



# Dental Caries Protocol

## Introduction

You might think that the most prevalent disease worldwide is heart or metabolic disease. But surprisingly, it's not. It's dental caries (cavities).

Caused by a dysbiotic community of microorganisms that form biofilm (known as "plaque" in the mouth) and lead to tooth decay,<sup>1</sup> dental caries affect nearly 100% of the adult population.<sup>2</sup>

Biofilms are a natural outcome of microbial growth and are not inherently harmful. They provide a structure inside which microbes flourish in a protected environment. But problems arise when the biofilm communities shift toward dysbiotic microbes. In the mouth, pathogenic biofilm communities occur when there is an overgrowth of acidogenic (acid-producing bacteria), aciduric (bacteria that can grow in an acid environment), and cariogenic (tooth decay-causing) bacteria populations.<sup>3</sup>

## Epidemiology

Dental caries are the most prevalent chronic disease among children as well as adults. From 2015-2016, treated and untreated dental caries in youths ages 2-19 affected 45.8% of the population. As children get older, the incidence increases. Socioeconomic status and race play a role in the prevalence of caries, with Hispanic children and those living at or under the poverty level being most at risk.<sup>4</sup>

## Physiology/Diagnosis/Clinical Relevance

Following the gut microbiome, the oral microbiome is the second largest and most diverse microbial community in the human body. It is a combination of archaea, fungi, protozoa, viruses, and over 700 species of bacteria.<sup>5</sup>

## Dental Caries and the Oral Microbiome

Dental caries are not caused by a specific type of microorganism acting alone, but rather by a shift in the oral microbiome to a more cariogenic population.<sup>6</sup> Specific microbes, however, have been shown to be more prevalent at the site of caries lesions. *Streptococcus mutans* is the main bacteria known to cause dental caries, although other bacteria and microbes play a role in the formation and progression of caries. These include (but are not limited to):

- *Streptococcus sobrinus, sanguinis* (formerly *sanguis*),  
*pyogenes, gordonii, constellatus, salivarius, mitis*<sup>7</sup>
- Certain *Lactobacillus* species
- *Candida albicans*
- *Prevotella*
- *Actinomyces*
- Certain *Bifidobacterium* species
- *Rothia dentocariosa*

<sup>1</sup> Mosaddad, S.A., Tahmasebi, E., Yazdani, A. et al. Oral microbial biofilms: an update. Eur J Clin Microbiol Infect Dis 38, 2005–2019 (2019).  
<https://doi.org/10.1007/s10096-019-03641-9>

<sup>2,3</sup> <https://www.ncbi.nlm.nih.gov/books/NBK551699/>

<sup>4</sup> <https://www.cdc.gov/nchs/products/databriefs/db307.htm#:~:text=The%20prevalence%20of%20total%20dental,among%20those%20aged%2012%E2%80%9319>

<sup>5</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10445586/>

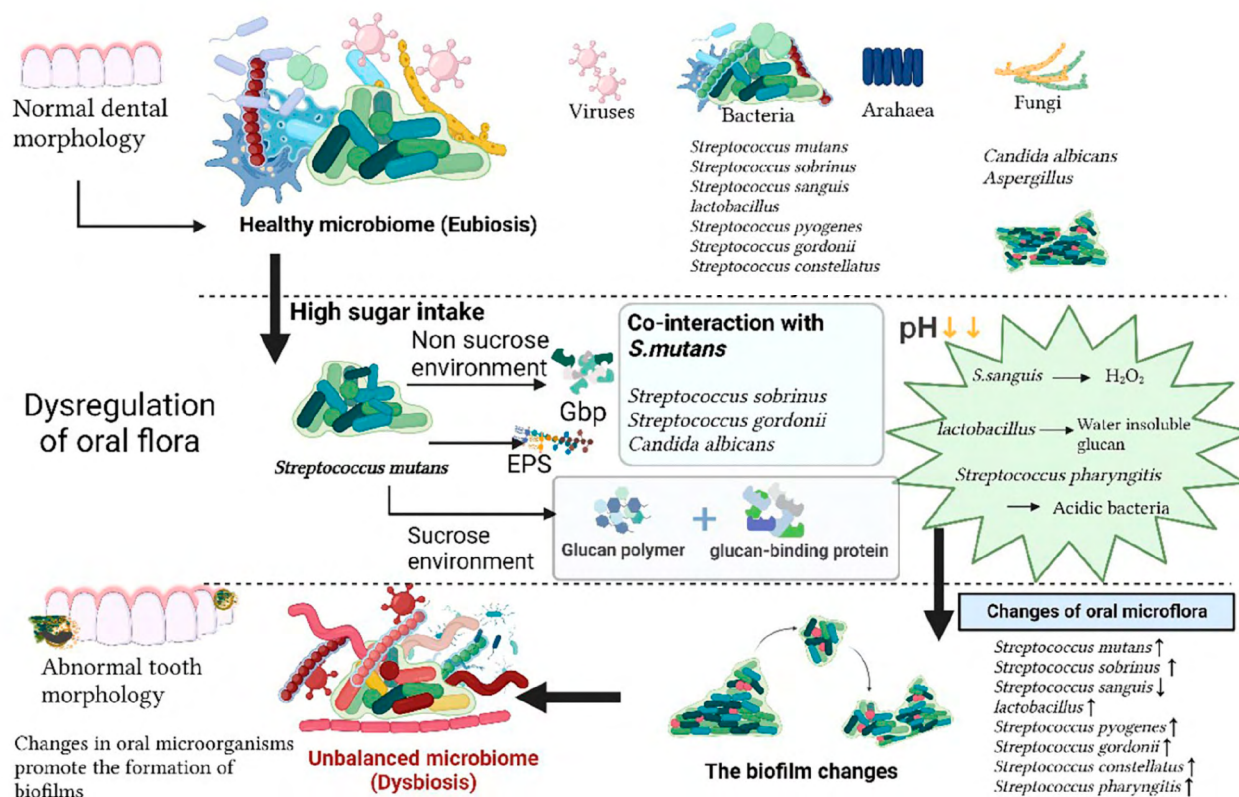
<sup>6</sup> <https://www.ncbi.nlm.nih.gov/books/NBK551699/>

