

## The Elusive B-12

The work at the Tree of Life and in all my nutrition books, *Spiritual Nutrition* and the *Rainbow Diet*, *Conscious Eating* and *Rainbow Green Live Food Cuisine* is to provide an optimal situation for everyone to be successful vegan and live food practitioners. To that end, we address every single issue that is connected with being successful. The B-12 issue is one that is critical to a successful and healthy vegan and live food way of life.

To understand the significance of this issue, we need to understand a little about the importance of B-12 in the diet. The average non-vegetarian stores between 2,000 and 3,000 picograms (pg., same as micrograms) of B-12 and loses about 3 pg. per day. About 60 percent of the total amount of the B-12 in the body is stored in the liver and 30 percent is stored in the muscle. The body has a special circulation pattern between the digestive tract and the liver. Through the bile, we secrete 1.4 pg. per day of B-12 into the small intestine, and healthy people reabsorb about 0.7 pg. Research suggests that if people have a low B-12 intake, the absorption increases to even draw more B-12 into the system. However, there is still a general potential for slow loss, depending on the variation in this special, what is known as enterohepatic circulation, before we develop the potential of B-12 deficiency symptoms.

B-12 has two functions: one, methylcobalamin is used by the enzyme methionine synthase to change homocysteine into methionine. When this enzyme is not working, we increase the homocysteine in our system, which recent research has associated with the increased potentiality of heart disease and deterioration of the arteries and nerves. When the homocysteine is high, it appears to be a nerve toxin, as well as a blood vessel toxin. The second function of B-12 is as a coenzyme is using 5'-deoxyadenosylcobalamin in the enzyme methyl malonyl-CoA mutase in the conversion of methyl malonyl-coA to succinyl-CoA.

Elevated homocysteine also happens with deficiencies in B-6 or folic acid. One of the major symptoms of B-12 or folic acid deficiency is macrocytic anemia. Folate, also called folic acid, is needed to turn the uracil into thymidine, an essential building block of DNA. This DNA is needed for production of new red blood cells and for red blood cell division. B-12 is involved because it is involved in the pathway that creates methyl cobalamin. This B-12 also produces a form of folate needed to make DNA. So, if there is no B-12, folate can become depleted and DNA production slows down.

Another little side part of the methyl malonyl-CoA to succinyl-CoA conversion is that when the B-12 is not available, the methyl malonyl-CoA levels increase and are converted to methyl malonic acid, which accumulates in the blood and urine. Since the B-12 is the only co-enzyme required in this pathway, methyl malonic acid levels are considered the gold standard as an indicator of B-12 deficiency. Other causes of high methyl malonic acid (MMA) are genetic defects, kidney failure, low blood volume, dysbiosis, pregnancy and hypothyroid. The MMA test is important because the progressive medical community no longer considers serum B-12 levels an accurate measurement of appropriate amounts of B-12. In other words, a normal serum B-12 may not mean that B-12 levels are healthy. We need a urinary assay of methyl malonic acid to really determine that. This is an important point, because when I first wrote about this issue in *Conscious Eating*, the establishment of the methyl malonic acid assay as the gold standard had not taken place yet. I based some of my statements at that time on the world research, which was using serum B-12. A serum B-12 of 200 pg. or less was considered deficient. As a result of the new gold standard and what we know about MMA and homocysteine, the B-12 serum levels should be around 450 pg. to maintain a normal homocysteine level. Therefore, serum B-12 levels less than 450 pg. may be considered as indicating a B-12 deficiency.

There are a variety of symptoms of B-12 deficiency, which are important to vegans and live fooders. The first is actually low energy. It could be a reason why some people just don't feel well on these diets, besides not getting the right protein/carbohydrate/fat mix for their constitutional type. There are specific neurological symptoms, often described as "subacute combined degeneration". Some of this damage can be almost irreversible, if it becomes chronic. This nerve system degeneration affects peripheral nerves and the spinal cord. Some of the typical neurological feelings include depression, numbness and tingling in the hands and feet, nervousness, paranoia, hyperactive reflexes, impaired memory and behavioral changes. With a B-12 deficiency, one can also have diarrhea, fever, frequent upper respiratory infections, impotence, infertility, sore tongue, enlargement of the mucous membranes of the mouth, vagina, and stomach, macrocytic anemia, low platelets, increased bleeding, low white blood cell count. Some of the causes of B-12 deficiency are low dietary intake of B-12 and/or poor absorption, which usually comes through loss of intrinsic factor and/or a lack of stomach acid.

