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Healthy and Happy Monthly Newsletter

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Vitamin B12 and the Importance of the Methylation Cycle for Maintaining a Healthy Body and Mind

It is no mystery that vitamins and minerals are important in adequate amounts to ensure the proper functioning of a healthy body. Even a slight reduction in one or many of the body's essential nutrients for a short period of time can lead to a number of symptoms. If allowed to develop into a long term deficiency, a mineral or nutrient shortfall can lead to several disease states and degenerative conditions, many of which our society is experiencing in epidemic proportions today.

One of the core constituents for maintaining a healthy body is energy in the form of ATP, adenosine triphosphate. At any given time the body's energy demand can fluctuate depending on the level of stress that is being experienced, or the amount of rapid cell division, growth, that is taking place. If the process by which energy is created becomes less efficient, or if a scarcity in one of the essential components for energy production exists, the entire body will experience a noticeable difference in the way it feels and functions.

Unfortunately, most people do not associate symptoms like increased anxiety, brain fog, low energy and muscle fatigue with a mineral/nutrient deficiency. So, the symptoms continue for an extended period of time and can develop into more serious conditions. Also, the person experiencing the symptoms may decide to accept the way that they feel as normal, never truly realizing the increased quality of life that they could feel if the inadequacy were corrected.

The human body's ability to produce energy and perform its biological processes is dependent on a number of factors, one of which is Vitamin B12. In fact, Vitamin B12 is essential for supporting the maintenance of every single cell in our body and it is crucial for the proper function of the nervous system, DNA synthesis, and the formation of blood. While all of the eight vitamins that make up the B vitamin family are water soluble, Vitamin B12 sets itself apart as the only one that is stored in the liver in a significant quantity, such that it decreases the likelihood of developing a deficiency. Yet by some estimates such a deficiency occurs in approximately 20% of the world's population.

Much like other mineral nutrient deficiencies, diet and lifestyle play a key role in determining whether the body has enough Vitamin B12, and so the necessary amount of dietary intake from food or supplement form can vary from person to person. Would you be interested to know that strict vegetarians, cigarette smokers, alcohol drinkers, women who are pregnant and nursing, people on medications that reduce stomach acid, and the elderly are more likely to develop a Vitamin B12 deficiency? If so, read on as we highlight several of the amazing health benefits of Vitamin B12, and explore the symptoms and effects that a deficiency can have on everything from poor digestion, to cognitive decline, pain, skin conditions, hair loss, and more.

Discussed in previous newsletters, maintaining robust gut health cannot be overstated. In terms of digestion and absorption, the digestive tract starts in the mouth. In fact, the mouth, tongue, throat and esophagus make up approximately 20% of the gastrointestinal tract. Digestion begins with chewing food up and mixing it with saliva, breaking it down into a smaller consistency and making it easier to absorb. From there, food moves down the esophagus into the stomach where proteins, fats, carbohydrates, minerals and nutrients are further micronized with the help of stomach acid. The nutrients then move into the small intestine, the large intestine (colon), the rectum, and finally the anus, where the remaining food waste is excreted.



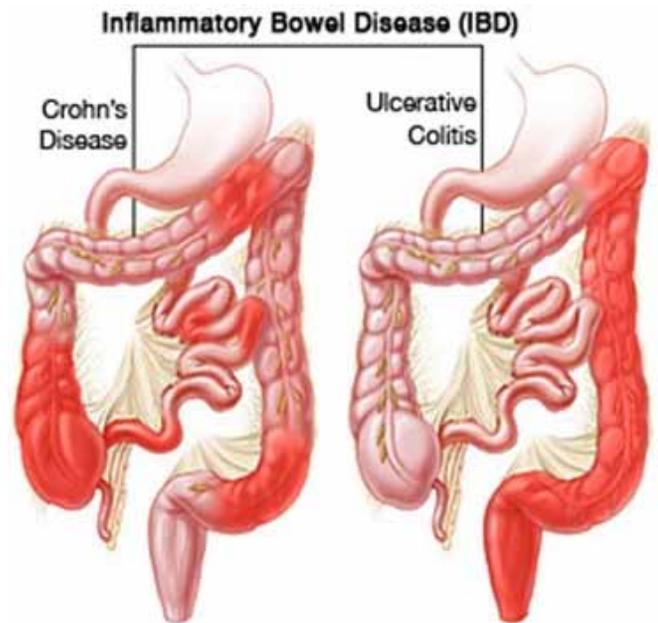
While it is logical to think that a B12 deficiency can develop due to lack of dietary intake, it is more likely that poor absorption in the gastrointestinal tract is to blame. The small intestine is where minerals, vitamins, and most other nutrients are absorbed and carried into the body where they enter the bloodstream. Water soluble vitamins like Vitamin C and B Vitamins leave your body every day, so it is important to replenish them so that your body can maintain an adequate supply.

