

# **A Protocol for Gingival Health**

## ***Mitochondria, Gut Bacteria, & Vitamin K2***

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The evolution of mitochondria in the human cell is fascinating. Healthy mitochondria are critical for periodontal health as well as overall health. As a matter of fact, it has been said that all disease begins with dysfunction in the mitochondria of the cell. This may have far reaching implications for all chronic diseases and aging.

## **In The Beginning**

Here is an account, which hasn't been proven, but is considered to be plausible.

About 4 billion years ago, life began on earth as a single-celled organism with no nucleus.<sup>1</sup> Fast forward 2 billion years.

About 2 billion years ago, bacteria were among the first living organisms. Some of these single-celled bacteria fed on organic compounds to create energy. These bacteria created carbon dioxide and hydrogen as waste products. Other single-celled organisms in existence at the same time fed only on carbon dioxide and hydrogen. Then, an extraordinary and life-changing event may have occurred.

A few of the bacteria producing energy from organic compounds successfully entered some of these single-celled organisms, which could not create their own energy from organic compounds. Eventually, these bacteria set up shop in their host cells. The invading bacterial cells created energy for their single-celled host organisms. Now the host cells, with a self-contained energy source from the resident bacteria, could evolve into multi-celled and more-complex entities. The gradual development of these structures eventually led to the makeup of our human cells, each with a self-contained energy-production machine. The origin of this energy-production machine was ancient bacteria. These organelles are called mitochondria.

Every cell in our body, with the exception of red blood cells, has mitochondria to create the energy to keep it alive. The mitochondria are embedded within the cytoplasm of our 10 trillion human cells. Some individual cells have only a few mitochondria; our most active cells (like heart muscle) may contain as many as 2,400 mitochondria per cell. If these bacteria-like structures in our body's cells did not function properly, we would get sick – very sick – and eventually would die.

## **Functions of Mitochondria**

The mitochondria primarily are the batteries of the cell. If the batteries fail, the cell ultimately dies. However, energy production is not the only purpose of our mitochondria.<sup>2</sup> Mitochondria also produce heat as necessary, assist in calcium signaling within the host cell and throughout the body, and will induce cell death (apoptosis) when its host cell is damaged beyond repair. In addition, mitochondria regulate insulin in the cell, synthesize cholesterol and other steroids, and participate in other functions required by specialized

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<sup>1</sup> <http://journals.sagepub.com/doi/full/10.1177/1745691617718356>

<sup>2</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4075653/>

cells. Another critical function of mitochondria is to interact intimately with other organelles of the cell, especially peroxisomes, to create cellular homeostasis.<sup>3</sup>

As a waste product, mitochondria produce free radicals, which must be neutralized. If the mitochondria are damaged beyond repair, the cell would not be able to function as it was designed. For example, a liver cell would not be able to function as a healthy liver cell; a brain cell would not be able to function as a healthy brain cell; a gum tissue cell would not be able to function as a healthy gum tissue cell. In some situations, the cell might begin to replicate out-of-control and become cancerous.

## **Gum Disease & Mitochondria**

When everything is working correctly, the mitochondria are healthy and functioning at the top of their game. Problems develop when our mitochondria are compromised. Gum disease is the result of dysfunction in the mitochondria within gum tissue cells.<sup>4</sup>

Gingival connective tissues are made up primarily of fibroblasts. Fibroblasts in the gum tissues play a major role in recognizing pathogenic microbial invasion. They are responsible for an effective host response to infection by releasing various cytokines to neutralize and destroy invading pathogens, which release lipopolysaccharides (LPS). LPS are remnants of cell membranes of gram negative bacteria, which can create a severe immune response.<sup>5</sup>

