

## Gingivitis

Gingivitis is the most common and mildest form of oral/dental disease. According to the Food and Drug Administration, approximately 15 percent of adults between 21 and 50 years old, and 30 percent of adults over 50, have gum disease (FDA 2002). Gingivitis is characterized by inflammation and bleeding of the gums. Because gingivitis is rarely painful in its early stages, it often goes unnoticed until severe irritation or receding gums occur.

The main cause of gingivitis is plaque (or biofilm), a soft, sticky film that forms on the teeth when starches and sugars react with bacteria that is naturally present in the mouth. Plaque buildup occurs between the teeth and gums, in faulty fillings, and near poorly cleaned partial dentures, bridges, and braces. If not removed within 72 hours, plaque will harden into tartar that cannot be removed by brushing or flossing.

The best defense against gingivitis is brushing and flossing after meals, as well as professional cleaning by a dental hygienist every three to four months.

If left untreated, gingivitis may lead to a more serious condition called periodontitis, in which the inner gum and bone pull away from teeth and form pockets. These pockets can collect bacteria and debris, and become infected or abscessed. Bacterial toxins eventually break down the underlying bone and connective tissue that hold teeth in place. The ultimate outcome is tooth loss. For more information, see the chapter on Periodontitis and Cavities.

Several studies suggest that gum disease may be passed from parents to children and even between couples (Asikainen S et al 1996; Saarela M et al 1993). Based on these findings, the American Academy of Periodontology (AAP) recommends that treatment of gum disease may involve entire families and that if one family member has periodontal disease, all family members should see a dental professional for a periodontal disease screening.

Other conditions that may contribute to gingivitis include:

**Medications.** Certain prescription and over-the-counter drugs can create a favorable environment for plaque buildup. Cold remedies and tricyclic antidepressant drugs decrease salivation, which allows plaque and tartar to form more easily (Koller MM et al 2000). Oral contraceptives can increase microbial flora that contribute to gingivitis (Klinger G et al 1998).

Other drugs—particularly anti-seizure medications such as phenytoin (Dilantin®), calcium channel blockers, anti-hypertension drugs, and medications that suppress the immune system—can sometimes cause an overgrowth of gum tissue (Johnson RB 2003; Morisaki I et al 2001). This condition, called gingival hyperplasia, can make plaque much more difficult to remove and provide more surface for bacteria to develop.

**Infections.** Viral and fungal infections can also adversely affect gum health. The herpes virus, for example, can lead to acute herpetic gingivostomatitis, a condition characterized by swollen gums and small, painful sores in the mouth (Kasper DL et al 2005). Oral thrush is caused by overgrowth of a yeast known as *Candida albicans* that is normally found in the mouth. Thrush can produce white lesions on the inner cheeks and tongue that can spread to the gums.

**Disease.** Certain health conditions that may not be directly associated with the mouth can affect gum health. For example, leukemia patients may develop gingivitis if leukemia cells invade the gum tissue (Kasper DL et al 2005). Fanconi anemia is a rare genetic disorder that attacks bone marrow and reduces white blood cell production, leaving the patient predisposed to infections and more susceptible to gum disease (Nowzari H et al 2001).

**Hormonal Changes.** During periods of hormonal fluctuation such as pregnancy and menopause, women may become more susceptible to gingivitis due to decreased salivation and blood supply to the gums. It is also thought that increased hormone levels cause the gums to respond aggressively to bacteria-producing irritation. However, while it is clear that hormone levels play a role in the progression of periodontal disease, hormones do not specifically cause gingivitis (Mascarenhas P et al 2003). Of particular importance to women is that several recent studies indicate that pregnant women who have periodontal disease may be more likely to deliver a pre-term, low-birth-weight infant (Jeffcoat MK et al 2003).

**Poor Nutrition.** A diet lacking in adequate amounts of calcium, vitamin C, and the B vitamins can increase the risk of developing periodontal disease (Nishida M 2000a,b; Kasper DL et al 2005).

**Smoking.** Tobacco use may be one of the largest preventable risk factors for periodontal disease. According to one study, smoking may be responsible for more than half of adult cases of periodontal disease in the US. The same study also found that smokers are four times more likely to develop advanced periodontal disease than people who have never smoked (Giannopoulou C et al 2003). Smoking diminishes oxygen and nutrient delivery to gum tissue and interferes with the synthesis of cytokines that regulate immunity and inflammation. Smoking also poses a risk of periodontal therapy failure, treatment complications, and increased time to treat the disease (Papantonopoulos GH 1999).

