

Hepatitis B

Chronic hepatitis B is a common viral infection that affects 350 million people worldwide—equal to the entire population of the United States.

Chronic hepatitis B infection can cause progressive, degenerative inflammation of the liver, resulting in cirrhosis of the liver or cancer of the liver. Unfortunately, there is no way to cure hepatitis B, and many of the most common prescription medications used to treat the disease are known to cause drug resistance. Newer generations of drugs are being studied that promise to revolutionize the way hepatitis B is treated.

Few people are aware of the nutritional therapies that can limit, or even reverse, the degenerative liver damage caused by chronic hepatitis B. While conventional medicine focuses on suppressing the virus that causes hepatitis B, few conventional medical protocols address the serious damage to the liver caused by the virus. Compelling evidence indicates that nutritional therapy can help support healthy liver function.

The Life Extension Foundation has surveyed hundreds of scientific studies to find proven nutritional therapies that even your doctor might not know about.

ANATOMY OF HEPATITIS B INFECTION

The hepatitis B virus (HBV) is a small-DNA virus that is easily transmitted—it is much more easily transmitted than HIV. At one time, hepatitis B was usually transmitted through infected blood products, but this mode of infection is rare today. Hepatitis B can be transmitted by exposure to contaminated body fluids (such as blood, semen, or vaginal secretions) during sexual intercourse, or from mother to fetus. The incidence of hepatitis B is increased in people who are undergoing dialysis, people who inject drugs (and share contaminated intravenous needles), people who have AIDS, transplant recipients, and people (such as those with leukemia or lymphoma) who frequently have blood transfusions.

Like hepatitis C, infection with hepatitis B begins with an acute infection that occurs after initial exposure to the virus. In this stage, symptoms are generally mild and flu-like. The symptoms of hepatitis B include weakness, nausea, vomiting, body aches, diarrhea, fever, joint pain, jaundice (yellowish discoloration of the skin and the whites of the eyes), loss of appetite, weight loss, and sometimes an itchy skin rash. The symptoms of acute hepatitis last, on average, 1 to 3 months. During this time, the person is extremely contagious. About 5 to 10 percent of those infected will develop chronic hepatitis B. The other 90 to 95 percent will develop antibodies that confer lifelong immunity to HBV (Lammert F et al 2000).

The consequences of chronic hepatitis B infection are serious and include cirrhosis and hepatoma (primary liver cancer, or hepatocellular carcinoma), which can develop in the chronically inflamed liver.

TESTS FOR DIAGNOSING AND TRACKING HEPATITIS B

The diagnosis of hepatitis relies on blood tests that either detect the virus in the bloodstream (viral load) or detect antibodies manufactured in response to infection. In addition, tests of liver enzymes are used to track treatment progress among people who have chronic hepatitis B. A liver biopsy is performed, not for diagnosis, but to grade the severity of liver disease.

Testing for hepatitis B includes evaluation of the following:

- **Hepatitis B surface antigen (HBsAg).** This is the first test to show a positive result with acute hepatitis B infection. The level of the antigen rises before symptoms begin and then returns to normal when the jaundice disappears. A person is considered to be a carrier of hepatitis B if this antigen persists in the blood 6 months after the initial infection. In rare cases, a person with hepatitis B who was initially a carrier of the disease may eventually become a noncarrier and thus have lifelong immunity (that is, he or she may be a "late seroconverter" of surface antigen).
- **Antibody to HBsAg (anti-HBs).** The body makes this antibody to fight the viral infection. Its presence usually indicates immunity against hepatitis B (the person has previously had hepatitis B, recovered, and is now immune, or has been vaccinated against hepatitis B and is now immune.) People who have a positive test result for this antibody will not develop a hepatitis B infection again. Hepatitis B immune globulin (HBIG) becomes detectable about 6 months after an acute hepatitis B infection and will remain in the blood for life, although its level will decrease over many years. To prevent hepatitis B, doctors inject super-concentrated antibody HBIG into people who have been exposed to the disease.