Vitamin B12 is a large and complex molecule, which makes it difficult to absorb. While the process begins in the mouth through chewing and mixing with saliva, it is important to maintain sufficient hydrochloric acid in the stomach for the acid secreting cells, known as parietal cells, to secrete a chemical substance called intrinsic factor. Simply put, intrinsic factor is necessary for the absorption of Vitamin B12. It binds to the B12 and forms an intrinsic factor/B12 complex that is then absorbed in the small intestine and transferred to the liver, where another protein called transcobalamin transports it throughout the body.

With this process in mind, individuals who are like a human disposal, that inhale their food quickly, or people who are on prescription or over the counter acid reducing medications should consider reevaluating their modus operandi. The stomach fluid and partially digested food should be acidic, with a pH of around 2.0 to kill off any bad bacteria and activate the digestive enzymes that separate vitamins and minerals from their protein carriers. So, if you don't chew your food up into small enough chunks, or if you take an acid reducer and create inadequate levels of stomach acid, there will be a disruption in the absorption of Vitamin B12 and other nutrients as well.

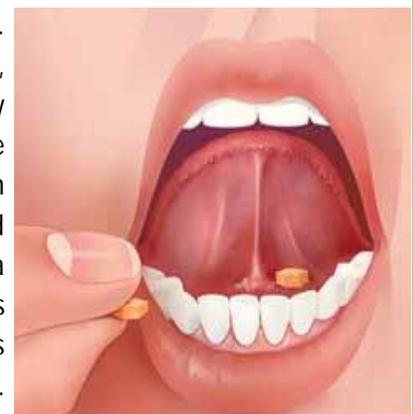
Malabsorption of Vitamin B12 can also take place with people who are suffering from anemia. Anemia is a blood disorder where the concentration of red blood cells or hemoglobin become too low. While there are several different types of anemia, disrupted gut health and inflammation can play a significant role in developing the condition.

Individuals with inflammatory bowel autoimmune disorders like Crohn's disease, celiac disease, and ulcerative colitis, pathogenic bacteria overgrowth, stomach surgery, diabetes, parasites, and more are at greater risk of a Vitamin B12 deficiency. Crohn's is an inflammatory disease of the intestines. Celiac is an inflammatory disease of the intestines that is triggered by the protein gluten, which is found in wheat, barley, oats, and rye. When people with celiac consume these foods, the small finger-like villi in the intestines are damaged and no longer able to move nutrients along into the bloodstream. Ulcerative colitis is similar to Crohn's, an inflammatory disorder of the intestines, in which the lining of the colon becomes inflamed and develops tiny open sores. The difference is that Crohn's can affect any part of the gastrointestinal tract and relates to the structural integrity or thickness of the bowel wall, whereas colitis only involves the colon.



While it is unusual for younger people to develop a Vitamin B12 deficiency, it is more common for individuals fifty years old and older and quite likely for the elderly. There are several reasons for this. First, the older you become, the more time you have spent practicing a lifestyle of unhealthy habits that can disrupt your gut health. Also, our thirst, taste, and hunger sensations become diminished as a natural consequence of aging, and so we are more at risk of becoming dehydrated, and eating sweeter and saltier foods that are unhealthy.

As we age our gastrointestinal motility decreases and so does our production of intrinsic factor. With less intrinsic factor we are less able to efficiently absorb B12 from our diet. Fortunately, the elderly are still able to get routine B12 injections if a deficiency is discovered. Unfortunately the symptoms of a deficiency are relatively subtle, making them harder to identify until the deficiency is at a more advanced stage. Therefore, as a method of prevention, Vitamin B12 can also be absorbed sublingually, or under the tongue, which should be the preferred daily method for the elderly and any individual with disrupted gastrointestinal health. Now that we have a general understanding of how Vitamin B12 is absorbed and what can cause a deficiency, let us more thoroughly explore the signs and symptoms, so that if you, a loved one or friend is experiencing them, the problem can be corrected to minimize any potential long term effects.



The most clinically significant symptoms of a Vitamin B12 deficiency include increased anxiety, depression, fatigue, memory loss and cognitive decline. Other symptoms include acne, arthritic pain, poor balance, burning or tingling of the limbs and extremities, dry skin, eczema, hair loss, brittle or flaking nails, and more. In general, each of these conditions is related to decreased or inefficient energy production, but not all of these symptoms will manifest simultaneously.

The B vitamin family is essential for maintaining emotional and mental fitness. If you suffer from regular panic attacks and cannot keep your thoughts in order, or you are consistently burdened by several forms of stress, you may be suffering from a B vitamin deficiency. More specifically, anxiety and confusion can be the result of a Vitamin B12 deficiency.

