

# Depression and Nutrition

Eat, drink, and be merry.

We do not catch a bacterial infection because we don't have enough antibiotics coursing through our blood stream. We do not get cancer because we do not have enough chemotherapy in our bodies. We do not get heart disease because we do not have enough heart medications in our medicine cabinets. And we do not get clinically depressed because we're not knocking back enough antidepressants each morning.

In your basic biology class we are taught that our blood is manufactured, that it begins, in the bone marrow. In Chinese medicine, we are taught that our blood begins on the end of our fork: we are what we eat.

Is there a nutritional connection to depression? Considering that there is a nutritional connection to nearly every dis-ease in the books, the odds are on: Yes. While visiting a friend he opened a book to an underlined statement (telling me, "I bought this book because of this sentence) that read: "85% of our serotonin is created in the gut." Serotonin is considered a "brain" chemical. Serotonin, whether created in the gut or in the brain, begins on the end of your fork.

## The Quest for Answers

I was diagnosed as clinically depressed in 1994. I was given Zoloft, and my whole world changed. I could concentrate. I could actually sit down and read without my mind wandering between paragraphs. I could actually listen to a conversation without my own thoughts getting in the way. To put it more dramatically, I was not about to commit the suicide I had planned to commit for months and months. I was just moments away from the actual act when the whole world opened up and told me, you'll be fine.

Zoloft saved my life. But the simple fact is, I was **not** clinically depressed because I did not have enough Zoloft in my body. I was clinically depressed because my diet lacked key nutritional factors.

Within a year or so I discovered that Zoloft was messing with my liver function. I was then put on Nefazodone. I soon discovered that I was one of the .4% who was allergic to it and was placed on Wellbutrin, which had the added benefit of helping me to quit smoking. However, in late 1998, I read an article about an experiment using [Celtic Sea Salt](#). I do not have the original article today, but I recall that prisoners, especially violent prisoners, were given Celtic Sea Salt without their knowing it and without the guards being informed either. Since violent prisoners are split up in these large

institutions, there was in another cell block a control group that was kept on regular table salt. Guards daily have a lot of paperwork. They have to report "incidents," fill in queries, and report on events. Within less than a month, reports coming from the cell block getting the [Celtic Sea Salt](#) showed that incidents were down and behaviors were significantly improved. Significant simply means that the changes were not due to "coincidence." The salt had had an effect. (To read our original article on Celtic Sea Salt, [Click Here](#).)

Perhaps the simplest of all studies showing the connection between nutrition and depression was published in *Neuropsychobiology*, 1995, 32:2, 98-105: Vitamin supplementation for 1 year improves mood, by Benton D; Haller J; Fordy J Department of Psychology, University College Swansea, UK. Here is the abstract:

The possibility that the taking of vitamin supplements may influence mood was explored. One hundred and twenty-nine young healthy adults took either 10 times the recommended daily dose of 9 vitamins, or a placebo, under a double-blind procedure, for a year. Males taking the vitamins differed from those taking the placebo in that they reported themselves as feeling more 'agreeable' after 12 months. After 12 months the mood of females taking the vitamin supplement was significantly improved in that they felt more 'agreeable', more composed and reported better mental health. These changes in mood after a year occurred even though the blood status of 9 vitamins reached a plateau after 3 months: this improvement in mood was associated in particular with improved riboflavin and pyridoxine status. In females baseline thiamin status was associated with poor mood and an improvement in thiamin status after 3 months was associated with improved mood.

Update (12/08/07): One of our friends, Dr Robert Rowan sent us a recent newsletter ([Second Opinion](#)) of a new study that shows SSRIs (Selective serotonin reuptake inhibitors) inhibit the absorption of calcium into your bones. He says: "Researchers found that daily use of SSRIs can cause a 4% reduction in bone mineral density in your hips. The lower spine lost 2.4% of bone density." Additionally, SSRIs can lower your blood pressure which can result in falling; a perfect prescription for broken bones.