<sup>7</sup> <https://www.frontiersin.org/articles/10.3389/fmicb.2023.1162380/full>

Different microorganisms can be classified by **genus, species, and strain** levels. Members of the same genus can be beneficial, commensal, or pathogenic. For example, the overgrowth of *Streptococcus mutans* predisposes an individual to dental caries, while *Streptococcus salivarius* has been shown to reduce the likelihood of caries.

Additionally, microbes that may be cariogenic in the mouth can be beneficial in the gastrointestinal tract. Research shows that certain strains of microbial species are more likely to be protective or, conversely, pathogenic. This is why you will see strain-level detail on some probiotics.

| GENUS                | SPECIES           | STRAIN    |
|----------------------|-------------------|-----------|
| <i>Streptococcus</i> | <i>salivarius</i> | BLIS M18® |



<https://www.frontiersin.org/articles/10.3389/fmicb.2023.1162380/full>

## Tooth Decay

Tooth decay results when there is irreversible solubilization of tooth mineral by acid-producing bacteria that adhere to the tooth surface in the form of dental plaque.<sup>8</sup>

<sup>8</sup> <https://www.ncbi.nlm.nih.gov/books/NBK8259/>

## Tooth Decay, continued

Teeth naturally lose some of their minerals from acid produced by microbes in dental plaque when eating fermentable carbohydrates. In a healthy mouth, saliva is able to neutralize these acids and remineralize the teeth. However, with frequent ingestion of carbohydrates, the mouth becomes acidic. This leads to a shift in the nature of the biofilm community, with an increase in bacteria such as *Streptococcus mutans*. These microbes continually produce acid, predisposing the teeth to mineral loss and tooth decay.<sup>9</sup>

## Prognosis

If caught early, dental caries may be reversed with prevention and minor dental intervention. If dental caries progress to the moderate stage with loss of specific tooth structure, the tooth must be filled and rebuilt.<sup>10</sup>

## Beneficial flora and their role in preventing caries:

| BENEFICIAL BACTERIA                              | ACTIVITY   | RESEARCH  |
|--|--|---|
| <i>Streptococcus salivarius</i> <sup>11</sup>    | <ul style="list-style-type: none"> <li>• Inhibits biofilm formation</li> <li>• Antimicrobial</li> </ul>  | <ul style="list-style-type: none"> <li>• Reduced likelihood of caries in children</li> <li>• Reduced gingivitis (moderate to severe) and periodontitis (moderate) in adults</li> <li>• Significant improvements in: plaque index, gingival index, modified sulcus bleeding index, pocket probing depth</li> <li>• Reduces <i>S. mutans</i></li> <li>• Reduces halitosis</li> <li>• Reduces black staining on teeth</li> </ul> |
| <i>Lactobacillus salivarius</i> <sup>12,13</sup> | <ul style="list-style-type: none"> <li>• Antimicrobial against: <i>C. albicans</i>, <i>S. mutans</i>, <i>Porphyromonas gingivalis</i>, <i>Prevotella intermedia</i>, <i>Staphylococcus aureus</i></li> <li>• Immunomodulatory (IgG)</li> <li>• Competitive inhibition</li> </ul> | <ul style="list-style-type: none"> <li>• Reduced dental caries for 12 months after only 2 weeks of use</li> <li>• Improved periodontitis including plaque index and probing pocket depth, especially in those at higher risk of disease</li> <li>• Improved halitosis and bleeding upon probing</li> </ul>  |
| <i>Lactobacillus reuteri</i> <sup>14</sup>       | <ul style="list-style-type: none"> <li>• Antimicrobial (bacteria, fungi, and protozoa)</li> </ul>  | <ul style="list-style-type: none"> <li>• Inhibits <i>S. mutans</i> growth in human clinical trial and reduces cavities</li> <li>• Reduces count of <i>P. gingivalis</i></li> <li>• Improves gingivitis</li> </ul>   |

