

Rebuild from Depression

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Chapter 8: The Usual Suspects, Your Starting Place

There are a lot of opinions on which nutrients are most important in the depression fight. The reason opinions vary so much is because, at the end of the day, the most important nutrient for you in your depression is the one you are deficient in. So we all need to be mindful of our own circumstances and develop our own plan. However, the medical literature does provide us with a very good place to start.

If you are depressed, you will very likely benefit from additional Omega-3 fatty acids, folate, and vitamin B-12 in your diet. Here is your cheat sheet:

Cheat Sheet

- **Add Omega-3 fatty acids to your diet today.**

Clinical trials for depression use very large doses of Omega-3 fatty acids. Andrew Stoll in *The Omega Connection* recommends 4 grams a day of EPA. Most people get added Omega-3 fatty acids by taking a fish oil supplement.

- **Add B vitamins to your diet today.**

The research on the link between folic acid and depression and B-12 and depression is impressive. In clinical trials, depression improves when these nutrients are added to the diet. There is some evidence as well for the importance of vitamin B-6 and historically clinicians have used niacin (vitamin B-3). Add a good B-vitamin supplement to your diet. My picks described in the Appendix are brewer's yeast and freeze-dried liver.

Read on for more detail.

Omega 3 fatty acids

It is becoming increasingly accepted that correcting deficiencies in Omega-3 fatty acids is therapeutic for depression. Omega-3 supplements line the shelves and refrigerators of health food stores. Short articles about Omega-3s cover the Internet. Often the information we receive is simply “increase your Omega-3s.” I was told to consume one tablespoon of cod liver oil a day for the depression and was directed to a national brand carried at Whole Foods and many other health food stores. Nearly every day for three years I took a tablespoon of that particular cod liver oil. Some days I took two tablespoons.

The problem with this approach is that not all tablespoons are created equal. It was not until I read the work of Andrew L. Stoll, *The Omega-3 Connection: The Groundbreaking Omega-3 Antidepressant Diet and Brain Program*, that I realized how deficient were both my pregnancy diet and my postnatal cod liver oil supplementation, given my struggle with depression.

Stoll discusses the limitations of our modern diet in the context of Omega-3 fatty acids. Whereas our ancestors received much of their Omega-3s from fish and game, our sources of fish and meat tend to have much lower levels of Omega-3 fatty acids. Traditionally wild fish fed on algae, high in Omega-3s, and the fat in their bodies contained high levels of Omega-3s. Wild game, free to graze on their natural diets of grasses and clover, were less fat overall and had much higher levels of Omega-3s. When our ancestors fished or hunted and consumed these animals, they consumed much higher levels of Omega-3s, levels at a 1:1 ratio with their cousins the Omega-6 fatty acids.

Farm-raised fish and cattle yard beef do not have their traditional sources of Omega-3s in their diets. As we eat these food sources, our diets are also deficient. Stoll reports that the Omega-6 to Omega-3 ratio in the modern diet is approximately 20 to 1 compared to about 1 to 1 in the Paleolithic diet of many generations past.

Stoll makes a compelling argument for high doses of Omega-3 fatty acids as therapeutic for depression, particularly eicosapentaenoic acid (EPA), one type of Omega-3 fatty acid. He makes the point that researchers are not clear on why Omega-3s fight depression, but they are important in so many biological processes such as cell-building and brain function that there may be many reasons a deficient diet impacts our moods.

The Omega-3-depression link

Research on Omega-3 fatty acids and depression has found:

- People with depression tend to have low levels of Omega-3s in their blood or a high Omega-6 to Omega-3 ratio (Tiemeier et al. 2003).
- In controlled clinical trials, **dosages of about 10 grams a day of EPA** have been shown to be effective in treating depression (Su et al. 2003, Stoll et al. 1999). However, one study found that only 1 gram/day was effective in patients who were taking antidepressant medication but were still depressed (Peet et al. 2002).
- **Controlled trials combine antidepressant medication with Omega-3 fatty acids** for improved results (Su et al., 2003 Nemets et al. 2002; Peet et al. 2002).
- Patients tend to see **positive results in 2-8 weeks** (Su et al. 2003).
- Postpartum depression clinical trials are in their infancy. The findings have been inconclusive but they have had problematic study designs. A 2004 study examined 7 pregnant women with a history of depression and had inconclusive results with supplementation of 3 grams of DHA+EPA (Marangell et al., 2004). A 2003 study selected pregnant women, did not consider their depression history, and supplemented with a very small dosage of DHA – 200 mg/day or a placebo (Llorente et al., 2003).