Consistent research over the last decade has shown that vegans and live food people of all ages and sexes have a much higher risk of becoming B-12 deficient. This does not mean that everyone becomes B-12 deficient. This deficiency is particularly true with newborn babies, especially babies of vegan live-food nursing mothers who are not using B-12 supplementation. In contrast to the average adult storage of 2,000-3,000 pg. of B-12, newborns of mothers with normal B-12 have about 25 pg. Studies have shown that the milk during the first week of life

does contain large amounts of B-12. This means that the B-12 storage in infants at birth is normally adequate to last the first few weeks of life. Afterwards, they must get it from breast milk or other sources. If a vegan or live-food mother is already B-12 deficient during pregnancy, the baby may be born with seriously low B-12 levels and develop clinical signs of deficiency as soon as two weeks. The general research suggests that even among non-vegetarians, B-12 can be insufficient in infants, and that perhaps all breastfeeding mothers should consider B-12 supplements for themselves and their infants during the time of breastfeeding. This lack of B-12 in the mother's diet during pregnancy has been associated with a lack of myelin production, which is the coating of the nerves. It takes somewhere between one to twelve months to develop, and manifests as failure to thrive and slow developmental progression. The babies are often lethargic, lose their ability to use muscle adequately, and even their sensory attunement decreases. They also have irregular macrocytic anemia.

The good news that one major study in the United Kingdom in 1988 showed, in studying 37 vegan children was that there was normal growth and development in children who were breastfed for 6 months at a minimum, when there was B-12 supplementation.

Young children and teenage children who were supplemented with B-12 were found to grow normally. Adults who were vegetarian without B-12 supplementation for greater than six years usually had a lower B-12 than non-vegetarian adults in the general research. In one study of adults in 1994, 81% of the vegan adults had a B-12 lower than 200 pg. That is approximately the percentage of adults on a live food diet who are low in B-12. In my clinical experience, meat eaters, vegans and live-fooders tend to have a fairly high percentage of B-12 deficiency, although meat eaters do have less incidence. My experience is that cooked food vegans have a higher incidence of B-12 deficiency than live fooders, but there is still a significant occurrence in live fooders. In vegetarians and vegans, there is also a high percentage under 200 pg., about 54%. A study in 1982 by Dunn and Scott of raw food vegans with 83 subjects from the Natural Hygiene Society showed that 92% of the vegans had a B-12 less than 200 pg., and in 53% it was less than 100 pg. The World Health Organization (WHO) considers B-12 deficiency to be less than 200 pg. The percentages of B-12 deficiency tend to increase over time on a natural hygiene diet. Another study in Finland in 1995 that examined B-12 status of long-term 100% raw vegans found that 66% of the people had a B-12 lower than 200 pg. One study done in 2000 by Donaldson at Hallelujah Acres on primarily live food diet people, but with some B-12 supplementation via nutritional yeast, showed only about 15% of the people were less than 200, and none of them less than 160. The supplementation with nutritional yeast was 5 pg. of B-12 from one tablespoon of Red Star Vegetarian Support.

Up until this time, many of us have felt that additional supplementation for live fooders with sea vegetables or probiotic formulas was sufficient for protection against B-12 deficiency. This does not seem to be the case. In macrobiotics, who primarily cook their food, we see a very high percentage of children actually having growth retardation due to low B-12 intake. Many of us have felt that spirulina, Klamath Lake Algae, all the sea vegetables had enough active B-12 to avoid a B-12 deficiency. Although the research is not fully in, we do know that, as I pointed out in Conscious Eating, these substances do have human active B-12. The problem is they also have a significant amount of analog B-12 that competes with the human active B-12. This analog amount was not measured in my studies. Using the methyl malonic acid reduction approach, which is now the gold standard, research showed that when people used dry and raw nori from Japan, the dried nori actually made the methyl malonic acid (MMA) status worse, which means it actually reduced the B-12 status. Therefore it could possibly worsen a B-12 deficiency. Raw nori seemed to keep the methyl malonic acid at the same level, meaning it did not harm the B-12 status, but the research showed it did not particularly help it either. No food in Europe or the U.S. has been tested for lowering methyl malonic acid. Research absolutely has to be done to answer this question fully.