- **Hepatitis B e antigen (HBeAg).** Presence of this antigen indicates that the person is highly infectious and that the virus is replicating. The antigen is found during the time of early symptoms of acute hepatitis. Persistent levels of HBeAg indicate a chronic infection.
- **Antibody to HBeAg (anti-HBe).** The presence of anti-HBe indicates that infectivity is decreasing and that the period of high infectivity is ending.
- **Antibody to hepatitis B core antigen (anti-HBc).** This antibody appears about 1 month after acute infection. Its level declines very gradually over many years. It is also present in people who have chronic hepatitis. During the time lag between the disappearance of HBsAg and the appearance of hepatitis B surface antibody (HbsAb)/anti-HBs, core antibody is elevated. This elevation, called the "core window," may be the only marker that indicates a recent hepatitis infection.
- **Viral load.** In a person who has the hepatitis C virus (HCV) or one who has chronic hepatitis B, the viral load is measured by the quantitative HCV polymerase chain reaction (PCR) laboratory test. PCR refers to the type of assay used in the test. The result is reported in number of copies of the virus. Quantitative HCV PCR is used to measure a patient's response to treatment.
- **Liver function.** An elevation in the results of some liver function tests, particularly the transaminases (found on routine blood chemistry testing), should prompt the physician to order a hepatitis screening panel, which would include screening tests for hepatitis B and other forms of hepatitis.

VACCINATION FOR HEPATITIS B

Vaccination for hepatitis B has been enormously successful. The infection rate for hepatitis B in infants and children has dropped dramatically since the introduction of an effective hepatitis B vaccine 20 years ago. Newborn infants, travelers, and other people at risk are routinely vaccinated for hepatitis B. The series of immunizations consists of three injections of the hepatitis B antigen over a period of 6 months. The antigen causes the recipient of the injection to make antibodies against the antigen. The recipient (now having antibodies against HBsAg) will make those antibodies if exposed to the entire hepatitis B particle. The recipient is thus immune to HBV. Immunity is conferred after vaccination in 85 to 90 percent of people and is proven by finding a titer greater than 10 milli-International Units per milliliter (mIU/mL) of surface antibody in the vaccine recipient.

The US Task Force on Adult Immunization recommends that adults receiving hepatitis B vaccination have a titer to check for immunity 1 to 6 months after completing the series. In adults, the vaccine must be given in the deltoid muscle of the upper arm to maximize effectiveness (it is not absorbed as well when administered in the hip). The thigh is the preferred site for infants. If the titer is below 10 mIU/mL 1 to 6 months after the initial vaccination series is completed, the person is not considered immune and the task force recommends an additional dose. The titers should again be measured 6 months later. These additional doses of hepatitis B vaccine can be given up to three times until the titer rises above 10 mIU/mL.

At this point, the US Task Force on Adult Immunization recommends no further doses, even if the person's titer status remains nonimmune. However, cases of acute hepatitis B and the accompanying risk of chronic hepatitis have been reported in these patients. Patients who do not become immune with the usual series of hepatitis B vaccine have been shown to have a genetic variant involving the way antigen is presented to their immune cells (Desombere I et al 1995; Durupinar B et al 1996).

In Japan and Europe, other protocols have been used in people who do not respond to hepatitis B vaccine. In Great Britain and some other parts of Europe, a higher dose of 40 micrograms (mcg) of vaccine may be used instead of the usual 10 mcg. In the United States, this is known as a dialysis dose of the vaccine, which is the dose most commonly used in patients undergoing dialysis. In a study reported in the *Journal of Infectious Disease*, 100 percent of the people given the 40-mcg dose became immune to hepatitis B (Bertino JS Jr et al 1997).

Even though the hepatitis B vaccine is not routinely recommended in the United States, it is worth noting that higher dosing of the vaccine has successfully been used abroad to obtain an immune titer that is sufficient to prevent future infection. This higher dose also provides immunity in those who do not become immune after receiving the usual initial dosing regimen in the vaccination series. If you are not immune after the initial usual series of hepatitis B vaccine (meaning your titer for HbsAb is less than 10 mIU/mL when it is checked with a blood test), you may wish to receive the dialysis dose because it has been shown to provide 100-percent response in all persons, including nonresponders.