Added Stress of Pregnancy and Breastfeeding

Clinical trials on postpartum moms are in their infancy but we have strong theoretical reason to believe that Omega-3 fatty acids are critical to our mental health. First, the clinical trials on major depression, not postpartum depression, give us good reason to believe that Omega-3 fatty acids help with depression. Second, at no time in life may Omega-3 fatty acids be as important as they are in pregnancy and breastfeeding.

As the baby develops in utero, baby needs DHA for brain development. Mother's milk contains high levels of DHA to meet the baby's early needs for DHA in infancy. Baby is first in line for this nutrient and so takes from mom's blood levels any amount of DHA and EPA that baby needs. If mom's diet is deficient and her blood levels are low, baby might take fatty acids from the Omega-3 stores in mom's tissues. In this way, baby can literally deplete an already fairly depleted mom of her Omega-3 stores.

And if mom got through pregnancy, she still has to get through breastfeeding. Breast milk is a high-fat food. Infants need DHA and EPA and will draw from mom's blood levels and tissues as necessary. Pregnancy and breastfeeding can sap all of your reserves if your diet is not rich in Omega-3 fatty acids. These deficiencies can lead to depression.

A key dietary source of Omega-3 fatty acids is fish. In his 2001 article, Hibbeln examines the relationship between postpartum depression and fish consumption at the national level. In 23 countries he estimates levels of postpartum depression from the research other scholars have done in each of those countries. He compares these estimated levels of postpartum depression to the levels of fish consumed (measured by national catches plus imports minus exports) and shows a compelling relationship between the two. Low levels of fish consumption are associated with higher levels of postpartum depression. Fish consumption may be the first line of attack against postpartum depression.

Very, very common deficiency

When it comes to Omega-3 fatty acids, the question is who are the few people around you who are actually getting enough. Our need for EPA and DHA is so great in pregnancy and during breastfeeding, but most of us simply do not consume enough.

A Canadian study followed the diet of 20 pregnant women, women blind to the topic of study. It collected food samples and had them lab-analyzed and it took blood samples to test for fatty acid levels. Of those 20 women, 18 of them (90%) consumed less than the 300 mg per day of DHA as recommended by the International Society for the Study of Fatty Acids and Lipids Working Group. Keep in mind that the 300 mg per day is low if you are battling depression.

How to test

You can have blood drawn to test the level of various fatty acids in your blood. A national lab called Metametrix will provide you with a long list of fats found in your blood or in your red blood cells. If you need a wake-up call on your diet, these are good tests. It will convince you that you are digesting those diner French fries just fine and the trans fats are making it into your blood. You will also probably note very low levels of EPA and DHA. You can also take a hard look at your diet and add an Omega 3 supplement to fill in the gap.

Are you a quart low?

As I have added cod liver oil to my diet, my chronic chapped lips and dry skin have disappeared. In the winter of 2006 as I write this book I managed my dry skin with a weekly or bi-weekly application of olive oil on my legs and arms and I use a lip balm on occasion. In the past, I used lotion on my arms and legs multiple times each day and they were still dry. I carried lip balm with me all the time so that my overly-chapped lips would not hurt as much. I've come a long way.

It's the dietary fats. Our body uses the fats to build our skin cells, just as it uses them to build cells throughout our body. My skin is not only hydrated, but it is softer and smoother than I ever

remember it. If your skin is dry and cracking, oil on the inside is far more effective than oil on the outside. Beneficial oil in your diet gives your body the tools to make soft, smooth skin. Add cod liver oil to your diet today and you may find that not only is your depression alleviated, but your skin feels better than ever.

Toxicities of Omega-3s are unlikely. For most of us it will verge on the impossible to get our diets anywhere near the ideal ratio of 1 to 1 of Omega-6 to Omega-3. In the case of pyroluria (see inset article in the B-6 section below), Omega-3s may aggravate depression. In general, consult with your doctor on your specific dosage and work to add Omega-3 foods to your diet and to reduce unhealthy fats, particularly partially hydrogenated oils (trans fats).

