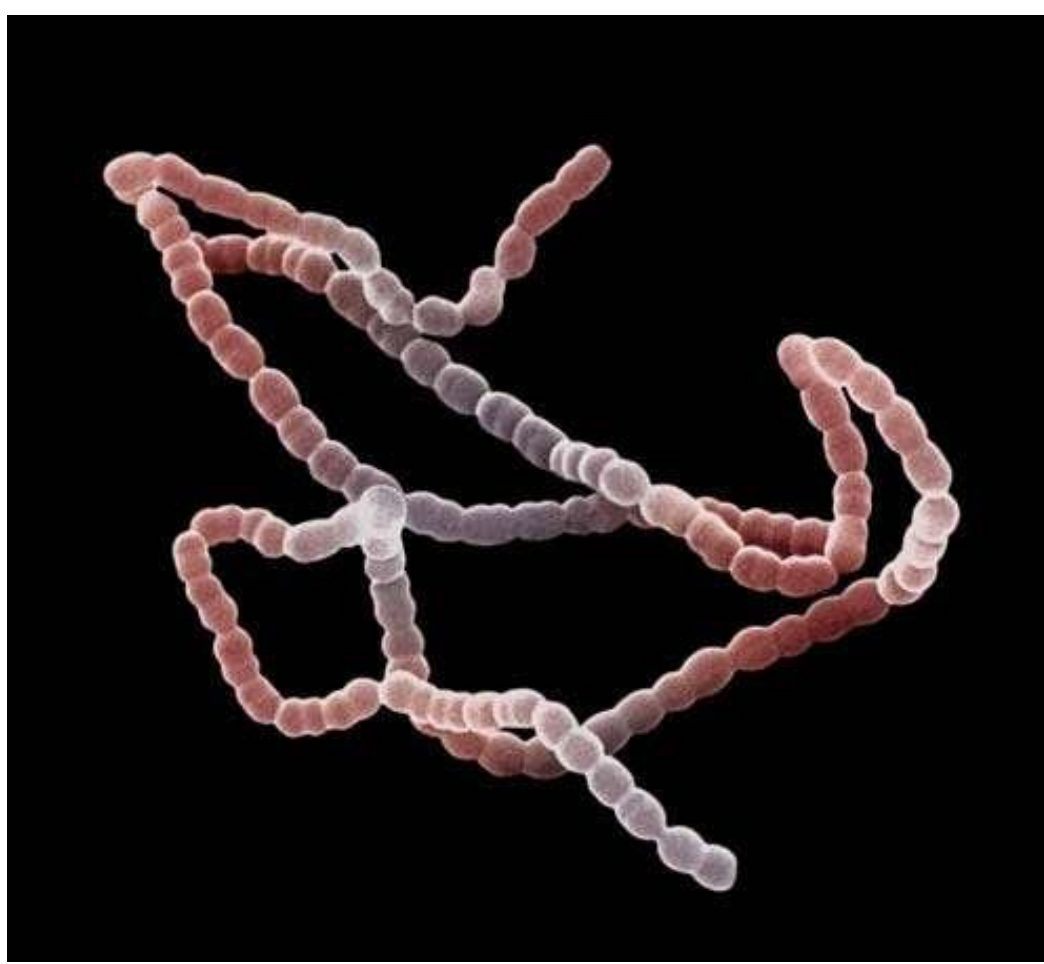


Figure 2: *Streptococcus mutans* (Britannica, 2018)



Figure 3: Lactobacillus casei Shirota strain (Science Photo Library, 2014)

- *Lactobacillus rhamnosus* GG & *Lactobacillus reuteri* - reduce *Streptococcus mutans*
- Probiotic milk containing *L. rhamnosus* GG - decrease *S. mutans* counts, reduce caries risk on children (Alok et al., 2017)
- Deo and Deshmukh (2015): Compare salivary levels of *S. mutans* with/without probiotics *Lactobacilli casei* strain (Figure 4)
- Zhejiang University: probiotic *Lactobacilli* and prevention of dental caries (Table 2)
 - All 4 different *Lactobacillus* strains inhibit growth of *S. mutans*, inhibition rate range: 70 to 90%, average: ~70 to 75% ($p<0.05$)

Table 1: Probiotics role in oral and general health

Production of antimicrobial substances
Organic acids
Hydrogen peroxide
Diacetyl
Carbon peroxide
Bacteriocins
Biosurfactants
Binding in oral cavity
Compete with pathogens for adhesion sites
Involvement in metabolism of substrates (competing with oral microorganisms for substrates available)
Immunomodulatory
Modulate humoral and cellular immune response
Stimulate nonspecific immunity
Modify oral conditions
Modulating pH
Modification of oxidation-reduction potential
Miscellaneous
Lower serum cholesterol
Reduction in risk of colon cancer
Lower level of toxigenic/mutagenic bacteria
Improves lactose tolerance