There is one exception to this lack of vegetarian B-12 active food, which is that we do produce B-12 from bacteria in our large intestine, but since this B-12 is produced in the area below where B-12 is reabsorbed, it is really not available for absorption. Some people have argued that a lot of species of lower mammals do not need B-12. The reason why this is true is that a lot of species that are primarily vegetarian animals eat their feces. Human research also has shown if you eat your feces, you will get enough B-12. Dr. Herbert sponsored research in England where vegan volunteers with a documented B-12 deficiency were fed B-12 extractions made from their own feces. It cured their B-12 deficiency. So, there is a natural vegan way to do it. It may not be the most tasteful way, however.

Some have theorized that organic foods, in various regions, would improve the B-12 tests by lowering the serum malonic acid, but again, the research has not shown that washed or unwashed organic food has made a difference. Many animals, aside from eating their own feces, will ingest a variety of eggs, insects, small vertebrates or soils. For example, gorillas, who are the closest to vegan of all the species, will eat insects and sometimes their feces. So there are ways to do this for vegans, but again, they may not be the most aesthetic or tasteful. I would love, at this point, to come up with an alternative to this, however it doesn't seem to be the case.

There are many ideas of vegan foods that have active B-12, but few are proving to actually raise

B-12 or prevent its loss. The research has shown, for example, that tempeh does not supply human active B-12. Research in both the U.S. and the Netherlands has confirmed this. There was one paper that showed that tempeh from one particular source in Thailand did have some B-12, but what they basically found was that fermented soybean did not contain B-12. Other foods such as barley, malted syrup, sourdough bread, parsley, shitake mushrooms, tofu, and soybean paste, had some B-12 in them. Amazake rice, barley miso, miso, natto, rice miso, shoyu, tamari, umeboshi, and a variety of nuts, seeds and grains did not contain any elements or even any detectable B-12 analog. My study using the earlier gold standard test for B-12 active bacteria did show indeed that arame, dulse, kelp, kombu and wakame had significant human active B-12. Other studies have shown that dulse did have a certain amount of B-12 analog per serving. Until research is done to see if it actually lowers the methyl malonic acid levels, the question has to be raised that we can't assume that because a food has human active B-12 it will help avoid a B-12 deficiency, because the actual non-human active analogs may be blocking the human active B-12. The same question arises now with the aphanizomenon flos-aqua and spirulina, as well as chlorella. So, until we actually do the gold standard test of these, through the methyl malonic test, to see if it actually lowers the methyl malonic acid, I think it is reasonable to eat these foods, but not expect that they are actually going to raise your human active B-12. My serum B-12 of 600 pg. may have thrown off my conclusions when I wrote my summary in 1990. I may have been in that 20% of vegans and live food people that don't seem to be affected. But I am more concerned about the other 80% that are B-12 deficient and that 50% whose B-12 levels go down to less than 100 pg. A study done in 1991 by Miller found that serum B-12 appeared to be unrelated to consumption of wakame, kombu, and other sea vegetables or tempeh in macrobiotic children. Other researchers feel that it is possible that raw nori, not dried nori, is a source of active B-12. Some of these conclusions are not finalized. This brings me to the next issue, which is, what is a normal level of B-12?