If you are a quart low, add Omega-3s to your diet to avoid some problems that may be heading your way:

- Alzheimer's (Alessandri et al. 2004)
- Cardiovascular disease (Breslow 2006)
- Rheumatoid arthritis (Simopoulos 2002)
- Multiple sclerosis (Simopoulos 2002)
- Diabetes (Ebbesson et al. 2005)

Omega-3s for vegetarians

EPA and DHA are found only in animal products but are critical in the fight against postpartum depression. In *The Omega Connection*, Stoll recommends flaxseed oil for those allergic to fish or those on a vegetarian diet. Flaxseed oil contains alpha linolenic acid (ALA), which the body can convert to EPA. It is not known the degree to which the human body can adequately convert ALA to EPA but there is some evidence that it can (Harper et al. 2006).

However, **pregnant and breastfeeding moms** should seek out sources of DHA, not just ALA. DHA is necessary for baby's brain development and baby acquires it from mom in the 3rd trimester and during breastfeeding. Studies of lactating women have found that the ALA in flaxseed oil *does not* convert to DHA (Francois et al. 2003; de Groot et al. 2004). The best sources of DHA that fit the vegetarian lifestyle are non-fertile eggs from free-range hens. Eggs from caged hens fed no flax seed or fish-related feed are insignificant sources of DHA. Algae sources of DHA are also available online for those who consume no animal products.

Dietary sources

In the food chapters of this book you will find many sources of Omega-3 fatty acids. The stand-outs are wild-caught fatty fish, cod liver oil, fish oil, egg yolks of free-range or flax-fed hens, wild game, and beef on grass diets. Stoll recommends flaxseed oil for alpha linolenic acid (ALA), which the body can convert to EPA to some degree.

But there is a flip side to the coin here: while you are increasing your intake of Omega-3 fatty acids, reduce your intake of Omega-6 fatty acids as well to reduce your Omega-6 to Omega-3 fatty acid ratio. I discuss this balance between Omega-6 and Omega-3 fatty acids in the food chapters that follow.

The B vitamin family

At an appointment with our chiropractor some years ago, he told me that the color of my lips betrayed my poor B-vitamin status.

“Look at your lips! They have no color!” He said.

“That’s right, my lip color is right there!” I said pointing to my son Frederick.

Frederick has beautiful red lips. I am pleased that I had enough B-vitamins to give him a decent B-vitamin storage, even though I didn’t have enough for the both of us.

I’ve looked for research on our chiropractor’s claim but have found none yet. However I notice the other children at preschool. Their lips do tend to be darker than their moms’ lips. Babies in utero receive our nutrients preferentially. That is, they are first in line for whatever nutrients our bodies are absorbing from our food. If our own diets are inadequate, our lips may become increasingly pale as we give our stores to our children.

In that case, our own bodies struggle with an ever-diminishing supply of B-vitamins and one typical response of our bodies is depression. The whole B-vitamin family is implicated in depression, but the most thoroughly researched B-vitamins are B-12 and folic acid. However, vitamins B-6 and B-3 (niacin) are commonly used by practitioners who are treating depression with nutrients.

Vitamin B-12

This book has been an emotional book to research and write because I come across data constantly on babies deprived of nutrition in utero. I do much of my reading at a state college on the central coast of California, California Polytechnic State University, a college with the typical young student population, years away from starting their own families. They would not

understand why tears stream down my face when I read about our children inheriting vitamin B-12 stores from us in the last two months of our pregnancy, for better or for worse.

Many babies these days are born too early and would certainly have benefited from a longer time in the natural incubator, including my technically full-term son who was born small, pulled out of me from a breech position with his hands covering his ears (“no, don’t tell me it’s time to come out!”), with a poor suck reflex, one of the last reflexes to be developed in utero.

In those last two months of gestation we begin to give B-12 to our children. If they make an early arrival, they likely have not received their full inheritance. And in a sick twist of fate, they are actually more likely to make an early arrival if we are deficient in B-12 (Vollset et al. 2000). And as we breastfeed them, the levels in the milk we make relate to the levels in our blood. If our blood levels are low, so too are the levels in our breast milk (Chanarin 1999, p 1428).

The rich get richer and the poor get poorer.

We have at least three generations of nutritional poverty in my family. I mention my own maternal grandmother throughout this book and I have suggested that my mother inherited postpartum depression from her. It is an easy argument to make, really: Grandmother bequeathed her vitamin and mineral stores to my mother who bequeathed an ever-dwindling supply to me. My grandmother did not even have the courtesy to pass on her movie star good looks as part of the package. But her body had no choice but to pass on a poor supply of B-vitamins.