Some states require hepatitis B vaccination for entrance to middle school. Although the three-dose schedule is standard, an optional two-dose schedule of hepatitis B vaccine (recombinant) for adolescents 11 to 15 years old became available in February 2002. The second dose is given 4 to 6 months after the first dose. Each of the two doses contains 10 mcg of HBsAg compared with 5 mcg in the three series. To date, follow-up data indicate that the rate of decline in antibody titers for the two-dose schedule is similar to that of the three-dose schedule. However, long-term follow-up studies will determine whether booster doses will be required. If it is not clear which dose an adolescent was administered at the start of a series, the series should be completed with the three-dose schedule.

Short-term (2-year) follow-up data indicate that the rate of decline in antibody levels for the two-dose schedule was similar to that for the three-dose schedule. No data are available to assess long-term protection (beyond 2 years) or immune memory following

vaccination with the two-dose schedule, and it is not known whether booster doses of vaccine will be required. As with other hepatitis B vaccination schedules, if administration of the two-dose schedule is interrupted, it is not necessary to restart the series. Children and adolescents who have begun vaccination with a dose of 5 mcg of hepatitis B vaccine (recombinant) should complete the three-dose series with this dose. If it is not clear which dose an adolescent was administered at the start of a series, the series should be completed with the three-dose schedule.

CONVENTIONAL TREATMENT

The conventional treatment of hepatitis B has made exciting strides in the past 5 years. Newer drugs have been introduced that work better, with fewer side effects, and researchers have learned about the benefits of combination therapy using several of these drugs. In general, the goal of conventional treatment is long-term reduction of virus levels in the blood. Complete eradication of the virus is not possible.

There are two categories of drugs used to treat chronic hepatitis B: nucleoside analogues and immunomodulators. The immunomodulators include interferon alfa and pegylated interferon. The most well-known nucleoside analogues are lamivudine and adefovir. Only the interferon drugs lamivudine and adefovir are approved by the US Food and Drug Administration (FDA). However, a number of antiviral agents (such as entecavir, tenofovir, telbivudine, and clevudine) show promising results in clinical trials.

Interferon alfa was one of the first drugs approved to treat hepatitis B. It induces seroconversion from highly infective HBeAg to less infective anti-HBe status in 30 to 40 percent of patients. However, its use is often limited by adverse effects including flu-like symptoms, nausea, diarrhea, energy loss, decreased blood cell counts of platelets and white cells, and depression.

Lamivudine is the other mainstay of hepatitis B treatment. It helps suppress the replication of the virus and delay the progression of the disease. Lamivudine is well tolerated and has seroconversion rates of 15 to 20 percent for hepatitis B at 1 year. If therapy with lamivudine continues for more than 1 year, the seroconversion rate also rises (Matthews GV et al 2001). Drug resistance is a persistent problem with the use of lamivudine (Delaney WE IV et al 2001).

These drugs are often used in combination. While they have been effective, a new era in hepatitis B treatment is about to dawn. This new era will be driven by new conventional drugs that have fewer complications in clinical trials and less tendency to provoke drug resistance.

Chief among these new drugs is a new form of interferon called pegylated interferon. This is standard interferon that is made into a longer molecule by complexing it with a polyethylene glycol molecule. Modifying the interferon into pegylated interferon makes it longer-acting so that it can be injected once a week instead of three times a week, as regular interferon must be. In clinical trials, pegylated interferon is superior to interferon alfa in maintaining viral suppression without the virus becoming resistant to the drug.

Early results show that pegylated interferon (combined with antivirals such as lamivudine) has better results than the standard combination of interferon alfa and lamivudine. A next-generation interferon is being developed and is being tested in combination with newer antivirals such as adefovir and entecavir (Galan MV et al 2001).

People who have hepatitis B would be wise to consult with a gastroenterologist (a specialist in the disorders of the gastrointestinal tract) or hepatologist (liver specialist) who is familiar with treating both hepatitis B and hepatitis C and is affiliated with a university center that researches and treats these diseases.

A PROMISING NEW THERAPY

Another new drug on the horizon is known as thymosin alfa-1. This peptide has been extensively studied for its beneficial effects on immune response. Originally isolated from the thymus gland, thymosin alfa-1 is found in highest concentrations in the thymus but has also been detected in the spleen, lungs, kidneys, brain, blood, and a number of other tissues.

In more than 70 studies involving hepatitis B and C, HIV, influenza, and certain cancers, thymosin alfa-1 has exhibited immunomodulatory activity and demonstrated benefits, whether used alone or in conjunction with conventional therapy. Many of these effects appear to be synergistic with those of other cytokines (interferon alfa and interleukin-2), and thymosin alfa-1 may work best in combination with other immunomodulators.