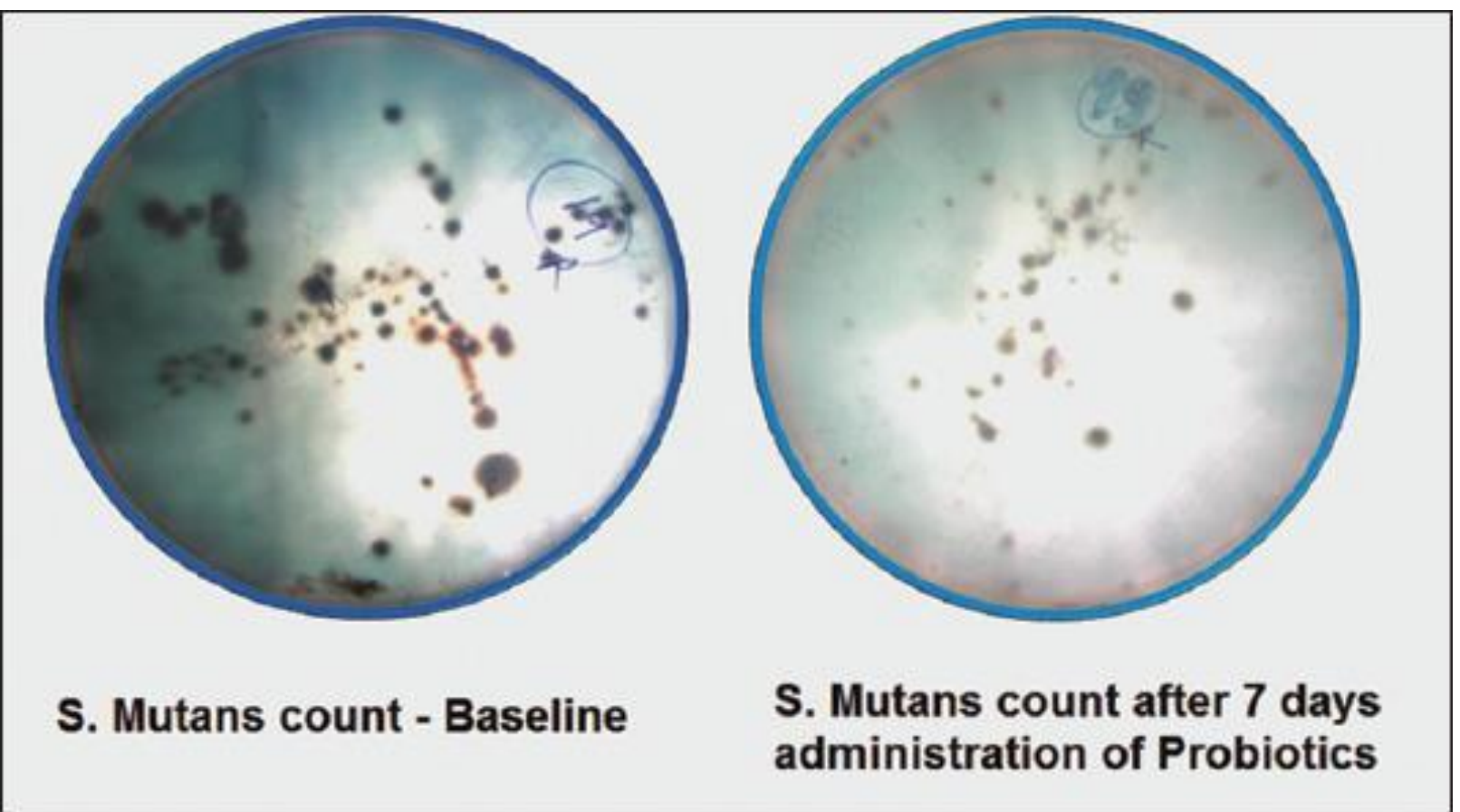


Figure 4: *Streptococcus mutans* count before and after administration of probiotics (Deo & Deshmukh, 2015)

Strains	Inhibition rate (%)
L. casei Shirota	70.57%
L. casei LC01	74.29%
L. plantarum ST-III	71.11%
L. paracasei LPC37	72.18%

Table 2: Inhibitory effects of 4 different *Lactobacillus* strains on clinical isolated *S. mutans* after 24 hours (Lin et al., 2017)

Conclusions

The purpose of this research was to emphasize that cariogenic bacteria are very serious and of utmost concern in the oral cavity. We also wanted to emphasize that there are different measures available that could reduce (or eliminate) the occurrence of dental caries. To try to reduce the cariogenic bacteria in the mouth, strategies such as using probiotics, amino acids, and the arginine deiminase system (ADS) have been shown to be very beneficial. It is not realistic that every person will implement these methods into their daily routines, but it is possible that this will help bring awareness to individuals that there is more that they can do to reduce the occurrence of dental caries.

Literature cited

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Acknowledgments