Now the next question really is, what is a healthy level of B-12 in the serum? The answer is that a serum level of 450 pg. keeps the homocysteine level within normal levels. Some might just say that dulse and raw nori and an algae called coccolithophorid algae, also known as pleurochritias cartera, may provide sufficient human active B-12. They have not been fully tested with the gold standard. The normal serum homocysteine level is 2.2 – 13.2 micromoles/liter. The normal adult urine MMA is .58 – 3.56 micromoles/mmol/cr. The normal level of B-12 for breast milk is 180 – 300 pg. per ml. The normal urine level for children is 820 – 11,200 micromoles/mmol/cr of MMA. The normal serum B-12 level of children is 160 – 1300 pg. per ml.

Using the methyl malonic acid study as the gold standard, elevated methyl malonic acid was found in subjects with a B-12 up to 486 pg. This is a really important statement, because up 'til this time most of the studies in the world health basically say that 200 pg and above is not

at this time, most of the studies in the world health basically say that 200 pg. and above is not considered deficient. That was somewhat how I based my ideas that B-12 in many vegans and raw foodists was low normal, but still within normal. Using the gold standard methyl malonic acid test, studies show that without supplementing with B-12, vegans have higher homocysteine levels than lacto-ovo vegetarians and non-vegetarians, which means they are deficient in B-12. The good news, of course, is that B-12 supplementation will decrease these high homocysteine levels back to normal range. High homocysteine levels are connected with the potential for heart disease, arterial destruction and neurological pathologies. Other diseases associated with an elevated homocysteine are: Alzheimer's, age related hearing loss, neural tube defects, recurrent loss of pregnancy, increased mortality. Many non-vegetarians also have a poor B-12 status because there are many factors that can cause B-12 deficiency. They include malabsorption or inadequate intake of protein or calories or B-12, radiation exposure, drugs, and a variety of toxins, paraminosalicylic acid, alcohol, pancreatic tumors, failure of the small intestine to contract and move food associated with bacterial overgrowth, oral contraceptives, fungal infections, liver and kidney disease, tobacco smoking and B-6 or iron deficiency.

The research conclusion is that: it is a reasonably safe bet that about 80% of the vegan and live food population, over time, runs the risk of a subclinical or clinical B-12 deficiency and increased homocysteine levels.

An even higher percentage of newborns run this risk. My suggestion, out of my concern for all of my clients, for my fellow live fooders and vegans is that it is well advised to supplement with an actual B-12 human active supplement. There are vegan B-12 supplements, which allow us to be totally successful vegan live fooders.

My general recommendation is that if you have symptoms of B-12 deficiency, you can even start with a 100 pg. injection, or according to the research, an oral administration of 1,000 pg. per day for two to four weeks is equal to repeated monthly injections. After about a month of the oral, the dose can be cut in half. One can even cut that in half again. I don't really recommend nutritional red star yeast, because of the fungal potential; I think that the safest and healthiest approach is via supplementation.

Some people eat according to their philosophy and belief of what is natural, and this may be an impediment. For example, the black Hebrews, a group of African-Americans who have migrated to Israel, have horrendously high levels of infant B-12 deficiency, as well as adult B-12 deficiency. They did not believe in taking supplements. Data in a 1982 study showed that of the

generosity. They did not believe in taking supplements. Data in a 1982 study showed that of the infants who were breastfed for three months, and then were given diluted homemade soymilk for three months to one year, 25 of them (a significant percentage) had protein deficiency, iron and B-12 anemia, as well as zinc deficiency. In the 1982 study, three of the infants were dead on arrival, five more died within a few hours of hospital admission, despite treatment. Serum levels were low in 9 of 15 cases and undetectable in three of them. I don't feel this is a very good example of what we want to show to the world in the way we want to treat our children. We can make those choices. We have a theory of natural, and we also have a theory of what it means to be healthy.

This is the first time in history that we can be completely successful live food vegans. What I mean by being successful is completely healthy, including no B-12 deficiency and no elevated homocysteine levels. It is my medical opinion, as a vegan since 1973 and live fooder since 1983, and as a person committed to supporting all those who choose to become healthy live food vegans, that it would be wise to incorporate some B-12 supplementation in your diet. I believe it is more natural to be healthy than it is to be anything less than that.