In clinical studies of patients who have hepatitis B, thymosin alfa-1 has been primarily investigated by itself, as the only therapy. However, promising results have also been obtained when thymosin alfa-1 was used in combination with interferon or lamivudine. In addition, thymosin alfa-1 has an excellent safety record. In the treatment of more than 3000 patients who had a range of diseases (including hepatitis B and hepatitis C), thymosin alfa-1 was well tolerated and was not associated with any significant adverse effects.

Several randomized controlled studies have investigated the safety and efficacy of thymosin alfa-1 as the sole therapy for the treatment of chronic hepatitis B. These studies show that thymosin alfa-1 promotes disease remission in 25 to 75 percent of the patients treated. Two of the studies resulted in statistically significant findings, and the third trial was statistically significant for the primary treatment center. When all the studies were considered together in a meta-analysis, the results showed that 6 months of treatment with thymosin alfa-1 almost doubled the sustained response rate (36 percent) compared to the control subjects (19 percent) (Ansell CD et al 2001).

Thymosin alfa-1 is available in more than 30 countries around the world, but it has not yet been approved by the FDA for use in the United States. Two phase-III trials have been conducted or are underway that test thymosin alfa-1 in combination with pegylated interferon alfa-2a in the treatment of hepatitis C. Additional trials are underway that examine thymosin alfa-1 as combination therapy for chronic hepatitis B infection.

PRECAUTIONARY STEPS TO AVOID INFECTING OTHERS

Although HBV is not spread by sneezing, coughing, or casual contact, be careful not to spread HBV to others. If you are a carrier of hepatitis B, the following precautions will reduce the risk of transmitting the disease to others:

- Remind your doctor, dentist, and other healthcare providers that you are an HBV carrier.
- Cover all open cuts and sores with a bandage. Wipe up your blood spills and other body fluids. Clean the contaminated area with a solution of 1 part household bleach to 10 parts water.
- Do not share toothbrushes; razors; needles or syringes; nail files, clippers, or scissors; or any other object that may have come into contact with your blood or body fluids. Do not share food that has been in your mouth or that has touched utensils that have been in your mouth. Do not prechew food and feed it to your baby.
- Do not donate blood, plasma, body organs, tissue, or sperm.
- If you are pregnant, tell your physician you are an HBV carrier. A child born to a woman who is an HBV carrier must receive HBIG and his or her first hepatitis vaccine within 12 hours of birth.
- Avoid or severely restrict alcohol intake. Your liver may be further damaged by alcohol, particularly if you also have taken acetaminophen (found in Tylenol® and other cold and headache remedies).
- Wash your hands with soap after touching your own blood or body fluids. Hepatitis B is transmitted by contact with infected blood, semen, and vaginal fluids.
- Throw contaminated items such as tissues, menstrual pads or tampons, or bandages away in a plastic bag.
- Tell sexual partners you have hepatitis B. All sexual partners should be tested for HBV. If they are not immune to the virus, they should receive the vaccination series of three shots. Until protection from HBV has been guaranteed, use a condom.
- Advise people living in your household to see their doctor for hepatitis B testing and vaccination. If anyone is exposed to your blood or body fluids, HBIG (given within 2 days to 2 weeks) can prevent the infection.

NONDRUG THERAPIES TO ENHANCE LIVER FUNCTION

The value of nutritional therapy in the treatment of chronic hepatitis B infection is consistently overlooked by most physicians, who usually focus on prescribing drugs that suppress the virus. The course of hepatitis B is characterized by chronic liver inflammation and oxidative stress that causes progressive liver damage. This damage results in the formation of scar tissue (fibrosis) within the liver; eventually, severe liver disease may result. Hepatitis B infection is a major cause of liver cancer. Hepatitis B infection can also cause advanced liver failure, leading to liver transplant. In light of these sobering statistics, it's imperative that all patients with hepatitis B become aware of proven strategies that can reduce inflammation and oxidative stress in the liver, thereby protecting this vital organ from viral damage.