B-12 and depression

It is not surprising, then, that depression tends to run in families given the critical role of B-vitamins in the depression fight. Researchers have found that those of us who tend to be depressed also tend to be:

- Low in B-12 (Penninx et al. 2000)
- High in homocysteine (a marker of a B-12 or folic acid deficiency or both) (Coppen and Bolander-Gouaille 2005)

Researchers suggest that B-12 and folic acid are crucial because of their role in creating S-adenosylmethionine (SAME) in the body (Coppen and Bolander-Gouaille 2005). SAME is made from the amino acid methionine, but B-12 and folic acid are crucial in the process. SAME has become a popular treatment for depression.

Deficiency signs

A B-12 deficiency can result from a diet low in B-12 or from malabsorption problems which keep your body from recycling its own B-12. Strict vegetarians who eat no animal products are at most risk for a B-12 deficiency since B-12 is found only in animal products.

You can walk for a long time on this earth with a deficiency in vitamin B-12 and not realize it. There are no specific clinical signs in the intermediate stages. Your best bet is to shore up your diet or to supplement with an animal-based B-12 supplement if you do not want to consume animal-based foods (see my argument in “Dietary Sources” below).

Your doctor can test your blood levels of B-12. The normal range for a plasma cobalamin test is greater than 200 pg/ml. However, the range is controversial and your doctor may direct you to supplement your B-12 if you are under 500. Many doctors prefer to test first your plasma homocysteine level, an indirect measure of low B-12, folate, or B-6. If your plasma homocysteine is low, then you can work with your doctor to determine if you are deficient in B-12, folate, B-6, or some combination of the three.

Do take the time to investigate which of these B-vitamins may be your biggest culprits. A problem with the “more is better” approach or a wild shot gun approach to supplementation is that if

you are deficient in B-12, supplemental folic acid will block your absorption of B-12.

B-12, folic acid, and antidepressants: supplementing improves the effectiveness of medication

Researchers are finding that patients deficient in B-12 and/or folic acid have improved treatment on their antidepressant medication if they are also supplementing this deficiency. Coppen and Bolander-Gouaille (2005) review the studies on depression and vitamin B-12 and folic acid and find that low levels of each are related to a poor response to antidepressants. Supplementing folate or B-12 in the diet helped patients respond better to their medication. Fava et al. (1997) found that patients with folic acid deficiencies were less likely to respond to fluoxetine (Prozac) in a double-blind placebo study. In their 1990 study published in *The Lancet*, Godfrey and colleagues found that 33% of the patients in their study were deficient in folate. Fifteen mg/day of methylfolate improved their clinical outcomes in a double-blind placebo study. Procter (1991) also found that in patients with low folate, medication therapy was more effective with the supplementation of folic acid.

Dietary sources of B-12

At the lowest end of the food chain, B-12 is produced in algae and eaten by small fish who are nourished by the B-12. Larger fish eat those fish and take in the B-12. Bears and seals eat those larger B-12-filled fish. Traditionally, humans hunted those bears and seals and thereby met our B-12 requirements.

With the exception of the algae, there are no vegetable foods that contain B-12, making B-12 problematic for the vegan diet. Furthermore, there is evidence that the algae form of vitamin B-12 is a B-12 analog, an inactive form for humans (Herbert 1988). Highly committed vegans will disagree because there is some

evidence that some of the B-12 in algae is active and that it is theoretically possible to get your B-12 from this plant source (Takenaka et al. 2001). Further, there are stories of vegans who have lived long lives without supplementing their B-12. Indeed, research shows that people can live 20-30 years without B-12 in their diet if their bodies have no absorption problems (Herbert 1987) and perhaps longer if they had excellent liver stores. And as those years pass, their liver stores dwindle.

If you are a woman and still having children, keep in mind that your extra B-12 is stored in your liver and you will bequeath those liver stores to your children. If your liver stores are good, the liver stores of your children are also likely to be good and, particularly if you have boys, those boys might be able to live a long, vegan life without B-12 supplementation. But as you continue to have babies and if you are B-12 deficient, your subsequent children will inherit an ever-depleted B-12 store from you. You will also face increased health consequences. I do not recommend algae forms of B-12 as a sole source of B-12 because there is too much evidence that much of the B-12 in algae is inactive. I appreciate the vegetarian ethic, but I hope that vegans can make one exception by including an animal-based B-12 in the diet, particularly if they are in their childbearing years.