He goes on to relate how SSRIs are over prescribed. He notes that Dr David Golzman, a senior investigator in this study (published in *Arch Intern Med*. 2007;167:188-194) discovered that prescriptions for antidepressants soared by more than 30% between 2000 and 2004, and quotes the doctor: "And that puts a lot of people at increased risk for fractures over and above the risk that they already have as a result of the fact that they're aging and are taking other medication, which may also predispose to osteoporosis"

Dr Rowen also reminds us that SSRIs do not work for 70% of those taking them. Dr Thomas Insel, the director of the National Institute of Mental Health points out that only 30% of the healthiest, highly educated, currently employed, Caucasian women met the criteria for remission, adding: "The gulf between research and practice has led to the unfortunate current state where too many research studies have little immediate relevance to practice, and too little practice is based on research evidence."

Drugs are not the answer to depression. Perhaps they can help you initially, but as always, getting to the cause of the problem is always the best answer.

At one point in my care, my psychiatrist recommended Lithium. I've seen what people look like on Lithium; very reminiscent of my early drug days in the sixties. I refused the drug, but told my psychiatrist I'd get some naturally.

Celtic Sea Salt contains natural Lithium salts. So now, [Celtic Sea Salt](#) is the only salt I'll use (with the exception of a bit of [Original Himalayan Crystal Salt™](#) at times) and I use it on everything.

In researching our 3rd Edition of the *Wellness Directory of Minnesota™* with our focus on Cardiovascular Wellness, I discovered that B vitamins supported heart function; that Congestive Heart Failure, referred to by Dr Bruce West as "beriberi of the heart," was due to a B vitamin deficiency. Being thorough, I began reading up on the B vitamin complex and discovered that they are also brain food.

In the early nineties, there was a big commercial push for brain nutrients. Every vitamin company had brain drinks and brain foods and brain stimulants. I recalled that one of the ingredients common to all these fad mixtures was Choline.

Choline is a B vitamin that is the precursor of the neurotransmitter acetylcholine and is essential for optimal memory function. Choline, being water soluble, is absorbed through the blood brain barrier and protects and nourishes other chemicals that support memory. Choline, along with B-12, is necessary for myelin formation. You've heard that fish is brain food? Well, fish contains a lot of choline. Choline is also found in eggs, fermented soy, dark greens, liver, yeast, and wheat germ.

Inositol, another part of the B-complex, is also remarkably effective against depression, panic attacks, and obsessive-compulsive disorder (OCD) in several studies. The effective dose was 12 grams per day for four weeks. Inositol has no side effects and is as effective as prescription drugs.

All of the B vitamins are water soluble, meaning they don't last long in your body and must be replaced (except for B-12 which is stored in the liver as we will see later).

So I went on to continue my research into the B vitamins and I found an article by Dr Judith DeCava, PhD called "Vitamin B Complex in Human Nutrition." She listed symptoms of B vitamin deficiency and at the top was mild to severe depression. She went on to list: forgetfulness, vague fears, uneasiness to panic, mood swings, rage, morbid thoughts, hostility,

restlessness, apprehension, constant feeling that something dreadful is going to happen, suspicions, instability, anxiety, mental confusion, noise, sensitivity, inability to handle stress, hearing noises, voices, etc., loss of ability to concentrate, impaired intellect, loss of memory, nervousness, loss of ability to concentrate, impaired intellect, loss of memory, nervousness, weakness, fatigue, lightheadedness or dizziness, digestive problems, hypochlorhydria (insufficient stomach acid production), constipation or diarrhea, stomach pains, decreased or increased appetite, craving for sweets, heart palpitations, chest pains, neuralgia to neuritis, muscular soreness, pain, tingling or achiness, cold hands and feet, heightened sensitivity to touch and/or pain, menstrual complaints, soreness of the mouth, dermatitis, acne, burning or itching eyes, difficulty swallowing, sore throat, hypochondria, headaches, insomnia or sleep disturbances.

Additionally, I learned that B-12 vitamin deficiency is common in people over 40 because it (like many of the B vitamins) relies upon stomach acid to be absorbed. Unlike the other B vitamins, it also needs to bond with something called "intrinsic factor." Those of Scandinavian, English, and Irish descent often lack this "intrinsic factor" (produced by the parietal cells of the stomach). I note the age 40 (though it could happen earlier) because as we age our digestion slows, we produce less stomach acid and less intrinsic factor, thus I discovered sublingual forms of B-12 to help my body absorb it better. There are liquids and little pink pills that you hold beneath your tongue and facilitate absorption that way.