Antioxidant Therapy. As with other diseases related to inflammation and tissue damage, oxidative stress is a key mediator that continues and magnifies the ongoing disease process. The livers of people who have hepatitis show reduced levels of antioxidants, which are consumed in an effort to protect the liver. According to a report in the June 1998 issue of the *Journal of Clinical Gastroenterology*, investigators showed that nutritional antioxidants are potential therapeutic agents for diseases such as hepatitis. Other investigators reported at the same time that oxidative stress (free-radical damage) is often seen in hepatitis B and may contribute to the emergence of hepatocellular carcinoma, seen in patients after years of chronic liver inflammation. The study stated that antioxidants that down-regulate oxidative damage may be a useful complement to specific antiviral drugs in the therapy of viral diseases.

In a related study, vitamin E (alpha-tocopherol) was reported in a randomized, double-blind, placebo-controlled study to be a successful adjunct approach when combined with alpha-interferon therapy in the treatment of hepatitis because of its strong antioxidant activity (von Herbay A et al 1997).

Selenium. The protective role of selenium against HBV was reported in 1997 in the journal *Biological Trace Element Research*. The study reported that, in areas of China with high rates of hepatitis B and primary liver cancer, high levels of dietary selenium reduced the incidence of liver cancer and hepatitis B infection. In a 4-year trial of 130,471 people, those who were given selenium-spiked table salt showed a 35.1 percent reduction in primary liver cancer, compared with the group who received salt without selenium. In the same journal report, another clinical study of 226 people who tested positive for hepatitis B showed that taking a 200-mcg tablet a day of selenium reduced the incidence of primary liver cancer to zero. Upon cessation of selenium supplementation, the incidence of primary liver cancer began to rise. The study seems to indicate that taking selenium on a continuous basis is beneficial to people who have viral hepatitis (Yu SY et al 1997).

These human trials have been duplicated in animal studies. The animal studies showed that selenium supplementation reduced hepatitis B infection by 77.2 percent and precancerous liver lesions by 75.8 percent.

Another study in the *Journal of Trace Elements and Medical Biology* reported the role of trace minerals in diseases such as liver disease and hepatitis. The report indicates that, while there is still some debate regarding the specific role of trace minerals, minerals such as selenium and zinc are of benefit to those who have diseases such as hepatitis (Loguercio C et al 1997).

A 3-year study of 20,847 people investigated whether supplementation with sodium selenite could prevent hepatitis B. The researchers concluded that: "The incidence of virus hepatitis infection in the test population was significantly lower than that of controls provided with no selenium" (Yu SY et al 1989).

Polyunsaturated Phosphatidylcholine (PPC). PPC is a naturally occurring phospholipid, derived from lecithin. It is necessary for maintaining the integrity of cell membranes. Oral PPC is incorporated into the liver cell membrane to improve functioning (such as determining which substances are allowed to enter the liver cell and which are blocked from entry). Adding PPC to interferon (a mainstay of medical treatment for chronic hepatitis B) improves the therapeutic value of interferon. PPC also helps normalize transaminase levels on liver function blood tests.

In patients who have chronic active hepatitis C, phospholipid therapy has been shown to significantly reduce disease activity and help regenerate liver cells. PPC has a history of not only protecting the liver, but also being able to enhance the bioavailability of various herbs and nutrients. The increased power of milk thistle, vitamin E, and interferon when taken along with PPC corroborates this finding. Lessening the liver's effort (regarding detoxifying injurious substances) allows the liver to begin healing.

Milk Thistle (*Silybum marinum*). Silymarin and its chief active ingredient, silibinin, are derived from milk thistle, a member of the daisy family. Both substances help prevent liver damage and help the liver regenerate faster if damage is done. Silymarin and silibinin actually accelerate the rate of protein synthesis in the liver, leading to faster cell regeneration (Sonnenbichler J et al 1986; Valenzuela A et al 1994). Silymarin and silibinin act in the ribosomes, special cellular organelles where protein synthesis takes place. It was discovered that silibinin can bind to the receptor for an important enzyme called DNA-dependent RNA polymerase. This results in an increase in ribosomal RNA, leading to more protein synthesis. When milk thistle is added to PPC in the treatment

of chronic hepatitis B, markers of oxidative stress such as malonaldehyde are decreased.

