THE POSSIBILITY OF PROBIOTICS

HOW THESE LIVE MICROORGANISMS AFFECT BOTH ORAL AND SYSTEMIC HEALTH.

By Sarah DeBowes, RDH, BS

INTRODUCTION

Sunstar Americas continues to listen to your requests for high-quality, relevant information. This month, Sarah DeBowes, RDH, BS, from Old Dominion University shares her knowledge of current dental probiotics and what the future holds for probiotics and their systemic uses. Clinical studies have shown that oral probiotics promote healthy teeth and gums, reduce plaque, and prevent halitosis.

As the demand for natural remedies grows, oral health professionals need to understand the benefits of alternative treatments. The popularity of probiotics in the treatment of general health conditions continues to increase and now oral health professionals have the option to recommend a dental probiotic.

As dental hygienists, we understand that patients require customized care, and we are always looking for additional therapies and modes of treatment that will not only benefit patients' oral health but their overall systemic health as well. The dental industry continues to develop exciting new treatment alternatives that focus on oral and systemic health. In order to provide the best possible care to our patients, we must stay informed and provide education on these advances.

Enjoy this month's Spotlight and DeBowes' insight into all that probiotics have to offer now and what the future may hold.

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Probiotics were discovered almost 100 years ago, although their use in the United States is a fairly new phenomenon.[1] Researchers are finding many ways in which probiotics may positively impact human health, and consumers are attracted to the idea of a potential natural healer.[2] Marketers have taken note of this interest and the promotion of probiotics in a variety of products is now ubiquitous. From foods and drinks to pills and lozenges, these live microorganisms can improve the health of humans in a variety of ways. Given the significant effect probiotics can have on the human body, oral health professionals need to understand how probiotics work and how they can positively affect our patients—both orally and systemically.

WHAT ARE PROBIOTICS?

The most current definition of probiotics was established in 2002 by an expert panel from the Food and Agriculture Organization of the United Nations and the World Health Organization. It states that probiotics are "live microorganisms which, when administered in adequate amounts, confer a health benefit to the host."[3] This definition has been accepted internationally, although it may change as research progresses.[4]

The US Food and Drug Administration (FDA) regulates the safety and handling of probiotic prod-

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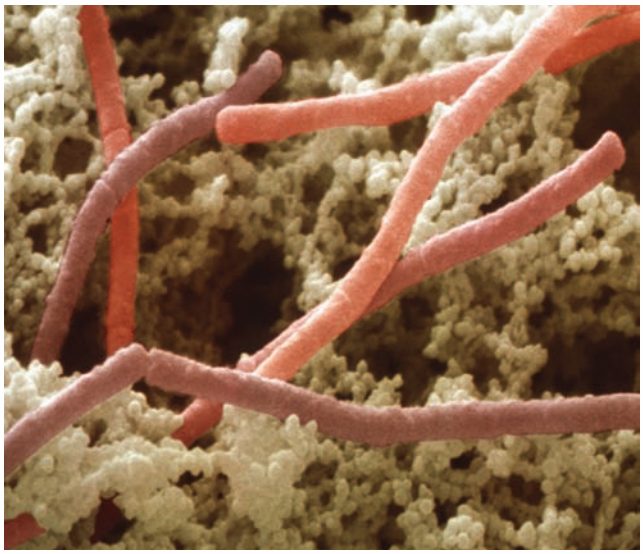

Figure 1. *Lactobacillus bulgaricus.*

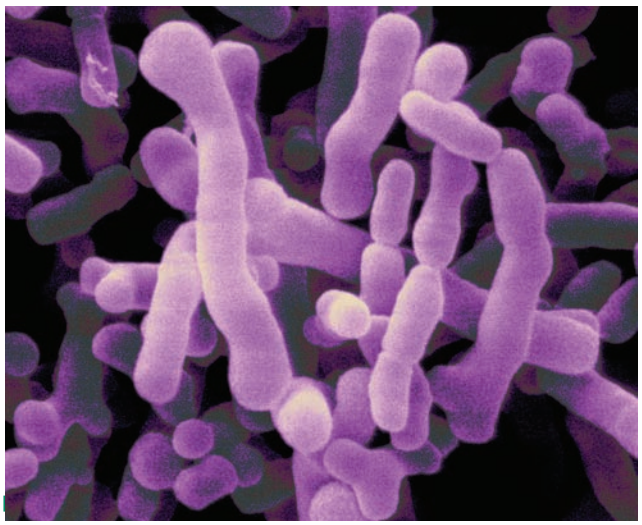

Figure 2. *Bifidobacterium.*

ucts but claims of efficacy are not closely monitored.[4] Probiotics fall under two different categories within the FDA: dietary supplements and foods.[5] Dietary supplements come in the following forms: capsules, tablets, powders, packets, straws, and lozenges.[5,6] In food, probiotics are traditionally found in yogurts and other dairy products such as sour cream, buttermilk, cheese, kefir, and infant formulas, but they can also be added to expressed breast milk, sauerkraut, sausages, miso, tempeh, juices, soy beverages, granola, candy bars, cereal, cookies, mouthrinses, and chewing gum.[5–11]

