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Cover Story

## Oral Probiotics Combat Gum Disease

By Stephen Greene

The human mouth is teeming with **bacteria** that can cause dental cavities and more serious gingivitis and periodontitis. Even good oral hygiene habits of brushing and flossing twice a day might not be enough to ward them off.

Nearly a third of US adults have untreated tooth decay, and nearly half of those 30 and older have periodontal (gum) disease.<sup>1,2</sup>

Gum disease can be serious. As it progresses, it can lead to tooth loss, as well as **inflammation** that accelerates degenerative aging processes.<sup>3</sup> Gum disease can lead to heart problems, cancer, Alzheimer's, lung and kidney disorders, and more.<sup>4-14</sup>

Scientists looking for a solution to gum disease and tooth decay have discovered an innovative way to reduce the risk through targeted oral **probiotic** lozenges.

### The Oral Microbiome



The natural community of microbes living in the mouth is called the **oral microbiome**. A healthy microbiome supports and protects the delicate mucous membranes as well as the surface of the teeth themselves.

When this community becomes disrupted and out of balance—whether by poor diet, lifestyle, drugs, or disease—it results in a state of microbial imbalance (called **dysbiosis**) that wreaks havoc on the normal immune system response.

**Dysbiosis** leads to numerous problems in the mouth, including **cavities** that arise from excessive acid-producing bacteria, and **gum disease** that contributes to tooth loss as well as inflammatory diseases throughout the body.

The need to restore a healthy oral microbiome led scientists to identify two strains of *good bacteria* that can combat gum disease on two fronts. The first one, *L. plantarum L-137*, boosts oral immune function and promotes healing. The second one, *S. salivarius M18*, kills harmful bacteria that live in the mouth, allowing itself to flourish.<sup>15-17</sup>

This **two-pronged** approach to gum disease prevention supports a healthy, balanced microbiome in the mouth, one that actively resists disease while promoting healing.

### Harnessing Natural Immune Responses

One of the key problems with an imbalanced **oral** microbiome is that it *reduces* the mouth's natural **immune-fighting** abilities. This leaves us vulnerable to infections by bacteria that cause gum disease, such as *Porphyromonas gingivalis*.

Making matters worse, *P. gingivalis* diminishes the mouth's immune system even further by downregulating protective **IL-12** and upregulating pro-inflammatory **IL-6**, creating a vicious cycle that makes it nearly impossible for the body to heal

itself.<sup>18-20</sup>

In order to counteract this disease-promoting cycle, scientists searched for a way to boost local immune function. They found their answer in the harmless bacterium *Lactobacillus plantarum*, strain L-137.<sup>17</sup> When killed by heat treatment, this strain of *L. plantarum* has been found to increase production of the protective **IL-12**.

Treating periodontitis patients with this immune-boosting bacterium helps to overcome the impaired immune function in their mouths that occurs as a result of *P. gingivalis*. This assists in restoring the body's natural oral immune response, which in turn promotes healing of the diseased, inflamed gums.

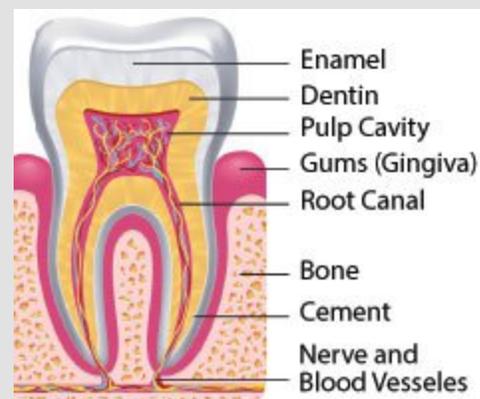
In other words, *L. plantarum* essentially plugs the immune system "hole" induced by evasive *P. gingivalis* and other bacteria, allowing our bodies to *naturally resist* gum disease.<sup>17</sup>

The impact of this was seen in a clinical trial of people with chronic periodontitis.

#### WHAT YOU NEED TO KNOW

### Probiotic Combats Gum Disease

- Tooth and gum disease are often-overlooked major contributors to failing health as we age.
- In addition to taking a toll on functions of the mouth, these conditions predispose us to heart, lung, brain, liver, and other age-related disorders.
- A balanced oral microbiome helps maintain a state of disease-resistance.
- An imbalanced, or dysbiotic, microbiome invites disaster by changing the elaborate natural immune and bacterial defenses against oral disease.
- Balancing a dysbiotic oral microbiome can restore natural disease resistance.
- HT-*L. plantarum* L-137 is a heat-treated strain of common *Lactobacillus* bacteria capable of inducing pro-healing cytokines in the mouth and boosting local immunity.
- *S. salivarius* M18 is a living probiotic strain that is armed with powerful *lantibiotics* that kill harmful bacteria.
- Adding these healthy bacteria to a regular routine of brushing and flossing can help make the mouth a safe place for protective microbes, which produces benefits throughout the body.



## Clinical Trial

Researchers conducted a randomized trial that included 39 people with chronic **periodontitis**.<sup>17</sup> The subjects were randomly assigned to receive either a placebo or the *L. plantarum* L-137 supplement for 12 weeks.