S-Adenosylmethionine (SAME). SAME is the product of a biochemical reaction between adenosine triphosphate (ATP) and methionine. Half of all methionine in the body is used in the liver to make SAME. SAME has been compared to ATP in its importance to the body. It is used in many different cellular processes, from replication to biochemical reactions that create melatonin and PPC. SAME is particularly important for the liver because glutathione, the liver's natural antioxidant, is synthesized from it. Without sufficient glutathione levels in the liver, free-radical damage will occur.

The liver contains the third highest amount of SAME in the body, after the adrenal and pineal glands. SAME is so important for liver function that it can be considered an essential nutrient for that organ. It has also been shown to be an effective antidepressant and plays a leading role in liver regeneration.

Glutathione. Glutathione is a potent antioxidant and is necessary for maintaining a normal redox state in the liver, which is vital to hepatic functioning. The following nutrients enhance glutathione levels in the body:

- **N-acetylcysteine (NAC).** Another substance that improves the response rate to interferon. NAC is necessary for glutathione production and thus decreases oxidative stress.
- **Whey protein.** Helps boost immune function, protect against free-radical damage, and improve cellular glutathione levels.
- **Lipoic acid.** A potent antioxidant that helps to increase cellular glutathione levels. In addition, lipoic acid helps to regenerate other essential antioxidants.
- **Glutamine.** Studies have demonstrated that glutamine supplementation increases glutathione stores in hepatic tissue, which protects liver function.

AVOIDING LIVER TOXICITY

The best diet for people who have hepatitis is chemical free (organic). The Life Extension Foundation suggests that you evacuate your bowels regularly and completely to avoid unnecessarily taxing your immune system and liver. Avoid drinking alcohol. As with all liver disease, you must be certain that you do not have an excessive amount of iron in your body because excessive iron is itself a liver toxin. Measurements of serum iron, total iron-binding capacity, percent saturation, complete blood cell count, blood ferritin, and bone marrow analysis for iron stores may be needed. Discuss how often you should obtain these measurements with your physician. If testing reveals very high serum iron levels, your physician may recommend iron depletion therapy (extracting blood, as in blood donation). Do not undergo iron depletion therapy if you are anemic (anemia is often a consequence of treatment for hepatitis). You should have your iron level closely monitored by your physician.

Certain nutritional supplements have been shown to reduce serum iron levels. To help keep serum iron levels in the normal range (30 to 80 grams per deciliter [g/dL]), high doses of green tea polyphenols and garlic high in allicin may be beneficial. Lactoferrin, a subfraction of whey protein, may be especially beneficial as an adjunctive treatment for serum iron overload in patients who have hepatitis. Lactoferrin is a potent antioxidant, antiviral agent, and scavenger of free iron. In addition, lactoferrin is directly involved in the up-regulation of natural killer cell activity, making it a natural modulator of immune function.

As mentioned earlier, HBV induces free-radical reactions that damage liver cells. A standardized grape-seed extract that provides a high percentage of antioxidant proanthocyanidins can help protect the liver against oxidative stress.

Some herbs can be toxic to the liver, especially in high amounts. The following herbal preparations have been shown to be toxic to the liver: germander, comfrey, chaparral leaf, pennyroyal, skullcap, and mistletoe.

Some patients with hepatitis B take 500 milligrams (mg) of licorice root extract three times a day. There is some controversy about people who have hepatitis B taking high doses of licorice. If you have hepatitis B, the Life Extension Foundation suggests that you take high doses of licorice only under the supervision of a knowledgeable healthcare provider. If you do take high doses of licorice, monitor your blood pressure to guard against any further increase in blood pressure.

LIFE EXTENSION FOUNDATION RECOMMENDATIONS

In addition to conventional drug therapy, the Life Extension Foundation recommends broad-spectrum antioxidant supplementation to protect and enhance liver functioning. Blood tests that measure liver enzymes (such as alanine transaminase [ALT], aspartate transaminase [AST], and gamma-glutamyl transpeptidase [GGTP]) can determine a patient's tolerance to supplements. The following individual supplements are important in the integrated treatment of hepatitis:

- **Selenium**—200 to 400 micrograms (mcg) daily
- **PPC**—1800 to 2700 milligrams (mg) daily in divided doses
- **SAME**—1200 mg daily