**Stress and Depression.** Stress has been linked to an increased risk of periodontal disease, possibly because it may trigger an increase in behaviors such as smoking and poor oral hygiene. Sustained levels of financial stress and poor coping abilities, which can trigger habits such as poor diet or smoking, double the risk of developing periodontal disease (Genco RJ et al 1999). Researchers have also found that clinically depressed patients are only half as likely to benefit from periodontal treatment as non-depressed patients (Elter JR et al 2002).

### ***Gingivitis and Heart Disease***

There is a clear association between gum disease and heart disease. A 2004 study found that 91 percent of patients with cardiovascular disease also suffered from moderate to severe periodontal disease (Geerts SO et al 2004). While people with gum disease have a 25 percent greater risk of heart disease than those with healthy gums, researchers have only recently begun to uncover possible causes for this link. Researchers now believe that gum disease, which is inflammatory, causes the release of pro-inflammatory chemicals into the bloodstream, which triggers a systemic inflammatory response. Atherosclerosis is also an inflammatory disease, and many of the same factors that increase risk for heart disease also increase risk for gum disease, including C-reactive protein (CRP), fibrinogen, and cholesterol (Wu T et al 2000).

This theory was supported by a recent study involving 5000 participants, which showed that oral inflammatory markers entering the bloodstream encouraged systemic inflammation (Noack B et al 2001). This large study also confirmed that periodontal disease and body mass index are jointly associated with increased levels of CRP in assessing the risk of heart disease.

## **CONVENTIONAL TREATMENT**

Treatment of gum disease begins with regular brushing and flossing. It is also important to make regular trips to the dentist for cleaning and monitoring. Most dentists recommend yearly full-mouth x-rays to assess the progression of bone loss in the jaws. Life Extension, however, has long been concerned about the radiation exposure that results from undergoing medical x-rays. Even x-rays that emit low levels of radiation damage DNA, which can lead to cancer. While some dental x-rays are necessary, annual x-rays are not advisable.

A full periodontal probe with a tiny, ruler-like instrument is also performed to measure the pockets surrounding the teeth. In healthy gums, the pockets measure less than 3 millimeters (one-eighth of an inch). Pockets measuring 3 millimeters to 5 millimeters indicate signs of gingivitis. Pockets measuring more than 5 millimeters signify the development of periodontitis. For more information, see the protocol on Periodontitis and Dental Cavities.

A professional cleaning to remove plaque and tartar buildup should be performed at least twice a year. Some people need to have cleanings done more frequently. Non-surgical deep cleaning involves two procedures known as scaling and root planing, which are sometimes performed in sections of the mouth at different times, especially if there is considerable soreness and bleeding from the gums. Scaling removes plaque and tartar above and below the gum line. Root planing smoothes out the tooth root to remove bacteria buildup and encourage the gums to reattach to the teeth.

**Mouth Rinses.** Mouth rinses are frequently used to help prevent gingivitis. Medicated mouth rinses containing a 0.1% solution of folic acid have effectively reduced gum inflammation and bleeding in double-blind trials (Pack AR 1984; Vogel RI et al 1978b). Prescription antibacterial mouthwashes containing the ingredient chlorhexidine (Peridex®, PerioGard®) are also frequently used to treat gum inflammation.

**Decapinol®**, a new oral rinse available by prescription, reduces the adherence of bacterial plaque to oral surfaces. This not only reduces the formation of new plaque but also breaks up existing plaque, making it easier to remove with normal brushing. Reducing the presence of plaque also reduces the amount of bacterial toxins released into the gum. The result is a reduction in both plaque and gingivitis. Decapinol® is only mildly antibacterial, so it does not upset the oral bacterial flora.

**Toothpastes.** The natural and synthetic antibacterial agents in many toothpastes can help keep gums healthy. Natural toothpastes contain botanical oils that have antibacterial properties, while commercial formulas offer the benefit of fluoride to help prevent cavities. The brand Colgate Total®—the only FDA-approved toothpaste for fighting gingivitis—contains triclosan, a mild antimicrobial proven to reduce plaque and pocket depths associated with gingivitis (Niederman R 2004; Davies RM et al 2004).