<sup>9</sup> <https://www.ncbi.nlm.nih.gov/books/NBK8259/>

<sup>10</sup> <https://www.ncbi.nlm.nih.gov/books/NBK551699/>

<sup>11</sup> <https://www.sciencedirect.com/science/article/pii/S1991790222001714?via%3Dihub>

<sup>12</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4236677/#:~:text=In%20conclusion%2C%20our%20results%20indicat>

<sup>13</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9566377/>

<sup>14</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9710395/>

## Beneficial flora and their role in preventing caries, continued:

| BENEFICIAL BACTERIA                          | ACTIVITY   | RESEARCH   |
|--|--|--|
| <i>Lactobacillus paracasei</i> <sup>15</sup> | <ul style="list-style-type: none"> <li>• Antimicrobial (bacteria, fungi)</li> <li>• Immunomodulatory by upregulating salivary IgA</li> </ul> | <ul style="list-style-type: none"> <li>• Reduced dental caries 4.5-fold</li> <li>• Antimicrobial against: <ul style="list-style-type: none"> <li>– <i>S. mutans</i></li> <li>– <i>S. sanguis</i></li> <li>– <i>S. aureus</i></li> <li>– <i>Actinomyces viscosus</i></li> <li>– <i>P. gingivalis</i></li> </ul> </li> <li>• Inhibits yeast: <i>C. albicans</i>, <i>Candida tropicalis</i>, and <i>Candida glabrata</i></li> </ul> |

## Risk Factors

- Poor oral hygiene
- Diet – especially those high in sugars (notably, sucrose) and fermentable carbohydrates
- Genetics – e.g., host mineralization defects, bacterial adhesion, bacterial resistance to acidic environments
- Sleep – poor or insufficient sleep affects immune competence
- Mouth breathing during the day or while sleeping decreases saliva production which normally neutralizes acid, resulting in a lower oral pH
- Pregnancy – hormonal changes affect inflammation and vascular permeability in the oral cavity
- Immunocompromised individuals – e.g., diabetes, autoimmune disorder, chronic illness
- Lower socioeconomics – due to reduced access to oral hygiene supplies and cleanings, and poor diet
- Lifestyle – stress, lack of exercise, overuse of mouthwash, smoking
- Things that affect the oral microbiome locally and systemically – teeth crowding, systemic chronic inflammation, gut dysbiosis, and/or acid reflux

## Clinical Pearl #1 – Oral Dysbiosis Has Systemic Consequences

### Whole-body health begins in the mouth

When oral dysbiosis occurs, pathogenic bacteria reach levels that may lead to infections, such as tooth decay and gum disease,<sup>4</sup> and ultimately a predisposition to many systemic diseases and conditions. Research has shown that more than 120 diseases originate in the mouth.<sup>5</sup>



Cognitive  
Decline



Health  
Microbiome



Cardiovascular  
Disease



Metabolic  
Health



Respiratory  
Health



GI  
Discomfort



Rheumatoid  
Arthritis



Weight  
Management

<sup>15</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3133768/>

## Clinical Pearl #2 – Include Botanical Antimicrobials

In addition to the proven benefits of oral probiotics, Dentalcidin® toothpaste and Dentalcidin® LS oral rinse may help to balance the oral microbiome, as well as address pathogenic biofilms, without harming beneficial microbes. This is especially important in patients with concurrent gingivitis or periodontal issues. Biocidin®, the active ingredient in the Dentalcidin® products, has the following activities:

- Antimicrobial
- Breaks down biofilms
- Immunomodulatory
- Anti-inflammatory

## Clinical Pearl #3 – Consider Treating the Gut

Bacteria and other microbes from the oral cavity can translocate into the gut when swallowed. As such, many GI-related issues originate in the oral cavity or are influenced by microbes in the oral cavity. These issues include:

- *Candidiasis*
- Small Intestinal Bacterial Overgrowth (SIBO)
- Irritable Bowel Syndrome (IBS)
- Irritable Bowel Disease (IBD)<sup>16</sup>

## Clinical Pearl # 4 – Fluoride Only Brushes the Surface When It Comes to Caries

Fluoride has long been used conventionally for caries prevention and has been touted as antimicrobial and supportive of tooth structure. In the United States, it was first added to city water in Grand Rapids, MI in 1945. Today, fluoridated water is delivered to almost 75% of the U.S. population through public water systems. Its widespread use coincided with increases in education and income, but the combination of these factors has resulted in only a 25% reduction in tooth decay rates.<sup>17</sup> Unfortunately, fluoride hardens only the outer six nanometers of the tooth.<sup>18</sup>