B-12, though it is water soluble, is stored in the liver and not washed away like most water soluble vitamins. However, it can take years before a deficiency in B-12 shows up, though the symptoms can resemble Alzheimer's disease in extreme cases:

It may takes years to develop a B-12 deficiency and the resulting neurological effects will be noticed before it can be detected by the usual blood tests. Testing urine levels of methylmelonic [Sic.] acid is the best way of assessing a B-12 deficiency and will detect it before the blood levels of B-12 will record outside the normal range. A B-12 deficiency causes slowly progressing and irreversible nerve damage. New evidence suggests that B-12 can be deficient even though pernicious anemia is not present. Even in cases where the blood does not indicate it, B-12 may be dangerously deficient and can contribute to such problems as mental deterioration, confusion,

depression, and other cognitive problems.

Source: "Vitamin B Deficiencies" by Karen Railey;  
<http://chetday.com/vitaminbdeficiencies.html>

The best form of B-12 is Methylcobalamin. Methylcobalamin seems to reverse nerve damage and has been reported in medical literature to help prevent and reverse peripheral nerve damage in conditions including multiple sclerosis, diabetes, and nerve damage caused by chemotherapy.

Vegetarians are often deficient in B vitamins as the foods richest in B vitamins are animal products. There are B vitamin analogues found in yeast and sea weeds, however there is also a great controversy over whether B vitamin analogues are the same as B vitamins and let me tell you that, personally, I've spent the better part of that past two years trying to untie this little knot to no avail. Someday someone will come forward and tell us what's up with this, we can only hope.

Folic Acid is part of the B Vitamin complex and clinical studies abound on how it can relieve depression better than antidepressants alone, with women in particular benefiting most.

Homocysteine is an intermediary amino acid associated with a variety of diseases, including heart disease. Elevated levels of homocysteine has been associated with depression disorders, as well as anger attacks caused by depression. Your B Vitamin complex contains nutrients that can lower homocysteine levels.

Few people know that the brain is 60% cholesterol. Perhaps fewer know that lecithin makes up about 30% of the dry weight of the brain. Lecithin contains a lot of choline and contains a vitamin not yet recognized by nutritionists called vitamin J. Vitamin J is pure brain food and is needed for good, healthy nerves.

Lecithin also contains phosphatidyl-serine. It used to be thought that once brain cells die, they're gone forever and that new brain cells cannot be grown. However, according to Dr James Balch, MD, more than 60 human studies and over 3000 scientific papers have demonstrated that new brain cells can be grown and even Alzheimer's symptoms (language deterioration, fatigue, depression, poor judgment, vision and hearing loss, etc.) can be reversed, and it's the phosphatidyl-serine that does it. I add liquid lecithin to my salad oils. There are some expensive supplements containing phosphatidyl-serine, however, I prefer to let my food be my medicine when I have the option.

The best B vitamins are found in food. If you are taking a B vitamin complex, or a daily multi-vitamin, keep this in mind: most vitamins are crap. Your body cannot survive on synthetic food, how is it supposed to survive on synthetic vitamins? The best B vitamins made today come from Standard Process Labs, however, they do not sell to the public; they sell to health care professionals only, doctors and chiropractors. You can order it by calling Dr Bruce West's vitamin company called Immune Systems, at 800.231.8063. My second choice would be [NOW Foods, B Complex](#). They are inexpensive and are not synthetic.

Clinical Rheumatology (July, 2006) reported on a study in the UK where those suffering from vitamin D deficiency scored much higher on anxiety and depression tests than those who had healthy vitamin D levels.

With the spate of studies showing that Vitamin D can lower your chances of certain cancers by 70%, everyone should be getting at least 1000 IU of Vitamin D daily.

In the July 07 issue of the New England Journal of Medicine, a report was published detailing the widespread vitamin D deficiency in our population – as much as one billion people.

The best form of Vitamin D is Vitamin D-3, the exact same type made in your body by sunlight.

Most nutritional physicians recommend between 1000 IU and 1500 IU daily, however, on study found that depression during winter months was significantly reduced among study subjects who took high daily doses of vitamin D (4,000 IU) for a period of one year.

Seasonal Affective Disorder (SAD) is a direct link between depression and lack of Vitamin D, though the simple lack of sunshine, something that can brighten up your day, has to be considered. On a dreary day, we just feel dreary.