- **Milk thistle extract**—At least 900 mg daily of *S. marianum* standardized to 80 percent silymarin, 30 percent silibinin, and 4.5 percent isosilybin B
- **Vitamin C**—2 to 3 grams (g) daily in divided doses. Do not take vitamin C with foods that contain iron because vitamin C can facilitate increased iron absorption, which can cause additional free radical activity in the liver.
- **Vitamin E**—400 international units (IU) daily with at least 200 mg of gamma tocopherol
- **NAC**—600 to 1200 mg daily
- **Whey protein**—20 to 40 g daily
- **R-lipoic acid**—300 mg twice daily
- **Grape-seed skin extract**—100 mg two or three times daily
- **Lactoferrin**—up to three 300-mg capsules daily
- **High-allycin garlic**—4000 mg daily in divided doses
- **Green tea polyphenols**—725 mg daily containing at least 246 mg of epigallocatechin gallate (EGCG). A decaffeinated form is available for people who are sensitive to caffeine.
- **L-Glutamine**—500 to 1000 mg daily. If given orally, use L-glutamine. If given intravenously, use either free glutamine or alanyl-glutamine.

HEPATITIS B 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:

Garlic

- Garlic has blood-thinning, anticlotting properties.
- Discontinue using garlic before any surgical procedure.
- Garlic can cause headache, muscle pain, fatigue, vertigo, watery eyes, asthma, and gastrointestinal symptoms such as nausea and diarrhea.
- Ingesting large amounts of garlic can cause bad breath and body odor.

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.

L-Glutamine

- Consult your doctor before taking L-glutamine if you have kidney failure or liver failure.
- L-glutamine can cause gastrointestinal symptoms such as nausea and diarrhea.

Lipoic Acid

- Consult your doctor before taking lipoic acid if you have diabetes and glucose intolerance. Monitor your blood glucose level frequently. Lipoic acid may lower blood glucose levels.

Milk Thistle

- Consult your doctor before taking milk thistle with tranquilizers such as Haldol, Serentil, Stelazine, and Thorazine. Milk thistle combats the effect of tranquilizers.
- Do not combine milk thistle with the blood pressure medication Regitine. Milk thistle combats the effect of Regitine.

NAC

- NAC clearance is reduced in people who have chronic liver disease.

- Do not take NAC if you have a history of kidney stones (particularly cystine stones).
- NAC can produce a false-positive result in the nitroprusside test for ketone bodies used to detect diabetes.
- Consult your doctor before taking NAC if you have a history of peptic ulcer disease. Mucolytic agents may disrupt the gastric mucosal barrier.
- NAC can cause headache (especially when used along with nitrates) and gastrointestinal symptoms such as nausea and diarrhea.

Phosphatidylcholine

- Phosphatidylcholine can cause increased salivation, a metallic taste, headache, drowsiness, and gastrointestinal symptoms such as nausea and diarrhea.

SAMe

- Consult your doctor before taking SAMe if you have bipolar disorder. See your doctor frequently if you take SAMe and you have bipolar disorder.
- Consult your doctor before taking SAMe if you take antidepressants. See your doctor frequently if you take SAMe in place of or in addition to antidepressants.
- Consult your doctor before taking SAMe if you have cancer. Nucleic acid methylation patterns may change in people who have cancer and take SAMe.
- Do not take SAMe if you are undergoing gene therapy.
- SAMe can cause anxiety, hyperactive muscle movement, insomnia, hypomania, and gastrointestinal symptoms such as nausea and diarrhea.

Selenium

- High doses of selenium (1000 micrograms or more daily) for prolonged periods may cause adverse reactions.
- High doses of selenium taken for prolonged periods may cause chronic selenium poisoning. Symptoms include loss of hair and nails or brittle hair and nails.
- Selenium can cause rash, breath that smells like garlic, fatigue, irritability, and nausea and vomiting.

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.

Vitamin E

- Consult your doctor before taking vitamin E if you take warfarin (Coumadin).
- Consult your doctor before taking high doses of vitamin E if you have a vitamin K deficiency or a history of liver failure.
- Consult your doctor before taking vitamin E if you have a history of any bleeding disorder such as peptic ulcers, hemorrhagic stroke, or hemophilia.
- Discontinue using vitamin E 1 month before any surgical procedure.

For more information see the Safety Appendix

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