As a side note, if most of your B-12 comes from algae sources and you get your blood tested for cobalamin (B-12), it will measure the active and inactive forms floating around inside you. It will give you a false sense of security. A plasma homocysteine test will be a better measure for you because it will give you a sense of the functional amount of B-12 in your body. If your levels are at all elevated (above 8), find an animal-based supplement.

Food Sources of B-12

- **Liver** is your best bet for those willing to eat anything to increase their levels of B-12. I provide recipes in the meat chapter.
- **Clams** and **oysters** are at the top of the USDA's list of B-12 rich foods as well.

Vitamin C, Folate, and Iron

Vitamin C is important for the depression fight in part because our body needs it to use our folate. It also helps us absorb the iron in our food. It is a nutrient most sensitive to heat loss and storage. An orange, for instance, filled with vitamin C, will lose some of that vitamin C as it sits, will lose it more quickly once it is juiced, and it will all but disappear if it is cooked. Find fresh food high in vitamin C and eat it raw or preserve it with traditional fermentation techniques to maintain its vitamin C content.

Sore and bleeding gums are an early sign of low vitamin C. As scurvy develops, the gums may ulcerate and your teeth may fall out.

Folate

Folate deficiency is so common that folic acid is now added to grain-based processed foods in the United States. Most of us do not get enough folate from our foods and many of us do not even get enough folic acid from our enriched grain products, as we saw in the previous chapter. Low folate intake can lead to a folate deficiency.

Deficiency signs

A sore red tongue and slow growth are signs of low folate. A plasma homocysteine test may be the most efficient first test to request from your doctor. A high homocysteine level (above 8) would suggest a possible deficiency in folate, B-12, or B-6. A serum folate test would then be your next step. Low folate can also result in anemia. Do not rule out low folate as one possible cause of low hemoglobin.

Folate and Depression

The evidence for the folate-depression link is mounting. If you are low in folate, you are likely to be depressed (Fava et al 1997; Bottinglieri 1990). If you are high in homocysteine (a marker of a folic acid deficiency) (Coppen and Bolander-Gouaille 2005). In clinical trials where patients were given vitamins to treat their depression, researchers found that:

- Depressed patients improved with folic acid (Coppen and Bailey 2000)

- Folic-acid deficient patients improved if they supplemented with folic acid (Godfrey et al. 1990)

Dietary Sources

A key reason most of us do not consume enough folate in our diet is because we do not eat enough fruit and vegetables, we do not eat them fresh enough, and we tend to cook them. Besides liver and kidney, the organ meats from animals, folate is found most commonly in dark leafy greens. But if those greens sit for a couple of days at room temperature, they may lose 50% or more of their folate. When we cook them, they could lose an additional 50% and upwards of 100% of their folate. You need to make a concerted effort to add folate to your diet by adding some of these foods:

- Liver and kidney are rich in folate. You will find recipes in the beef section and on my website.
- Green leafy vegetables are a good source. Eat them fresh and raw.
- As I describe in the next chapter, fermentation techniques will increase the amount of folate in your foods.

Folate supplements and nutrient interactions

Coppen and Bolander-Gouaille (2005) recommend dietary supplementation of 800 mg/day of folic acid. However, doses of 350 mg or more of supplemental folic acid can reduce your ability to absorb zinc (Herbert 1987). If you face a major zinc deficiency, you might want to increase your dietary folate, not supplemental vitamin folic acid, while you rebuild your body's zinc.

Vitamins, minerals, and probiotics

Probiotics are a food supplement that contain beneficial bacteria and yeast to help re-establish a good balance of bacteria and yeast in your intestinal tract. Antibiotic use and consumption of refined foods can throw off the natural balance of beneficial microbes in your intestines. A telltale sign in women of an imbalance is a vaginal yeast infection. Thrush during breastfeeding is another.

Re-establishing a good balance is critical in the depression fight. First, overgrowth of bad bacteria will impede your digestion of B-vitamins. Those bad bacteria have to live on something and your B-vitamins are their food of choice. Second, you will improve your mineral absorption as you increase the beneficial microbes in your intestinal tract (Van Loo et al. 1999).

But you do not have to buy an expensive food supplement to aid your digestion. Nature provides us with probiotics in the form of cultured and fermented food. Natural fermentation of food increases the lactic acid in that food and that lactic acid will help you absorb the nutrients in your food. A study of milk, cultured versus not cultured, found that calcium was absorbed more in the cultured milk (Rasic 1987). Eat yogurt, drink kefir, and ferment your fruits and vegetables. I provide directions in the Appendix.

