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## REPORT

## Friendly Acids To Watch For

by Terri Mitchell

The word “acid” has negative connotations—stomach acid, battery acid. People stay away from acids if they can help it. Yet some acids are very friendly. Ascorbic acid, lipoic acid and folic acid are three acids that provide great benefits to the human body. Ascorbic acid is, of course, vitamin C. Lipoic acid is also known as thioctic or alpha lipoic acid. Folic acid is sometimes referred to as folate. Ascorbic and lipoic acid are antioxidants; folic acid works differently.

Antioxidants are such old news that people have drifted away from the research. Yet, over 1000 articles on ascorbic acid alone were published last year. And although folic acid has been around a long time, it's suddenly in the lime light for its role in reducing homocysteine, a major risk factor for heart attack and stroke. Given all the new information coming out it's time to ask, What's up with the acids?

## Ascorbic acid

When plastic surgeons in Indiana wanted to find out if putting ascorbic acid on skin improves wrinkles, texture and firmness, they turned to a computer for help. The technique they used is called “optical profilometry,” and it can give an objective analysis of skin condition by digital analysis. Using a topical vitamin C product on one side of the face, they were able to prove that sun-damaged skin improves when the vitamin is used everyday. Sunlight depletes vitamin C, and people with skin cancer have sub-normal amounts of the vitamin in their skin. Smog also depletes vitamin C up to 80% in one study. People living in sunny, smoggy places are getting a double whammy. Antioxidant depletion is visible in the form of wrinkles, slackness and bad texture. That depletion can be reversed with supplementation, both oral and topical.

Ascorbic acid not only protects the skin from sunlight, it also protects the eyes. The lens of the eye contains high concentrations of ascorbic acid where it acts as antioxidant protection for the lens. People with cataracts have low blood levels of the vitamin. Research from the University of California shows that low vitamin C is the number one risk factor for cataracts. Other risk factors are aging, smoking and diabetes mellitus, all of which deplete ascorbic acid.

Another type of skin cell that benefits from ascorbic acid is the endothelial type that lines arteries. Maintenance of this layer of cells is crucial for healthy arteries. Ascorbic acid protects these cells from oxidized low-density lipoprotein (LDL). Without it, when LDL comes in contact with endothelial cells, it destroys them. Wound-like areas develop in the arteries if vitamin C (and vitamin E) are deficient. These “wounds” are one feature of heart disease.

Ascorbic acid not only protects arteries from LDL, it also protects LDL itself. Low-density lipoprotein becomes oxidized in the presence of homocysteine, a toxic by-product of methionine metabolism.

Homocysteine actually latches onto LDL. Ascorbic acid prevents LDL from oxidizing and creating free radicals. Unoxidized LDL is not evil: it's the oxidized version that damages blood vessels. Researchers at the University of Iowa created homocysteine in patients by giving them drinks loaded with methionine (note: methionine is naturally found abundantly in meat). Negative effects were reversed by two thousand milligrams of ascorbic acid.

Besides scavenging free radicals, ascorbic acid also has beneficial effects on nitric oxide, a vasodilator. According to research, 500 mg to 6000 mg a day of ascorbic acid has “a sustained beneficial effect “ on nitric oxide. This should be of relevance to those with heart disease.



## Stress and ascorbic acid



If you are a smoker, have diabetes, live in a smoggy or sunny area, or exercise, you may have subnormal levels of vitamin C. Smoking, smog, sunlight and exercise all increase free radicals, and up the demand for antioxidants. People who are newly-diagnosed with diabetes have significantly less vitamin C than they should. The effects of smog on the lungs are graphically illustrated in a study out of The Netherlands. Bicyclists were subjected to toxic ozone, then lung function was assessed. Forced expiratory volume decreased 95 ml without supplementation. With supplementation of 500 mg of vitamin C and 100 mg of vitamin E, the decrease was only 1 ml. Forced vital capacity decreased 125 ml without extra C and E, and only 42 ml with supplementation. Lungs are especially dependent on vitamin C for protection. In a study out of England, ascorbate was the only antioxidant that was significantly reduced in the lungs by ozone.

## Lipoic acid

An extremely powerful antioxidant, lipoic acid has demonstrated powers against brain damage, aging and diabetes. It may also help kill cancerous cells and retard heart disease.

A remarkable study shows how lipoic acid can reverse aging. Researchers at the University of California at Berkeley took liver cells from aging rats, and measured how energized they were, how many free radicals were present and how well the cells could recycle vitamin C. The aged rats were three times less active than young ones. Free radicals were five times higher, the generation of energy had plummeted and the ability to recycle ascorbic acid was about half. After two weeks on lipoic acid, everything was reversed. Ascorbic acid levels rose, free radicals decreased and energy levels took off. Levels of glutathione, an important antioxidant for the liver, were also protected by lipoic acid.