Vitamin D is very inexpensive. You get it free from the sun, but when the sun isn't visible, or you just can't get out into it, it's still pretty cheap. Check out the prices at the link below:

At one point in my research, I began experimenting. I'd take my drugs for a week on, then two weeks off. I realized I was almost there. And then I discovered flax oil, fish oils, and DHA (docosahexaenoic acid).

Johanna Budwig, a biochemist, was reversing cancer and heart disease with omega-3 fatty acids back in the fifties (in Germany). Little known is that she

was also relieving many mental disorders and childhood behavioral disorders. Researchers at Harvard Medical school [Omega-3 polyunsaturated fatty acid levels in the diet and in red blood cell membranes of depressed patients by Edwards R, Peet M, Shay J, Horrobin D University Department of Psychiatry, University of Sheffield, UK. *J Affect Disord* 1998 Mar; 48(2-3):149-55; <http://www.biopsychiatry.com/omega3.html>], [Omega 3 fatty acids in bipolar disorder: a preliminary double-blind, placebo-controlled trial by Stoll AL, Severus WE, Freeman MP, Rueter S, Zboyan HA, Diamond E, Cress KK, Marangell LB. Brigham and Women's Hospital, Department of Psychiatry, Harvard Medical School, Boston, Mass, USA. *alstoll@mclean.harvard.edu Arch Gen Psychiatry* 1999 May; 56(5):407-12; <http://www.biopsychiatry.com/omega3.htm>], and in Bethesda, Maryland [Essential fatty acids predict metabolites of serotonin and dopamine in cerebrospinal fluid among healthy control subjects, and early- and late-onset alcoholics by Hibbeln JR, Linnoila M, Umhau JC, Rawlings R, George DT, Salem N Jr Laboratory of Membrane Biochemistry and Biophysics, National Institute on Alcohol Abuse and Alcoholism, Bethesda, Maryland, USA. *Biol Psychiatry* 1998 Aug 15; 44(4):235-42; <http://www.biopsychiatry.com/fattyacids.html>] have continued on with Budwig's research into omega-3, essential fatty acids. The conclusion is simple, the lack of essential fatty acids can contribute to depression, as well as bipolar disorder and including them in your diet can help to eradicate these same disorders. My only question, when it comes to these studies, concerns how much better their results might have been had they administered the omega-3 oils in a water soluble form.

DHA (docosahexaenoic acid) is found in fish oils. It was discovered that DHA levels were low in alcoholics and women in their postpartum period. Apparently alcohol helps to deplete DHA levels. As for women in their postpartum period, because babies need DHA for proper brain development, in the last stages of pregnancy, the baby "pulls" DHA from the mother's stores. This is thought to be the cause of postpartum depression. Studies at Harvard Medical school suggest "...that DHA may be associated with depression, and the limited data available on supplementation with DHA or other omega-3 FAs seem to support the hypothesis that DHA may have psychotropic effects." [Docosahexaenoic acid and omega-3 fatty acids in depression by Mischoulon D, Fava M Depression Clinical and Research Program, Department of Psychiatry, Massachusetts General Hospital and Harvard Medical School, Boston, Massachusetts, USA. *Psychiatr Clin North Am* 2000 Dec; 23(4):785-94; <http://www.biopsychiatry.com/dhaomega.htm>]

Update: DHA is now found in a product by Udo, called Udo's DHA Blend. It comes from algae, meaning vegans and vegetarians can use it.

This was when I met Stan Mann and his product Omegasentials™. Though Stan is a vegan (he avoids any foods that come from animals) his

**Omegasentials™** contain fish oils because it is the only way to get your DHA. This was the final rung of the ladder. Within two weeks of adding the Omegasentials™ to my daily regimen, I had conquered my depression. (Omegasentials™ is the most exciting product I have ever found in my research and if you have yet to read Johanna Budwig Revisited to learn about its healing potential, you should do it now. Additionally, the suggested retail price for Omegasentials is \$40.00 per two pound bag.

I've received a few letters from vegans who tell me that I can get DHA from nuts, flax, etc., but that's because they've read articles telling them that these foods are a great source for DHA, when in fact, these foods are a great source for alpha-linolenic acid, which is a biologic precursor to DHA (and EPA). However, they are created in your body, and if your body is not in perfect condition, no conversion is possible. The liver can create DHA if it his healthy and receives the proper nutrition. If your liver isn't producing it, then you'll have to have a sizable quantity of good bacteria in your gut. These bacteria take in your alpha-linolenic acit and pass DHA and EPA. They also pass B Vitamins.