**Antibiotic Therapy.** Antibiotic therapy used alone or in combination with other treatments may also be recommended to treat

gingivitis. Atridox® (doxycycline hyclate), PerioChip® (chlorhexidine gluconate), and Arestin® (minocycline hydrochloride) are antibiotics applied in sustained-release doses directly into the periodontal pocket. A relatively new drug called Periostat® (doxycycline hyclate) was approved by the FDA in 1998 for use in combination with scaling and root planing. Taken orally, Periostat® suppresses the action of collagenase, an enzyme that causes destruction of the teeth and gums (Lee JY et al 2004; Lee HM et al 2004).

**Surgery.** If a diligent regimen of proper brushing, flossing, and regular dental cleanings is followed, nearly all cases of gingivitis can be reversed in a short time. However, in advanced gingivitis, or conditions that make treatment difficult, the following surgical treatments can help:

- Curettage is a procedure in which diseased gum tissue in the infected pocket is scraped away, allowing the infected area to heal.
- Flap surgery involves pulling back the gums to remove tartar buildup. The gums are then sewn back in place so that the tissue fits snugly around the tooth, thereby reducing pocket depth.
- Guided tissue regeneration stimulates bone and gum tissue growth, and is often performed in combination with flap surgery. In this procedure, a small piece of mesh-like fabric is inserted between the bone and gum tissue. This keeps the gum tissue from growing into the area where the bone should be, allowing the bone and connective tissue to reattach.
- Soft tissue grafts reinforce thin gums or replace tissue where the gums have receded. The grafted tissue, usually taken from the roof of the mouth, is sewn in place over the affected area.

## NUTRITIONAL APPROACHES FOR HEALTHY GUMS

In maintaining tooth health, the best offense is a good defense. Regular visits to the dentist are important, as is a good toothpaste. Hydrogen peroxide, which is included in many toothpastes, is valuable for its ability to reach bacteria hiding among gingival folds and gaps. Its frothing action exposes anaerobic bacteria that thrive in an airtight environment to oxygen-rich air contained in its bubbles. Hydrogen peroxide has been used effectively for years in dentistry.

In addition to brushing with a good toothpaste and making regular visits to the dentist, a number of nutrients have been shown to improve gum health.

**Coenzyme Q10.** Coenzyme Q10 (CoQ10), a vital nutrient needed by every cell in the body to make energy, is beneficial for a variety of diseases and disorders, including periodontal disease. In addition to energy production, CoQ10 plays a vital role as an antioxidant at the cellular level by neutralizing free radicals. As early as the 1970s, researchers found that gum tissue in people with periodontal disease was often deficient in CoQ10 (Nakamura R et al 1974; Hansen IL et al 1976). Subsequent studies have shown that CoQ10 doses of 50 mg to 75 mg a day can halt deterioration of the gums and allow healing to occur, sometimes within days of starting therapy. In one double-blind trial, 50 mg per day of CoQ10 was significantly more effective than placebo in reducing symptoms of gingivitis after three weeks of treatment (Wilkinson EG et al 1976).

Stephen T. Sinatra, M.D., clinical cardiologist and author, reports that many of his patients see improvement in their gum health after beginning CoQ10 supplementation for heart disease. According to research by Sinatra, CoQ10's supportive effects on the immune system in general account for its ability to promote healing in diseased gums. Dr. Victor Zeines, a holistic dentist and author, recommends 100 mg a day of CoQ10 in combination with other supplements to help reverse gum disease naturally.

**Calcium.** A study found that people who do not consume adequate amounts of calcium each day are at significantly higher risk for periodontal disease (Nishida M et al 2000b). According to the American Dietetic Association, three of four people do not fulfill their daily calcium requirement. The study showed that men and women who had low calcium intakes (below the recommended dietary allowance) were almost twice as likely to have periodontal disease, as measured by the loss of attachment of the gums to the teeth.

**Folic Acid.** Studies have demonstrated that folic acid is very effective in preserving gum tissue and reducing the risk of gingivitis and periodontitis (Stein GM et al 1973). Although the benefits of oral folic acid in protecting against heart disease and birth defects are well documented, new evidence suggests that using folic acid topically (as a mouthwash) can also strengthen one's oral defenses. Studies have demonstrated folic acid's ability to improve gingivitis symptoms, reduce gum tissue's inflammatory response, and make gum tissue more resilient to irritants such as bacteria and plaque (Thomson ME et al 1982; Pack AR 1984).