Probiotics are predominately bacteria-based, but a few are yeast-based.[6] There are seven known classes of probiotics—six from bacteria and one from yeast.[5] The most common bacteria found in probiotics are *Lactobacillus* (Figure 1) and *Bifidobacterium* (Figure 2).[5,6] Each genus breaks down into different species (ie, *L. reuteri*, *L. acidophilus*), and then each species has one or more strains (Table 1).[6,12] Each probiotic strain serves its own purpose. For example, *Lactobacillus* has at least 11 species, and each of those species may have one or more strains. Even though each one is from the genus *Lactobacillus* and some of the strains share the same species, the health benefits of one strain is not indicative of what another strain can do.[5]

ORAL HEALTH

Exactly how probiotics work in the oral cavity is still under investigation. Research suggests that probiotics may work in the following ways: attach to the various components of the mouth (teeth, biofilm, soft tissues, etc) and alter the environment to minimize disease; produce various antimicrobial substances to fight existing bacteria; trigger the body's immune response and fight inflammation; and/or change the pH of the oral environment to create a healthier environment. Each of these theories is encouraging, and they may all be valid.[9,10] Studies are being conducted on the use of probiotics and oral candidiasis (thrush), dental caries, gingivitis and periodontal diseases, the inflammatory response from gingival crevicular fluid, and halitosis.[9,11,13–15]

With oral candidiasis, one study found a 32% reduction of salivary yeast when probiotic-containing cheese was consumed, whereas the control group experienced an increase in the presence of salivary yeast.[13] An *in vitro* study analyzed eight strains of *Lactobacilli* and each of their abilities to inhibit the growth of *Streptococcus mutans* and *Candida albicans*.[16] All but one of the strains successfully restricted the development of *S. mutans*. As for the growth of *C. albicans*, all eight strains reduced the growth to some degree, but the results were not nearly as strong as that of the *S. mutans* findings.[16] Another analysis of two *Lactobacilli* strains found a strong reduction of *S. mutans*.[14]

Probiotics also show potential in reducing the incidence of dental caries.[2,5,11,17] A study performed using a strain of *L. reuteri* found a remarkable reduction in the presence of *S. mutans*.[17] Another study compared the use of chlorhexidine, a probiotic mouthrinse, and a mint-water placebo. The results showed a significant reduction in plaque accumulation in the chlorhexidine and probiotic groups compared to the control group.[11] When comparing the gingival index between the groups, however, the probiotic group had a mean of 0.23 compared to the chlorhexidine group with a mean of 0.68. This study suggests that probi-

TABLE 1. BACTERIA COMMONLY FOUND IN PROBIOTICS.[12]

***Lactobacillus* species**
- *L. acidophilus*
- *L. casei* (rhamnosus)
- *L. reuteri*
- *L. bulgaricus*
- *L. plantarum*
- *L. johnsonii*
- *L. lactis*

***Bifidobacterium* species**
- *B. bifidum*
- *B. longum*
- *B. breve*
- *B. infantis*
- *B. lactis*
- *B. adolescentis*

Others
- *Bacillus cereus*
- *Escherichia coli*
- *Saccharomyces cerevisiae*
- *Enterococcus faecalis*
- *Streptococcus thermophilus*

FIGURE 1. POWER AND SYRED/SCIENCE PHOTO LIBRARY
FIGURE 2. SCIMAT/SCIENCE PHOTO LIBRARY

otics can reduce plaque accumulation and the gingival index.[11]

Probiotics may also be helpful in reducing periodontal diseases. The use of a *L. salivarius* strain with xylitol compared to a group that only received xylitol yielded improvement in the periodontal status for both groups—however, smokers from the test group showed significant improvement in both the plaque index and probing depths, results which were not found in smokers of the control group.[18] Another study found a reduction in bleeding after 4 weeks of probiotic use.[19]

Periodontal diseases may be impacted by probiotics through the reduction of the body's inflammatory response. A study using *L. casei* Shirota found a significantly lower amount of elastase activity and lower production of matrix metalloproteinase-3 (the agent involved in the inflammatory response).[15] Another study used two strains of *L. reuteri* and found a reduction in both bleeding on probing and the amount of cytokines present in the gingival crevicular fluid.[20] This is another example of how probiotics may reduce the inflammatory response, which in turn may reduce oral disease.