The best (and most inexpensive) probiotics (good bacteria) we've found come from Sedonal Labs.

One more thing I learned from my research is that people who get depressed have a high alkalinity. In fact, bipolar types can watch the pH of their urine fluctuate from 5 to 8. Testing your urine's pH is a good idea. I lowered my alkalinity by using Omegasentials™, and by drinking a potassium broth. Additionally, a shot of apple cider vinegar in the morning actually helps lower your alkalinity. Here is the potassium broth recipe:

Fill a large pot with 25% potato peelings, 25% carrot peelings and whole chopped beets (half and half), 25% chopped onions and garlic (more onions than garlic), 25% celery and dark greens. Add hot peppers to taste (or cayenne pepper). Add enough distilled/purified water to cover vegetables and simmer at a very low temperature for a minimum of 2 hours. Strain and drink only the broth, put the veggies in a compost (I feed my chickens). Make enough for two days and refrigerate the leftover broth. Do not store for more than two days.

Having beaten my depression is no guarantee that some event will not suck me into another fog of depression. For the most part, however, my chronic/clinical depression is gone. One bad day cannot be equated with



clinical depression. We all have our ups and downs. The main point is, my chronic depression is now a thing of the past. Should enough stress build up and start to drag me back, my research has uncovered still more supplements used for depression and anxiety that I have access to. I don't believe that these supplements are a substitute for good nutrition, but once in a while we all need help.

St John's Wort has been touted as a natural anti-depressant. St John's Wort is a drug. Natural or not, it is still a drug. It should be used only as an emergency stopgap and is no substitute for good nutrition.

Since I did a ton of research over the past three years, I feel I should pass on to you some of the things I've found that also fight depression. Some can be used daily, some can be used only in an emergency. **However, do not go this alone. Have a professional work with you and monitor your progress.** And again, there is no substitute for good nutrition. Period.

### **Exercise - Another Strategy**

Research shows that a moderate exercise program, three times a week is nearly as effective at relieving depression as antidepressants.

In my struggle to relieve my depression, I also took up tennis (again...it's been years). I also began a daily program of Qigong/Tai Chi. This program has been remarkable.

And getting out on the tennis courts in the bright sunlight has increased my Vitamin D stores. The cheapest source of natural Vitamin D is sunlight.

### **Additional Supplements**

**5-Hydroxytryptophan (5-HTP):** a direct precursor to serotonin. Proven to be extraordinarily effective in increasing levels of serotonin in the brain. However, one out of five people who respond well to 5-HTP relapse after a month. I've recently found a version of 5-HTP that contains L-tyrosine, a non-essential amino acid that plays an important role in the production of neurotransmitters dopamine and norepinephrine. In addition, because L-Tyrosine is necessary for the synthesis of thyroid hormone and epinephrine (adrenaline), L-Tyrosine supports healthy glandular function and stress response.

**Adapton or Garum Armoricum®:** an extract from the brain and stomach of the Great Bluefish. Though this chemical has a long history of helping many chronic illnesses, it is primarily used for stress related problems; anxiety, fatigue, and depression. It is one of the single most effective

supplements for these disorders and French studies seem to prove this out. It is an inexpensive alternative to anti-anxiety drugs such as Xanax™, Valium™, and Buspar™ or antidepressant drugs such as Prozac™, Zoloft™, and Paxil™. It is also used in Europe as a replacement for Ritalin™ in children with ADD.

Garum contains vitamins, minerals, and Omega-3 essential fatty acids. Its effect is to increase the amount of calming, endogenous opiates called endorphins. The polypeptides in Garum act as precursors for endorphins and other neurotransmitters.

A study in Japan showed that Garum was able to triple the incidence of alpha (brain) waves, something normally accomplished by narcotics and major anti-psychotic tranquilizers.

Still, for chronic depression, this might be only a part of the solution.

**Colostrum with transfer factor:** comes from the first milking of a cow (found in the first milkings of every mammal). Normally this is used to boost immune function, but it also increases beneficial neurotransmitters such as serotonin and dopamine and prevents their re-uptake. It also seems to improve concentration and alertness, so much so, that if used late in the day it will interfere with sleep.