Folic acid has been clinically tested in mouthwash solutions to assess its benefit in treating gingivitis. One study showed significant improvement after four weeks of using a folic acid mouthwash. In this double-blind, placebo-controlled study of 60 patients, dietary folic acid intake did not correlate with treatment results, suggesting the importance of applying folic acid topically to the gums (Pack AR 1984).

A double-blind study of 30 pregnant women evaluated the effects of folic acid mouthwash and folic acid tablets versus placebo. After

28 days, folate serum levels increased significantly in both groups receiving folic acid, but only the group receiving folic acid mouthwash showed a highly significant improvement in a gingival index (Thomson ME et al 1982).

Another study evaluated 30 patients with normal blood folate levels in a clinical setting. One group rinsed their mouths daily with a folate solution, and the other used a placebo mouth rinse. After 60 days, the group receiving the folic acid rinse showed significant improvement in gingival health compared to the placebo group (Vogel RL et al 1978a).

A double-blind study of 30 patients compared supplementation with 4000 mcg of ingested folic acid to placebo. After one month, plaque and gingival indices showed that folic acid supplementation appeared to increase the resistance of the gingiva to local irritants, leading to a reduction in inflammation (Vogel RL et al 1976).

**Green Tea.** Green tea extract is rich in a class of antioxidants called catechins. Two in particular, epigallocatechin gallate (EGCG) and epicatechin gallate (ECG), combat oral plaque and bacteria (Horiba N et al 1991; Otake S et al 1991; Rasheed A et al 1998). These green tea polyphenols work as anti-plaque agents by suppressing glucosyl transferase, which oral bacteria use to feed on sugar. Other research has demonstrated that green tea extract can kill oral bacteria and inhibit collagenase activity. Collagenase, a natural enzyme that becomes overactive in the presence of bacterial overgrowth, can destroy healthy collagen in gum tissue.

Green tea extract applied topically inhibits *Streptococcus mutans* bacteria, which have been implicated in the development of dental caries (the decay and breaking down of teeth and their bone support). Scientists suggested that certain extracts from green tea might be especially helpful in preventing tooth decay by preventing the development of bacterial plaque (Hattori M et al 1990). In a Chinese study, green tea extract was used to rinse and brush the teeth. The study demonstrated that *S. mutans* could be inhibited completely after contact with green tea extract for five minutes. There was no drug resistance after repeat cultures (You SQ 1993). The scientists concluded that green tea extract is effective in preventing dental caries (You SQ 1993). Other studies have shown that the plaque index and gingival index decreased significantly after green tea extract was used (Tsuchiya H et al 1997).

More recent studies confirm the benefits of green tea in fighting gum disease, especially when combined with conventional treatments. In a pilot study, hydroxypropylcellulose strips containing green tea catechins as a slow-release local delivery system were applied to the pockets in periodontal patients once a week for eight weeks. The green tea catechins inhibited the bacteria *P. gingivalis* and *Prevotella* spp., and a reduction in pocket depth was observed (Hirasawa et al 2002).

**Vitamin C.** People deficient in vitamin C may be at risk of developing gingivitis (Vaananen MK et al 1993). In one study, a group of subjects with periodontal disease who normally consumed only 25 mg to 30 mg of vitamin C daily were supplemented with an additional 70 mg. They experienced marked improvement in gum tissue after only six weeks (Aurer-Kozelj J et al 1982). Although it is established that smoking contributes to gum disease, tobacco users may especially benefit from vitamin C supplementation, as smoking depletes the body of vitamin C (Nishida M et al 2000a).

**Herbal Protection.** Tea tree oil, used as an oral rinse, has been proven to kill bacteria (Kulik E et al 2000). In fact, research has shown that a tea tree oil concentration of 0.6 percent inhibited 14 of 15 oral types of bacteria. In one study, 49 subjects aged 18 to 60 with severe, chronic gingivitis were divided into groups, one of which was given a gel containing tea tree oil to apply with a toothbrush twice daily. The tea tree oil group had improved gingival index and papillary bleeding index scores attributed to the herb's anti-inflammatory properties (Soukoulis S et al 2004).