Over the course of 12 weeks, researchers measured the **probing pocket depth**, which is the distance from the gum line to the bottom of the tiny "pocket" between gum and tooth root.<sup>17</sup> A normal, healthy gum pocket is **3 mm** deep or less, and a depth of **4 mm** or more defines **periodontitis**.<sup>21</sup> Deeper pockets are a clinical measure of **periodontal** disease.

After 12 weeks, subjects supplementing with *L. plantarum* L-137 had a **64% greater improvement** in pocket depth compared with placebo recipients.<sup>17</sup>

This remarkable study showed that it's possible to improve periodontal disease through **modulation of the oral immune**

system.

Improving pocket depth is one piece of the puzzle. It is equally important to restore balance to the mouth's microbial community. By doing so, we can prevent immune dysfunction and the resulting inflammatory changes before they set in. That's where an oral probiotic called *S. salivarius* M18 comes to the rescue.

#### WHOLE-BODY EFFECTS OF PERIODONTAL DISEASE

Periodontal (gum) disease can be painful, disfiguring, and even disabling when tooth loss and jawbone resorption occur.

But new science is showing that periodontal disease has far-reaching consequences that extend into most body systems, largely the result of inflammatory changes and other signaling pathway disruptions throughout the body.

Gum disease is now associated with disorders of the brain, heart, lungs, kidney, liver, and blood vessels—all of which promote aging and shorten lifespan.<sup>7-14</sup>

The good news is that reducing bacteria-laden plaque results in significant reductions in total-body inflammation.<sup>29</sup> This means that improving our tooth and gum health is vital not just for those oral structures, but also to preserve our health in practically all body systems.



## A Well-Armed Probiotic Oral Defense System

A disease-resistant oral microbiome includes a wide variety of microbes that provide important biological functions. A *dysbiotic* microbiome is one in which one or several harmful strains dominate, suppressing other beneficial organisms and creating a disease-permissive environment.

What the research is proving is that in order to restore oral health and avoid problems such as gum disease, it is necessary to support the colonization and growth of beneficial organisms.<sup>22</sup>

The helpful organisms compete with the “*bad guys*,” cutting their populations down to size and allowing a wider range of beneficial microbes to succeed.

*S. salivarius* M18 is one of the “good guys.” It competes with dangerous oral bacteria that cause or exacerbate periodontal disease, and has been shown to improve parameters of gingivitis and periodontitis.<sup>15,16</sup>

A randomized, controlled trial was conducted to determine the impact of *S. salivarius* M18 treatment on some of the most important clinical parameters of oral and gingival (gum) health.<sup>23</sup> The study included men and women aged 20-60 years with moderate or severe **gingivitis** (gingival index score of 2 or 3), and moderate **periodontitis** (less than **6 mm** probing pocket depth).

Half of the subjects received no treatment, and half received lozenges with 200 million *S. salivarius* M18 daily after brushing. The subjects took the lozenges for 30 days, and the researchers observed them for an additional 30 days to determine if the benefits would continue even after the subjects stopped taking the probiotic.

The results of the *S. salivarius* M18 group were favorable for all four measurements compared to the control group:<sup>23</sup>

- The mean **plaque index** score was reduced by **44%** on day 30 (the last day of treatment), and by **37%** on day 60.

- The mean **gingival index** score was reduced by **42%** on day 30, and by **35%** on day 60.
- The **modified sulcus bleeding index** scores were reduced by **53%** on day 30, and by **51%** on day 60.
- Finally, **probing pocket depth** measurements were reduced by **20%** on day 30, and by **22%** on day 60.

Of note, the lowest scores for each index in the *S. salivarius* M18 group indicated a return to **near-normal** values of less than 1 for plaque index, gingival index, and modified sulcus bleeding index, and a probing pocket depth of just over **3 mm**. These values remained markedly abnormal in control subjects.<sup>23</sup>

This study demonstrated the ability of the **probiotic lozenge** not only to significantly improve all four of the most important parameters of periodontal health, but also to *continue working long after supplementation ended*.

Previous clinical studies lend additional support to the use of *S. salivarius* M18 for oral health. In one, **88%** of *S. salivarius* M18 recipients maintained plaque scores lower than their baseline, pretreatment values at the end of a 3-month treatment period, compared with just **44%** of placebo recipients.<sup>15</sup>

## GUM DISEASE AND THE ADULT IMMUNE SYSTEM

Dysbiosis (an imbalanced microbiome) in the mouth induces profound dysfunction of the immune system that is designed to protect the teeth and gums, and has two major effects on oral health:

- First, oral dysbiosis and pathogenic bacteria (e.g., *P. gingivalis*) are associated with **increased** activity of inflammatory cytokines (signaling molecules), notably **IL-6**.<sup>18</sup>
- Second, dysbiosis **reduces** production of **IL-12**, a regulatory cytokine that supports healthy immune responses and healing after inflammation. This altered immune response contributes to persistent inflammation and slowed healing, a situation that the destructive microbes can exploit to promote their own growth.<sup>18,30,31</sup>