**DHEA:** has been found to help in chronic depression, but since it is a hormone, it, like all hormonal therapies, is a double-edged sword and we feel that the possible side effects would wipe out any possible positive effects and we cannot recommend it with a clear conscience. The form I use is called 7-Keto, by NOW Foods. Here is what they have to say about it: 7-Keto® is a natural occurring metabolite of DHEA, providing the same benefits of DHEA, without its associated side effects. Because the body's production of DHEA declines with age, so does the production of 7-Keto®. Weight gain is a common sign of aging that often accompanies the decreased production of DHEA and its metabolites. Supplementation with NOW® 7-Keto® can safely promote thermogenesis, thereby supporting the maintenance of healthy body weight.

**DL-Phenylalanine:** an amino acid. It increases Norepinephrine levels (also associated with depression) and for those who've relapsed using 5-HTP, DL-Phenylalanine worked like a charm.

**Ginkgo biloba:** an herb from the Maidenhair tree. Ginkgo, famous for improving memory loss, contains terpenes that increase circulation to the brain and other parts of the body (aids in male impotence too), and protect nerve cells. They even seem to regenerate damaged nerve cells. Ginkgo in a dose of 240 mg per day improves memory in Alzheimer's patients. If used

early enough, it can slow the progression of Alzheimer's.

Ginkgo has been shown to be a very effective antidepressant, especially in the elderly. In a study of 40 older patients who were not responding well to antidepressant medications, one group was given Ginkgo while the control group got a placebo along with their antidepressant. They were tested using the Hamilton Depression Scale, and the Ginkgo group dropped from 14 to 7 after one month and to 4.5 after two months, while the score for the placebo/antidepressant group went from 14 to 13 over the same time period. Ginkgo seems to reduce the loss of serotonin receptor sites.

Ginkgo can have some minor side effects (in a small percentage of people) of mild headaches or mild stomach upset, but these seem to go away after a short while.

Ginkgo also thins your blood, so you'll want to discuss all your drugs and supplements with a nutritionist before adding ginkgo to your regimen.

**Idebenone:** an analogue of CoQ10. It has many of CoQ10's properties, but does one thing CoQ10 doesn't: it increases serotonin in the brain.

**Jiaogulan:** written up in our [Alternative Cancer Therapies](#), is the Longevity Herb from China. In addition to all its wonderful properties, it also helps to stabilize mood.

**MSM:** a form of nutritional sulfur that is also written up at [Alternative Cancer Therapies](#) and is primarily used to support connective tissue and reverse pain in people with arthritis, also tends to normalize mood and increase feelings of well-being.

**N-Acetylcystein (NAC):** is something we should all be taking daily (I use it daily). It converts many carcinogens into harmless chemicals, reduces homocysteine levels, and increases glutathione levels (a powerful antioxidant and cellular detoxifier). It also supports our capillary system, has antiviral properties, and protects the liver. High homocysteine levels are associated with both depression and heart disease.

**SAMe:** the latest craze in the world of alternatives (tons of junk mail about SAMe in my mail box). However, upon further research, all of the fabulous results from this supplement were gotten from the injectable form only. However, we have now found more studies (at [MedScape](#)) that seem to show that SAMe works better than the placebo in both depression and pain relief (from chronic inflammation).

Trimethylglycine TMG: (also known as betaine), and Dimethylglycine DMG, are methyl donors that help in the production of several brain chemicals and

hence improve mood, energy, wellbeing, alertness, concentration, and visual clarity. DMG (I use this daily too), has anti-tumor properties, modulates the immune system, acts as an anti-viral, anti-bacterial, anti-fungal agent, and increases oxygen utilization, while decreasing lactic acid formation and making energy production more efficient.

Vitamin C and vitamin E: Studies indicate that levels of vitamin C are lower in people with depression. Low levels of vitamin E are also to major depression.

Zinc: published in J Affect Disord 1999 Dec; 56(2-3):189-94, was a study showing that "There is now some evidence that major depression is accompanied by activation of the inflammatory response system (IRS). Other signs of IRS activation, which have been reported in major depression are lowered serum zinc (Zn) and serum albumin (Alb) concentrations. 15 to 30 mg daily is the usual dose.

© Copyright 2002, 2007 Minnesota Wellness Publications, Inc.

For non commercial use: You may copy, print, reprint, and/or transfer this entire article, if and only if it is unmodified and in its complete state with this copyright notice attached and all the links work properly. All others must contact us in writing.