However, once a tooth is demineralized by acid-producing bacteria, the crystalline enamel structure is gone for good. The structure that remains may reharden in the presence of fluoride, but not remineralize. What results is a harder outer surface with a porous internal structure from the damage. This allows acid to further seep into the deeper structures of the tooth, and ultimately cause decay from the inside out that can hide from x-rays under a hardened shell.<sup>19</sup>

Additionally, fluoride, like mercury, is a poison and is toxic to the body. It is known to impact the health of bones, liver, pancreas, lungs, heart, skeletal muscles, and kidneys, even in small amounts. Although fluoride does have antimicrobial properties that can reduce the attachment of *S. mutans* and *lactobacillus* to teeth, it also can negatively affect the beneficial flora of the oral cavity and disrupt the oral microbial balance.

<sup>16</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5960472/>

<sup>17</sup> <https://www.cdc.gov/fluoridation/index.html>

<sup>18</sup> [https://www.researchgate.net/publication/1735511\\_Elemental\\_depth\\_profiling\\_of\\_fluoridated\\_hydroxyapatite\\_by\\_X-ray\\_photoelectron\\_spectroscopy](https://www.researchgate.net/publication/1735511_Elemental_depth_profiling_of_fluoridated_hydroxyapatite_by_X-ray_photoelectron_spectroscopy)

<sup>19</sup> <https://queenofdentalthygiene.net/2023/02/fluoride-the-destroyer-see-the-dark-side/>

## Clinical Pearl #5 – Xylitol as a Sweetener and Caries Buster

Xylitol is a natural sugar alcohol derived from plants that has been used as an alternative sweetener in foods and products such as chewing gum. This natural sweetener has health benefits specifically related to oral health and caries, as it:

- Reduces plaque formation
- Reduces abundance of *S. mutans*
- Inhibits the formation of biofilms
- May inhibit the growth of *P. gingivalis*
- Reduces gingival inflammation, likely via inhibition of *S. mutans* and biofilm formation
- Reduces dental caries and may lower the risk for tooth decay<sup>20</sup>

## Therapeutic Plan Suggestions

Prevention is key:

- Brush regularly – brushing after meals can drastically reduce cariogenic microbes, including *candida* species, to help reduce the risk of caries. At the very least, brushing twice daily and flossing 1-2 times per day should be part of a regular oral hygiene routine.
- Schedule regular teeth cleanings (every 6-12 months)
- Use a water pick
- Choose products and gum with xylitol
- Use an herbal antimicrobial toothpaste and rinse
- Add oral probiotics to oral care routine
- Include a remineralizing toothpaste
- Eat a plant-forward, anti-inflammatory diet that is high in nutrients
- Incorporate additional lifestyle support – manage stress, move regularly, prioritize consistent and restful sleep
- Restore nose breathing with mouth taping
- Avoid commercial mouthwashes, smoking, candy, sugar, and processed foods.



<sup>20</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5320817/>





## Therapeutic plan suggestions

### Dental Caries

#### CORE PROTOCOL

|  |  |
|--|--|
| <b>Dentalcidin® LS</b>   | Swish with 2 pumps for 1-2 minutes, then spit.<br>Use 2-3x/day after flossing and before brushing.                   |
| <b>Dentalmin PRO™</b>  | Brush 2-3x/day   |
| <b>Dentalflora®</b>  | Dissolve 1 tablet in mouth daily after brushing with Dentalmin PRO™.<br>Do not eat or drink for at least 30 minutes. |
| For maximum effectiveness, it's important to use the products as directed above. |  |

## Additional Support to Address Gastrointestinal Dysbiosis

### Bioclear® Microbiome Detox Program

CHOOSE EITHER BIOCIDIN® LIQUID, CAPSULES, OR LSF IN YOUR PROGRAM

|   |   |   |
|---|---|---|
| Biocidin® Liquid or Capsules  | Titrate to 10 drops 2x/day per instructions in the Lifestyle Guide included with each program   | Titrate to 2 capsules 2x/day per instructions in the Lifestyle Guide included with each program |
| Biocidin® LSF   | Titrate to 2 pumps 2x/day per instructions in the Lifestyle Guide included with each program  |   |
| G.I. Detox®+  | 2 capsules at bedtime. 1 hour away from food, supplements, and medications. Temporarily increase dose to 2 capsules 2-3x/day if Herxheimer reaction observed/worsens. |   |
| Proflora® 4R  | 1 capsule any time  |   |
| Each program comes with a <a href="#">Lifestyle Guide</a> with instructions and diet and lifestyle recommendations. |   |   |