IL-12 production decreases with aging, leaving a “hole” in immune responses in the mouth.<sup>32</sup> This allows organisms like *P. gingivalis* to evade the immune system and become overgrown, and it ultimately causes gum disease.<sup>30</sup>

Making matters worse, *P. gingivalis* itself also impairs host immune responses, specifically reducing beneficial IL-12 and upregulating pro-inflammatory IL-6.<sup>18-20,30</sup> This permits overgrowth of *P. gingivalis* and other infection- and inflammation-producing microbes.<sup>33</sup>

Additionally, when IL-6 levels remain high, and IL-12 levels low, it is nearly impossible for inflammation of the gums to resolve on its own. This leads to a chronic inflammatory state that eventually erodes the bony tooth socket, ultimately producing **tooth loss**.<sup>10,18-20</sup>

In an elegant but destructive process, *P. gingivalis* releases chemical fragments that suppress the effects of certain immune cells, “disguising” itself as a normal, beneficial organism, while simultaneously invading the host’s tissues and suppressing its immune response towards other bacterial species as well.

## How it Works

*S. salivarius* M18 works by several actions to help create a healthier oral environment. Unlike many probiotic formulations, *S. salivarius* M18 can specifically colonize the human mouth. This results in stable, reproducing colonies of this beneficial

organism even after supplementation ends.<sup>16</sup>

*S. salivarius* M18 has also been shown to compete effectively with bacteria (such as *Streptococcus mutans*) that can cause cavities, helping to support healthy teeth and gums.<sup>15</sup>

*S. salivarius* M18 is an abundant producer of bacteria-suppressing weapons called **bacteriocins**.

**Bacteriocins** function similar to antibiotics, but are entirely natural, and appear to act only at the local level between different bacterial strains.<sup>24</sup>

The specific bacteriocins that *S. salivarius* M18 produces are in a class called **lantibiotics** that use a mode of action that literally creates a hole, or pore, in the target organism's cell membrane leading to its destruction.<sup>25,26</sup> In this fashion, *S. salivarius* M18 has been shown to inhibit the growth of several well-known tooth and gum disease-producing organisms, including *S. mutans*, *S. sobrinus*, and *Actinomyces naeslundii*.<sup>15,24,27,28</sup>

In addition to its targeting of disease-causing organisms, *S. salivarius* M18 produces **enzymes** that help break down dental **plaque**, which is a main cause of tooth decay and gum disease. *S. salivarius* M18 also helps generate a neutral **pH** in the mouth that supports healthful bacteria, further balancing the oral microbiome and reducing disease risk.<sup>15</sup>

An additional research finding is that *S. salivarius* M18 reduces the presence of the pro-inflammatory cytokine **IL-6** which is associated with periodontal disease.<sup>15</sup> This complements a beneficial overlap with the immune-modulating features of *L. plantarum* **L-137**, providing added protection against chronic gum **inflammation**.

#### WHAT DENTISTS LOOK FOR TO MEASURE GUM HEALTH

All that probing and poking around in your mouth at the dentist's is no fun. But the dentist or hygienist is in fact looking carefully at multiple features of teeth and gums.

These have been standardized into several scores useful for measuring gum health, as well as for determining the best treatment option.

Those used in studies cited in this article are:

- The **Plaque Index** score: a zero to 3 rating, with zero being no plaque, and 3 being an abundance of plaque that extends below the gum line on the teeth.<sup>34</sup>
- The **Gingival Index** score: a zero to 3 rating, with zero being normal gums, and 3 indicating severe inflammation with swelling, ulceration, and a tendency to spontaneous bleeding.<sup>34</sup>
- The **Modified Sulcus Bleeding Index** score: a zero to 3 rating, with zero being no bleeding with gentle dental probing and 3 being ready bleeding, change of color, and gum swelling.<sup>35</sup>
- **Probing Pocket Depth**: using a calibrated probe marked in millimeters, the dentist or hygienist measures the depth of the pocket between the tooth root and the gum. Generally, the deeper the pocket, the worse the gum disease, with pockets 3 mm or less in depth considered normal, while those deeper than 4 mm indicate periodontitis.<sup>21,36</sup>

## Summary

Gum diseases are rampant, especially as we age past 30 years.

Tooth brushing and flossing are important, but are insufficient to restore a damaged **oral microbiome** to its natural, disease-

resistant state.

Recent advances in the understanding of beneficial bacteria (probiotics) reveal a two-pronged approach to restoring a balanced microbiome and rejuvenating healthy immune function in the mouth.

*L. plantarum* **L-137** is a heat-treated preparation of beneficial *L. plantarum* bacteria that boosts oral immune function, reduces inflammation, and promotes healing.

*S. salivarius* **M18** is a proven oral probiotic capable of colonizing the human mouth, where it kills harmful bacteria.

These two **probiotics**, when taken as a daily **lozenge**, can work together to enhance not only oral, but total-body health.

If you have any questions on the scientific content of this article, please call a Life Extension® Wellness Specialist at 1-866-864-3027.

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