## Treatment for diabetes

No less dramatic are the effects of lipoic acid on the complications of diabetes. Diabetes comes with a free radical price tag. Oxidative damage caused by radicals is behind many complications of diabetes. Neuropathy is one. Multiple studies show that lipoic acid relieves symptoms of neuropathy such as pain, burning and numbness. In fact, lipoic acid is the supplement-of-choice in Europe for this condition. In a study done in Germany, 600 mg of lipoic acid, three times a day, decreased neuropathy as measured on three different tests. Total symptoms decreased 47% compared to placebo at 24%. The study lasted three weeks, and there were no adverse effects of lipoic acid. A review undertaken by researchers in Germany last year concluded that lipoic acid helps the symptoms of diabetic neuropathy.

## Regulates glucose

This high-powered supplement not only stops damaging free radicals, it also enhances the body's ability to take up glucose and use it. Reduced glucose has been linked to nerve degeneration. By enhancing glucose utilization, lipoic acid reduces the amount of energy the body must create from other sources, and maintains glucose sufficient for nerve function. Unlike other organs of the body, the brain and nervous system must be supplied with glucose to operate. If the body has to create glucose from fatty acids because it can't use existing glucose, free radicals will be generated. This is what happens in diabetes.

## Lipoic acid and cancer

Dr. Lester Packer is a top authority on antioxidants. He and his group at Berkeley recently published results from a study on lipoic acid and human cancer cells. For the first time they showed that lipoic acid activates an enzyme that kills leukemia cells. The enzyme, capase, increased 100% with treatment. Other research from his lab indicates that lipoic acid goads crippled immune cells (such as those of cancer and AIDS patients) into action. Among his other research projects is one showing that lipoic acid suppresses the "cancer gene," c-fos. Another group, this time at Yale, used lipoic acid and vitamin E succinate with vitamin D3 to make leukemia cells differentiate (become a normal cell as opposed to a cancer cell). Both antioxidants needed vitamin D3 to cause this positive effect.

A big question is whether a person undergoing chemotherapy should take antioxidants such as lipoic acid. Since generating free radicals is one of the ways chemotherapeutic drugs work, there is concern that taking antioxidants could keep chemotherapy from working. The jury is still out. Some studies show that antioxidants ameliorate the toxic effects of chemotherapy without affecting the drugs' ability to work. Others show that antioxidants reduce the effectiveness of the drugs—at least in cell culture. It may depend on the type of cancer, the drug used and the dose of antioxidant. Positive effects have been reported by people undergoing chemotherapy, but this is something that should be discussed with an oncologist.

#### Folic acid

Folic acid is found abundantly in vegetables and legumes. Studies repeatedly show that people who eat Western diets are deficient. This vitamin is extremely critical for health, especially as we age.

#### DNA protection

Folic acid is an extremely important nutrient for the protection of DNA. Humans have innate DNA repair mechanisms, but these decrease with age. Folic acid can help that mechanism stay active. Chemicals and free radicals also provoke breaks and mutations in DNA that can be repaired if folic acid and other nutrients are in good supply.

Damaged DNA is a feature of cancer. The trick is to keep DNA damage at a minimum. Studies show that people who either take folic acid supplements or eat plenty of food with folic acid in it have a significantly reduced likelihood of getting cancer of the pancreas, colon and breast.

#### Folic acid, mutation and methylation

Researchers at the University of Arizona have found a relationship among low folate, a mutated cancer gene and a type of cancer known as colorectal adenocarcinoma. People having folate levels at the high end of the scale were half as likely than those at the lowest to get the mutation. Age is also a risk factor for having the mutated gene—those older than 72 were twice as likely as those less than 65 to get the mutation. People who drink a lot of alcohol are also at risk for colorectal cancer. When researchers at Tufts fed rats alcohol, their DNA methylation dropped to about half normal. Other studies show that alcohol depletes SAMe. Methylation deficiency allows mutations to occur—mutations that can lead to cancer.

Folate works its magic on DNA by enhancing methylation. Methylation contributes to DNA repair, and folate is crucial for this process. Without it, DNA goes unrepaired, and mutations such as the one found in colorectal cancer, accumulate.

#### Defective methylation and heart disease

Researchers have discovered that the estrogen receptor gene in diseased arteries has defective methylation. This means that the receptor isn't functioning correctly. How much impact this has on heart disease isn't known yet. But it is known that aging causes more of the defective receptor to appear.

#### Acids are extremely important

You can benefit now from knowing that the acids have powerful and unique abilities to reverse conditions caused by aging, the environment and deleterious lifestyle habits. Vitamin C coverage has been so overdone, it's easy to forget how important this vitamin is. Lipoic acid is a newcomer that appears to have unique powers, including the ability to streamline blood sugar. And folic acid is a DNA powerhouse that also protects the heart and brain by lowering homocysteine and keeping arteries healthy. Mother never told you to eat your acids, but then again, she didn't know about estrogen receptors and oxidized LDL.



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