Camu-camu, a shrub from the Amazon rainforest, is revered for its rich supply of vitamin C, which aids in circulation, fortifying blood vessel walls, and regenerating tissue. Moreover, camu-camu has astringent, antioxidant, and anti-inflammatory properties (Visentainer JV et al 1997;Justi KC et al 2000).

Both gotu kola and vitamin E help to heal wounds and promote connective tissue growth, as well as fight free radicals. Goldenseal is a medicinal plant that boosts immune function (Rehman J et al 1999).

Chamomile is a mild antimicrobial, as is red thyme oil (Aggag ME et al 1972). Finally, herbs such as parsley, spearmint, menthol, and eucalyptus are stimulating to the gums, as well as refreshing and cooling for the mouth in general (Sato S et al 1998).

## REDUCING GUM-RELATED INFLAMMATION

Because of the association between gum disease and systemic inflammation, researchers have begun looking at anti-inflammatory nutrients in the context of gum disease. In one study, 30 adults with gum disease were given a variety of polyunsaturated fatty acids, including omega-3 fatty acids from fish oil (up to 3000 mg daily) and omega-6 fatty acids from borage oil (up to 3000 mg daily). At the end of the study, clinically significant improvements were measured in both gingival inflammation and the depth of gum pockets (Rosenstein ED et al 2003). Another preliminary human study found that omega-3 fatty acids tended to reduce inflammation, but called for more thorough research (Campan P et al 1997). However, in light of the established connection between omega-3 and omega-6 fatty acids and inflammation, and the fatty acids' lack of side effects, it is reasonable for people with gum disease to consider using these supplements. Other anti-inflammatory supplements include ginger and curcumin, though neither of these has been studied in the context of inflammatory gum disease.

## LIFE EXTENSION FOUNDATION RECOMMENDATIONS

Healthy teeth and gums depend on regular brushing and flossing, as well as trips to a dentist every three or four months for cleaning and monitoring. It is also important to make lifestyle changes to protect your gums, including:

- Stopping smoking
- Consuming a diet low in fat and high in fresh fruit and vegetables
- Reducing intake of sugar, which reacts with bacteria to form plaque

Your choice of toothpaste is important. Today, the market is flooded with very strong toothpastes that contain whitening agents (usually hydrogen peroxide or carbamide peroxide). A toothpaste is now available that has been fortified with coenzyme Q10, folic acid, tea tree oil, and other nutrients that are directly delivered to the gums every time one brushes. This novel toothpaste also contains a mild solution of 0.2 percent hydrogen peroxide.

A mouthwash containing tea tree oil, peppermint, eucalyptus, and other soothing nutrients may also be helpful. A mouth spray called MistOral III™ contains CoQ10, vitamin E, camu camu, peelu, vitamin K1, gotu kola extract, propolis extract, and many other herbal ingredients. The recommended daily usage is to spray this along the gum lines and swish it through the mouth and teeth several times.

In addition, a number of nutrients have been shown to improve the health of the gums, including:

- **Coenzyme Q10**—100 milligrams (mg) a day
- **Calcium**—1200 mg a day
- **Magnesium**—160 to 500 mg daily
- **Folic Acid**—800 mcg daily, taken with 300 mcg of vitamin B12 daily to prevent a vitamin B12 deficiency
- **Green tea extract**—725 mg daily (93 percent polyphenols)
- **Vitamin C**—2 to 4 grams (g) a day (taken as 500 mg every few hours)
- **B vitamin complex**—A daily complex should contain at least 50 mg or more of vitamins B1, B2, B3, B5, and B6
- **Omega-3 fatty acids**—Up to 3000 mg daily of EPA/DHA
- **Omega-6 fatty acids**—Up to 3000 mg daily of GLA

## GINGIVITIS SAFETY CAVEATS

An aggressive program of dietary supplementation should not be launched without the supervision of a qualified physician. Several of the nutrients suggested in this protocol may have adverse effects. These include:

### Calcium

- Do not take calcium if you have hypercalcemia.
- Do not take calcium if you form calcium-containing kidney stones.
- Ingesting calcium without food can increase the risk of kidney stones in women and possibly men.
- Calcium can cause gastrointestinal symptoms such as constipation, bloating, gas, and flatulence.
- Large doses of calcium carbonate (12 grams or more daily or 5 grams or more of elemental calcium daily) can cause milk-alkali syndrome, nephrocalcinosis, or renal insufficiency.