Finally, halitosis may be treated effectively with probiotics. A New Zealand study found a reduction in sulfur production among subjects taking probiotics. Sulfur production contributes to halitosis, and the reduction occurred when *S. salivarius* K12 was used in mouthrinses, lozenges, and chewing gums.[9] A similar study was performed using a strain of *L. salivarius*. After 2 weeks of consumption,

TABLE 2. Conditions that may be helped by probiotics.[2,13–15]

- Common cold
- High cholesterol
- Rheumatoid arthritis
- Type 1 diabetes
- Constipation
- Bacterial resistance
- Pancreatitis
- Obesity in both children and adults

PRODUCTS IN PRACTICE

GUM® PerioBalance®

Various strains of *Lactobacillus reuteri* show great potential for the future of oral health. In fact, the presence of *Lactobacillus* in the oral cavity may correlate to its health status—the more probiotic present, the healthier the mouth.[10] Sunstar Americas Inc offers an over-the-counter probiotic product—GUM PerioBalance—that contains *L. reuteri* Prodentis, which is specifically engineered to improve oral health (Figure 3). Contained in a mint-flavored lozenge (Figure 4), the goal of PerioBalance is to enhance the health of the oral cavity by supplying "good" bacteria to negatively affect the "bad" disease-causing bacteria in the mouth. GUM PerioBalance is designed to improve the overall health of both the gum tissue and teeth, reduce plaque levels, and fight halitosis. The product is designed for use once daily, immediately following flossing and brushing. The lozenge must dissolve in the mouth, which takes about 10 minutes, and no agents should be used in the mouth immediately after the use of the lozenge for approximately 30 minutes.

Figure 3. GUM PerioBalance contains Lactobacillus reuteri *Prodentis and is designed to improve oral health.*

In 2006, a randomized, placebo-controlled, double-blind study was performed over 2 weeks using two strains of *L. reuteri*. The results found a 17% reduction in moderate to severe plaque levels over a 14-day period and a 42% reduction at 28 days.[25] In 2010, a clinical trial using *L. reuteri* Prodentis was published that showed significant reductions in plaque accumulation, clinical attachment level losses, probing depths, and the amount of bleeding among participants using *L. reuteri* Prodentis.[26]

A recent study conducted by Noël Kelsch, RDHAP, and Gregori Kurtzman, DDS, shows great potential for the use of GUM PerioBalance to help maintain optimal oral health. The study included 34 participants who received a prophylaxis, including scaling and root planing when necessary, and used one GUM PerioBalance lozenge daily. Four visits took place (on days 0, 14, 30, and 60) to collect the necessary data. The data collected included: photographs; assigning a periodontal classification of I, II, or III based on the individual's oral health status; full-mouth probing; determining the plaque index; and measuring the bacterial count in the mouth. The unpublished results of Kelsch and Kurtzman's study are impressive. After 60 days of using the GUM PerioBalance daily, there was a 43% improvement in the periodontal classification score, a 49% reduction in oral bacteria, and a 47% reduction in plaque accumulation. Study results and photos are available at www.periobalance.com.

Figure 4. PerioBalance's probiotic comes in a mint-flavored lozenge that is dissolved in the mouth once daily, immediately following flossing and brushing.

The use of GUM PerioBalance could significantly impact oral health. The research performed thus far is highly favorable in regards to the product's ability to help balance the oral environment and maintain optimal oral health.

Circle 100 on the card found at page 56 for more information.

there was a noticeable decrease in halitosis, and after 4 weeks, there was a significant reduction in halitosis.[19]

SYSTEMIC HEALTH

Given the variety of probiotic strains, researchers find it challenging to decipher which strains definitively work in the treatment of particular health problems. Probiotics have the potential to provide both preventive and therapeutic effects. Some health benefits include strengthening the immune system, fighting against disease-causing organisms, and assisting with digestion.[6]

One of the most common uses of probiotics is in conjunction with antibiotics. Because antibiotics kill both bad and good bacteria, probiotics help replenish the good bacteria to keep the body balanced.[6] Using probiotics in conjunction with antibiotics may prevent antibiotic-associated diarrhea. While some researchers validate this claim, others believe probiotics show potential but require additional research.[2,21–23] Because probiotics contain live microorganisms and antibiotics are designed to kill certain bacteria, probiotics should be taken at least 2 hours following administration of the antibiotic.[5]

Numerous potential uses for probiotics are being researched. Most potential uses vary regarding whether efficacy is possible, promising, or validated. Probiotics have been shown to be effective against viral diarrhea and pouchitis (a type of inflammatory bowel disease).[2,5] Thus far, research has found that probiotics may be useful in treating additional conditions but further research is needed for confirmation of actual benefit (Table 2).[2,22–24]

As research continues on probiotics, each strain must be carefully evaluated and tested, the amount of microorganisms that are required to create the health benefit must be determined, and safety issues must be evaluated.[5] To date, probiotics have been deemed safe for use among most children and adults. However, there are a few exceptions: individuals who are immunocompromised, seriously ill, taking immunosupressants, or have central venous catheters should not use probiotics because of potentially harmful side effects.[5,22]

CONCLUSION

Studies show that probiotics have positive health effects. The use of probiotics both systemically and orally may change the way medicine and dentistry are practiced. Research is underway to help determine which diseases can be prevented and/or treated, and by which probiotic strain and how much of the strain is needed to provide effective results. Patients should be educated about the positive effects of probiotics on both oral and systemic health while dental hygienists need to remain up-to-date on their use, as probiotics are an important addition to the oral health care armamentarium. ■

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