LPS also can be systemically transmitted as a result of pathogenic bacteria in the gut leaking into the circulatory system. Researchers have demonstrated that activity of inflammatory bowel disease would influence the inflammation in gingival tissue.<sup>6</sup> If the gut lining is damaged allowing LPS to get into the blood system, then gut bacteria must be brought back to a healthy balance and the lining of the gut must be repaired. A healthy gut lining could prevent further systemic chronic inflammation resulting in various chronic diseases.<sup>7</sup> Normally, LPS is excreted in the feces with no harm to the body as long as the gut lining is intact and healthy.<sup>8</sup>

LPS will cause mitochondria to produce free radicals called reactive oxygen species (ROS). Research demonstrates that the production of ROS by mitochondria in the gingival fibroblasts precedes the production and release of cytokines by the fibroblasts.<sup>9</sup> Overproduction of ROS will create ongoing chronic inflammation that will begin to destroy periodontal tissues.

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<sup>3</sup> <https://www.ncbi.nlm.nih.gov/pubmed/?term=10.1111%2Fggi.12296>

<sup>4</sup> <https://www.ncbi.nlm.nih.gov/pubmed/?term=10.1016%2Fj.yexcr.2016.08.007>

<sup>5</sup> <https://www.ncbi.nlm.nih.gov/pubmed/24580642>

<sup>6</sup> <https://www.ncbi.nlm.nih.gov/pubmed/?term=10.1016%2Fj.cyto.2017.01.016>

<sup>7</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5707675/>

<sup>8</sup> <https://www.ncbi.nlm.nih.gov/pubmed/?term=10.1111%2Fobr.12370>

<sup>9</sup> <https://www.ncbi.nlm.nih.gov/pubmed/?term=10.1016%2Fj.yexcr.2016.08.007>

If the overproduction of ROS by the mitochondria of gingival fibroblasts could be neutralized, periodontitis might be stopped in its tracks. Strong and healthy mitochondria can resist the overproduction of ROS.

## **Support for Strong and Healthy Mitochondria**

So, it appears that healthy mitochondria are critical for our oral health, for our cells' health, and for our existence. Nutrient-dense foods, efficient exercise, restorative sleep, and reduction of stress support healthy mitochondria. If mitochondria are not firing on all cylinders, disease will occur. In the past, I wrote about exercise and how it benefits healthy mitochondria.<sup>10</sup>

Also, the gut microbiome is important for the health of mitochondria. The beneficial bacteria in the gut will produce many metabolites. Some of these metabolites are butyrate, other short chain fatty acids, and lactate from the metabolism of fiber. Another metabolite is urolithin-A from the metabolism of tannins in food. These specific metabolites feed healthy mitochondria, support the cells that line the colon, and actually increase diversity in healthy gut bacteria.

Since it is suggested that ancient bacteria were the precursors of our modern-day mitochondria, the needs of the mitochondria in our cells might be similar to the needs of healthy gut bacteria. There is actually “cross communication” between our gut microbiome and our mitochondria.<sup>11</sup>

## **Vitamin K2 – Another Support for Mitochondria**

Another important nutrient in all of this is vitamin K2. Vitamin K2 is produced by healthy gut bacteria. This vitamin is also available in some fermented foods, organ meats, egg yolks, and grass-fed dairy.

Vitamin K2 is a form of Vitamin K, which can be subdivided into Vitamin K1 and vitamin K2. Interestingly, the USDA didn't distinguish K1 from K2 in foods before 2006. Vitamin K2 itself can be subdivided into eight forms (MK-4 through MK-11), which are defined by their polyunsaturated tails. These various forms of vitamin K2 are called *menaquinones*. The most important forms are MK-4 (primarily available from animal sources) and MK-7 (primarily available from fermented foods). Our bodies can synthesize all the Vitamin K2 that is needed in the body from MK-7.

Vitamin K1 is used by the liver to activate blood-clotting proteins. On the other hand, vitamin K2 is used outside of the liver in other tissues for various functions. For example, vitamin K2 directs calcium deposition where it should be (such as bone and cartilage), and it prevents calcium from accumulating where it shouldn't be (such as blood vessels and kidneys).