A note on the B-family, research findings, and high correlations

Vitamins B-6, B-12, and folic acid are commonly cited in depression studies, as is the rest of the B-complex to a lesser degree. In statistical analyses of these vitamin levels and levels of depression, some researchers find that B-6 matters (Hvas et al. 2004), some find that folic acid matters (Fava et al. 1997; Bottinglieri 1990), and some find that B-12 matters (Pennix et al. 2000). Some find that B-12 and folic acid matter (Coppen and Bolander-Gouaille 2005). The findings, in general, are mixed.

Do not let these mixed findings get in the way of fixing any nutrient deficiencies you may have. Deficiencies in these vitamins are fairly highly correlated in nature which means that if you have one of the deficiencies, you are likely to have others. The potential high correlation among the data in these studies causes an analytical problem for researchers. The correlation increases the amount of error in the statistical models and that error might artificially suppress some of the findings.

In depression studies, then, some vitamins might appear to be unrelated to depression when, in fact, if God could whisper the true relationship into our ears, we might hear that each of these vitamins is very important for depression.

But what we do know is that all of these vitamins are important for our body functions. If you are deficient in these vitamins, improving your vitamin status will improve your health, with or without divine inspiration on the precise relationship between them and your depression.

B-6 is necessary for your body to convert amino acids into key neurotransmitters and yet the medical literature on the B-6-depression link is mixed:

- B-6 supplements will improve your depression (Adams 1974; Bell 1992; Doll 1989)

- If you are deficient in B-6, you are also likely to be depressed (Hvas et al. 2004).
- B-6 supplements won't improve your depression (Lerner et al. 2002)

But don't let mixed findings in the medical literature discourage you. The peculiar point about the B-6 clinical trials is that researchers do not tend to select participants who are low in B-6. They simply select anyone who is depressed. If you are not low in B-6, a B-6 supplement is more likely to give you diarrhea than to help you feel better. (Don't ask me how I know what high doses of B-6 can do. And don't take high doses just before stepping onto an airplane. In fact, don't take high doses without consulting with your doctor.)

You are already adding the whole B-vitamin family to your diet but you may find reason to focus more on vitamin B-6. The key question is whether *you* need more.

- You can have your blood tested. The most common test used is the blood plasma test for pyridoxal 5'-phosphate (P5P).
- You can look at your body. One important bit of wisdom for identifying B-6 deficiencies comes out of the Brain Bio Center from the work of Carl Pfeiffer and his colleagues, who worked for years on the link between nutrients and depression. In 1973 **Pfeiffer and his colleagues discovered that people deficient in B-6 were unable to recall their dreams.** Pfeiffer argues that it is normal for people to be able to recall their last dream each night. He supplemented patients with B-6 until they began to do so.
- You can examine your diet. Keep a food journal for about a week and come to my website to use some of the nutrient tools to examine your B-6 intake.

Pyroluria

If you find that you exhibit signs of deficiencies in B-6 and zinc, consider getting a urine test for pyroluria. People with pyroluria produce too many pyrroles. Pyrroles bind to B-6 and zinc and then, together, they are excreted out in the urine. People with pyroluria are treated with higher levels of B-6 and zinc than are those without the condition because they simply have a much higher need for these nutrients. The lab work is about \$50. I provide labs in the Appendix.

A word to the wise

If you are taking large amounts of B-6 or P5P, take it in the morning. For most vitamins, spreading the dosage throughout the day will maximize your body's ability to absorb the vitamin. That is the case here as well, but B-6 will also cause you to urinate more. It could interrupt your sleep if you were taking large doses later in the day. See the Appendix for information on B-6 tests and dosages.

Motivation to fix your B-vitamin status status

A study published in 2000 in the *American Journal of Clinical Nutrition* provides us with some great motivation to fix these deficiencies. Vollset et al. analyze plasma homocysteine levels and find that elevated levels (an indirect measure of deficiencies in B12, B-6, or folic acid) increase the **risk in pregnancy** of:

- Preeclampsia
- Premature birth
- Low birth weight
- Stillbirth
- Neurotube defect
- Club foot

High plasma homocysteine levels are also associated with heart disease and stroke. You need to fix the problem today, particularly if you are a woman who plans to have more children. See the Appendix for more information on lab tests for low B-12 and folate.