B12 ... in response to letters about the above article

I was pleased by the general positive response to the B12 article. It was nice that so many people understood the integrity of my intent, which is to create the understanding and support for everyone to be successful on a live food diet. The ethics of live food lifestyle are wonderful, but we need to remember that we are still in the first few generations of a worldwide live food movement. We need to give honest feedback so we can attain the highest level of health and make this a truly successful worldwide movement.

Contrary to what a few people wanted to interpret from my article, there was more than one study that showed live food people were B12 deficient. There were at least three studies on adults and two on children. All five of these published live food studies showed the participants had serious deficiencies. These are no studies that show live food vegans do not get B12 deficient overtime. There are at least fifteen vegan studies on adults that have shown identical results. Cooked food and live food vegans show the same results...approximately 80% of those who do not use B12 supplements or B12 fortified foods sooner or later develop symptoms of B12 deficiency. These may include physical symptoms such as the inability to walk, tremors, weakness, fatigue, diarrhea, fever, upper respiratory infections, impotence, infertility, anemia as well as neurological symptoms such as depression, anxiety, panic attacks, hyperactive reflexes

well as neurological symptoms such as depression, anxiety, panic attacks, hyperactive reflexes, numbness and tingling in the hands and feet, impaired memory, and paranoid delusions. These appear in children as well, but in children if they are not caught in time, they often result in death. Sickness and death due to B12 deficiency do not support the expansion of the vegan live food movement. These symptoms are not just “a misunderstood healing crises or poorly functioning colon or a poor live food diet.”

Although bacteria in the colon do produce B12, it is not reabsorbed into the system. Published research has shown that if people eat an extract of their feces they will not get a B12 deficiency. Although this may be considered natural, it is not something that I recommend. There are far easier and tasteful ways to build the B12 such as taking a supplement or eating B12 fortified foods. Whether one’s colon is clean or not, B12 does not get absorbed from the colon. A reasonable dose is 10-100 micrograms per day. Research shows that a daily intake best approximates the natural intake pattern. Vegan tablets are available from a variety of companies; Twin Labs has gelatin in its tablet and therefore is not vegan. There are three forms of B12: cyanocobalamin, methylcobalamin, and hydroxycobalamin. Although all three forms work, but cyanocobalamin probably should not be used in people with kidney problems or who smoke. In some studies with people with severe B12 deficiencies oral doses of 1000 micrograms per day for two months worked as well as 1000 microgram injections repeatedly given.

A published report cites a man in his eighties who had been in excellent health as a vegan for 38 years, when suddenly he began to suffer from mental disturbances, developed confusion and sadness, lost bowel control, and lost motor control skill to the point where he could marginally stand up. After one shot of B12 his physical and mental health began to rapidly return and by one week many of his symptoms had disappeared. A personal communication with Nazariah Owen who developed weakness, fatigue and impaired motor and nervous system symptoms including the loss of the ability to walk following a seven year history of lacto-vegetarian diet followed by a five year history of a pure raw vegan diet tells of a too common story. His symptoms disappeared after starting B12 supplementation and eating B12 fortified foods. He found many people who had similar B12 deficiency symptoms, but who were afraid to share publicly. An additional health problem associated with a low B12 is elevated homocysteine which is associated with an increased incidence of heart attacks, neurological problems, neural tube defects in children especially if the folic acid is low, increased incidence of hearing loss with age. In one study women with higher homocysteine levels had 170% chance of two or more pregnancy losses in the first trimester.

If the live food movement is to mature, it requires that we do not suppress honest feedback so we can solve the problems that do arise in this young mass movement. Yes...there are 20% who may not get an immediate or even a deficiency after 20 years. There are one million four hundred thousand genetic variations in our DNA. Some people are going to get B12 deficient sooner than

others or not at all because of their particular enzyme systems and metabolic patterns. For some it may be like the man in his eighties who took thirty-eight years before becoming deficient.

For those who do not want to risk the eighty percent chance of becoming deficient, oral supplementation is the simplest way to avoid a B12 deficiency and elevated homocysteine levels. The personal physical, moral and spiritual reasons for succeeding at live food vegan diet, the shift in world consciousness and healing of the planetary ecology brings is a far greater gift than the ego gratification of holding on to a concept of naturalness.