## Coenzyme Q10

- See your doctor and monitor your blood glucose level frequently if you take CoQ10 and have diabetes. Several clinical reports suggest that taking CoQ10 may improve glycemic control and the function of beta cells in people who have type 2 diabetes.
- Statin drugs (such as lovastatin, simvastatin, and pravastatin) are known to decrease CoQ10 levels.

## EPA/DHA

- Consult your doctor before taking EPA/DHA if you take warfarin (Coumadin). Taking EPA/DHA with warfarin may increase the risk of bleeding.
- Discontinue using EPA/DHA 2 weeks before any surgical procedure.

## Folic acid

- Consult your doctor before taking folic acid if you have a vitamin B12 deficiency.
- Daily doses of more than 1 milligram of folic acid can precipitate or exacerbate the neurological damage caused by a vitamin B12 deficiency. Green Tea
- Consult your doctor before taking green tea extract if you take aspirin or warfarin (Coumadin). Taking green tea extract and aspirin or warfarin can increase the risk of bleeding.
- Discontinue using green tea extract 2 weeks before any surgical procedure. Green tea extract may decrease platelet aggregation.
- Green tea extract contains caffeine, which may produce a variety of symptoms including restlessness, nausea, headache, muscle tension, sleep disturbances, and rapid heartbeat.

## Magnesium

- Do not take magnesium if you have kidney failure or myasthenia gravis.

## Niacin (nicotinic acid)

- Do not take high doses of nicotinic acid (1.5 to 5 grams daily or more) if you have liver dysfunction, an unexplained elevation in your serum aminotransferase (transaminase) level, active peptic ulcer disease, arterial bleeding, or if you consume large amounts of alcohol.
- Consult your doctor before taking high doses of nicotinic acid if you have a history of jaundice, peptic ulcer disease, gastritis, disease of the liver or bile ducts, gout, kidney dysfunction, or cardiovascular disease (especially acute myocardial infarction or unstable angina).
- Consult your doctor before taking high doses of nicotinic acid if you have diabetes. High doses of nicotinic acid can negatively affect glucose tolerance. Monitor your serum glucose level frequently if you take nicotinic acid and have diabetes.
- Have your doctor monitor your serum aminotransferase level if you take high-doses of nicotinic acid.
- Nicotinic acid may cause flushing, principally of the face, neck, and chest. This flushing is thought to be prostaglandin-prostacyclin mediated. Histamine may also play a role in the flushing.
- Nicotinic acid can cause dizziness, palpitations, rapid heartbeat, shortness of breath, sweating, chills, insomnia, nausea, vomiting, abdominal pain, and muscle pain.
- High doses of nicotinic acid can cause blurred vision, macular edema, toxic amblyopia, and cystic maculopathy.

## Vitamin B1 (Thiamin)

- Consult your doctor before taking vitamin B1 for a thiamin deficiency, lactic acidosis secondary to thiamin deficiency, Wernicke-Korsakoff syndrome, Wernicke's encephalopathy, or Korsakoff's psychosis.

## Vitamin B2 (riboflavin)

- High doses of vitamin B2 (riboflavin) may interfere with the Abbott TDx drugs-of-abuse assay.
- Riboflavin absorption is increased in hypothyroidism and decreased in hyperthyroidism.
- If you are taking nucleoside reverse-transcriptase inhibitors, even a mild riboflavin deficiency can increase your risk of lactic acidosis.

## Vitamin B6

- Individuals who are being treated with levodopa without taking carbidopa at the same time should avoid doses of 5 milligrams or greater daily of vitamin B6.

### **Vitamin B12 (cyanocobalamin)**

- Do not take cyanocobalamin if you have Leber's optic atrophy.

### **Vitamin C**

- Do not take vitamin C if you have a history of kidney stones or of kidney insufficiency (defined as having a serum creatine level greater than 2 milligrams per deciliter and/or a creatinine clearance less than 30 milliliters per minute).
- Consult your doctor before taking large amounts of vitamin C if you have hemochromatosis, thalassemia, sideroblastic anemia, sickle cell anemia, or erythrocyte glucose-6-phosphate dehydrogenase (G6PD) deficiency. You can experience iron overload if you have one of these conditions and use large amounts of vitamin C.

For more information see the Safety Appendix

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