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<sup>10</sup> <https://drdanenberg.com/connecting-the-dots-hiit-mitochondria-gingivitis/>

<sup>11</sup> <https://www.ncbi.nlm.nih.gov/pubmed/26500226>

Also, vitamin K2 appears to assist mitochondria by increasing their capacity to create energy. An important study showed that mitochondrial dysfunction was rescued and reversed by vitamin K2.<sup>12</sup> Vitamin K2 serves as a mitochondrial electron carrier, helping to maintain normal ATP production in the cell.

Vitamin K2 is fat soluble, and its absorption and function in the body are dependent on other nutrients including healthy fats, vitamins A and D, magnesium to name a few. So, consuming nutrient-dense foods and fats is necessary for Vitamin K2 to provide its benefits.

## Causes of Mitochondrial Dysfunction

So, what will cause mitochondria to malfunction? Mitochondria can become damaged and dysfunctional when necessary nutrients are not available from the gut, when the energy created by mitochondria is less than the free radicals they produce, and when mitochondria are unable to repair themselves or increase their numbers in their host cell. Also, specific environmental elements and medications can be toxic to mitochondria. These include xenoestrogens (estrogen imitators) in the environment, acetaminophen (Tylenol), statins (anti-cholesterol drugs), glyphosate (Roundup), and heavy metals like lead, mercury, and aluminum.

## My Gum Treatment Protocol

Based on the research I have uncovered, I want to assist my patients who have gum disease. Supporting healthy mitochondria should be considered with gum treatment. Current research suggests that supporting the mitochondria's ability to maintain homeostasis in the cell might be lifesaving.<sup>13</sup>

Obviously, all external elements that might be damaging mitochondria must be first identified, and then removed or reduced as much as possible. And, whatever nutrients that are required to enhance mitochondria function should be consumed.

To that end, clinical treatment of active gum disease along with specific supplements, which support healthy mitochondria, could be an ideal protocol to treat periodontal disease.

I first treat active gum disease by removing local irritants from under the gum tissues and by teaching effective oral hygiene. When advanced gum disease has created jawbone damage, I use the **LANAP (Laser Assisted New Attachment Procedure) Protocol**<sup>14</sup> to assist the body in regenerating new bone around damaged teeth, new periodontal ligament fibers, and new cementum.<sup>15,16</sup>

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<sup>12</sup> <https://www.ncbi.nlm.nih.gov/pubmed/?term=10.1126%2Fscience.1218632>

<sup>13</sup> <https://www.ncbi.nlm.nih.gov/pubmed/?term=10.21873%2Fanticancerres.11963>

<sup>14</sup> [https://youtu.be/R\\_AGSP1Smek](https://youtu.be/R_AGSP1Smek)

<sup>15</sup> [https://www.lanap.com/site/wp-content/uploads/2016/04/2012\\_July9\\_IJPRD\\_32\\_5\\_Nevins\\_2.pdf](https://www.lanap.com/site/wp-content/uploads/2016/04/2012_July9_IJPRD_32_5_Nevins_2.pdf)

<sup>16</sup> <https://www.lanap.com/site/wp-content/uploads/2016/06/PerioLase-Indications-for-Use-K151763.pdf>

In addition, I encourage my patients to eat nutrient-dense foods and remove the foods that damage the gut. With few exceptions, I recommend the ancestral diet Weston A. Price Foundation describes.<sup>17</sup> Also, environmental factors that are toxic to mitochondria must be identified and removed or reduced. I've written about nutrient-dense, anti-inflammatory foods and a primal lifestyle to support overall health.<sup>18</sup> I even discussed this as it applied to my personal life's challenges.<sup>19</sup>

While some natural foods may provide specific nutrients to assist mitochondrial health, a patient may not be able to consume enough of these nutrients in their diet. In addition, many patients may not want to change their diets to include all these nutrients. So, these three supplements may be an ideal choice:

- A spore-based probiotic to help repopulate the gut with healthy and diverse bacteria, which create metabolites that enhance the health of mitochondria. Examples are: **MegasporeBiotic**<sup>20</sup> from *Microbiome Labs* and **BioSpora**<sup>21</sup> from *Klaire Labs*.
- A Vitamin K2-MK7 supplement to improve the energy capacity of mitochondria. Examples are: **MegaQuinone K2-7**<sup>22</sup> from *Microbiome Labs* and **MK 7**<sup>23</sup> from *Jarrow*.
- A gluten-free prebiotic to feed the healthy bacteria in the gut so that they can provide necessary metabolites. Examples are: **PaleoFiber**<sup>24</sup> from *Designs for Health* and **Whole Food Fiber**<sup>25</sup> from *Standard Process*.

## My Supplement Protocol

**MegasporeBiotic** is a unique probiotic that can survive stomach acidity and set up residence in the intestines. Its formula includes 5 types of bacillus spore cells and will increase the population and diversity of healthy bacteria in the gut. A peer-reviewed study published in 2017 demonstrated this probiotic's ability to repair damage to the human gut lining after a 30-day regimen.<sup>26</sup>

**MegaQuinone K2-7** is a blend of vitamin K2 and several nutrients required by vitamin K2 to enhance the efficiency of the mitochondria. The form of K2 in this product is MK-7, which is produced from fermentation. Practically all MK-4 in the marketplace is synthetically produced and not derived naturally from animal products. (Patients taking warfarin blood thinners may not be able to take this product.)

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<sup>17</sup> <https://www.westonaprice.org/health-topics/abcs-of-nutrition/dietary-guidelines/>

<sup>18</sup> <https://drdanenberg.com/nutrition-gingivitis-a-marriage-in-science-nutrition-gingivitis-a-marriage-in-science/>

<sup>19</sup> <https://drdanenberg.com/i-could-have-died-ten-years-ago/>

<sup>20</sup> <https://microbiomelabs.com/products/megasporebiotic/>

<sup>21</sup> <http://www.klaire.com/prod/proddetail.asp?id=K-BSP>

<sup>22</sup> <https://microbiomelabs.com/products/megaquinone-k2-7/>

<sup>23</sup> <http://www.jarrow.com/product/241/MK-7>

<sup>24</sup> [http://catalog.designsforhealth.com/assets/itemresources/PaleoFiber\\_TechsheetsREV10.16.pdf](http://catalog.designsforhealth.com/assets/itemresources/PaleoFiber_TechsheetsREV10.16.pdf)

<sup>25</sup> [https://www.standardprocess.com/Products/Standard-Process/Whole-Food-Fiber#.Wk\\_fFoZG3\\_Q](https://www.standardprocess.com/Products/Standard-Process/Whole-Food-Fiber#.Wk_fFoZG3_Q)

<sup>26</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5561432/>

**PaleoFiber** is a combination of fibers derived from fruits, vegetables, roots, seeds, and tree extracts to feed the beneficial bacteria in the gut.

**Dosing:**

- Take two capsules of MegasporeBiotic once a day about 10-20 minutes after a meal so that it can begin providing benefits in the upper and lower intestinal tract. However, it might be necessary to take a smaller dose of the probiotic for a few days and work up to the ideal dose as your body gets used to the probiotic.
- Take one capsule of MegaQuinone K2-7 with your first meal of the day that contains fat and then another capsule with your last meal of the day that contains fat. A meal containing fat is important since vitamin K2 is a fat-soluble vitamin.
- Take 2-3 teaspoons of PaleoFiber per day with water or any liquid. You could take it at any time, and you could take more if necessary.

My recommendation is to take all three supplements for at least 60 days. Then, determine the health of the gum tissues. It may or may not be necessary to continue to take them in the future. However, some people may want to take them on a regular basis for overall health and quality of life.