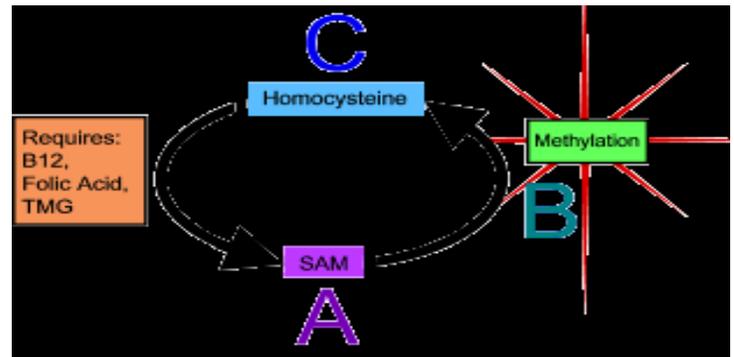
The body's energy demand increases to compensate for the effects of stress. When this happens, it can be characterized as the "fight or flight" response. In order to produce more energy, the body needs Vitamin C, all B vitamins, cholesterol, and glucose. In response to stress many people consume alcohol or caffeinated beverages, smoke cigarettes, and eat foods rich in refined sugars, or all of the above to take the edge off. These activities actually destroy the nutrients that are necessary to produce the energy needed to deal with the stress. As these behaviors are also stressful on the body, allowing yourself to regularly participate in them will only increase your level of emotional and mental instability, which can lead to depression and fatigue.



In order to understand how this takes place, it is important to review the importance of methylation. Methylation is the process whereby the body takes one substance and turns it into another by either donating or accepting a methyl group. A methyl group is made up of one carbon atom with three hydrogen atoms attached to it. Methyl groups turn on and turn off biological processes. They perform such functions as regulation of gene expression, protein function, neurotransmitter production and detoxification. Amazingly, this methylation process takes place millions or even billions of times a second in the body depending on the level of energy that is needed, stress that is being experienced, and degree to which detoxification is taking place.

Methylation occurs when the chemical compound S-adenosine methionine, donates a methyl group and attaches it to the molecule or process that needs to be methylated. While this sounds complicated, and it is, simply put this means that the methyl group is popped off of the S-adenosine methionine molecule and attached to whatever biological component needs it. When this methyl group is donated, the S-adenosine methionine molecule turns into a homocysteine molecule.

The homocysteine molecule is normally recycled back into methionine, where it undergoes another enzymatic process, the SAM cycle, where it is combined with ATP, adenosine triphosphate (energy), to become S-adenosine methionine where it can begin the methylation cycle again. This is where vitamins B12, B6 and folic acid come in to play. These vitamins in addition to betaine HCL (stomach acid), are important donors of methyl groups, and without them there would be no new methyl groups to turn the homocysteine molecule back into S-adenosine methionine again.



So, what are the factors that influence the methylation cycle, and what happens if the required nutrients are not present in adequate amounts to keep the process going? Most commonly routine physical and emotional stress, regularly smoking cigarettes and/or drinking alcohol, coffee, soda, and poor diet and malnutrition will cause you to use up your methyl group donors more quickly. Also, genetic factors, like a mutation of the MTHFR gene will disrupt the methylation process. With less available methyl donors, the homocysteine does not get recycled, and it continues to accumulate in the body.

Interestingly, an elevated level of homocysteine in the blood has been associated with atherosclerosis, hardening and narrowing of the arteries, as well as an increased risk of heart attack, sudden death, Alzheimer's, dementia, and Parkinson's disease. So, is it elevated homocysteine that puts millions of people at increased risk of developing serious life debilitating diseases? Or is it just that homocysteine is a chemical marker for poor methylation. In our humble opinion, the answer to both questions is yes. Either way, elevated homocysteine does not send a good message.

Since a disrupted methylation cycle means that homocysteine does not get converted back into S-adenosine methionine, the body's S-adenosine methionine reserves are soon depleted. Can you see where this downward spiral is leading? Where there is a shortage of S-adenosine methionine, the body's processes of gene expression, protein function, neurotransmitter production and detoxification become disrupted.

In previous newsletters we have explored the concept of epigenetics. Epigenetics is the study of how the external environment and what you do or do not put into your body can affect everything from how your genetic code is expressed to your mood and the diseases that you develop.

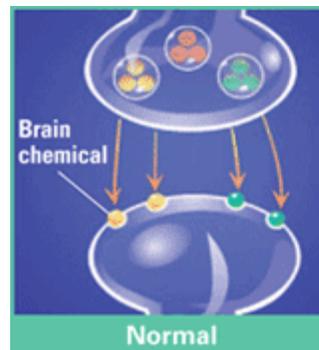
Epigenetically speaking, in terms of gene expression and protein function, poor methylation and the prevalence of homocysteine plays a clinically significant role in all aspects of our existence. Beginning with embryonic development, if the mother and father were regularly participating in the activities mentioned above that detrimentally influence the methylation cycle by depleting the body of the nutrients that are essential for the process to occur, even with a healthy egg and sperm, the manner in which the DNA is expressed can be different than if the parents to be were living a more healthy lifestyle before conception.

For example, there is a genetic condition recognized early on in childhood called homocystinuria. In this rare but serious condition, the child has a genetic deficiency of the essential enzymes that are necessary to recycle homocysteine, disrupting the methylation pathways. Similar to above, this leads to elevated levels of homocysteine and symptoms of developmental delay, an underdeveloped skeletal structure, impaired vision, blood clots, and more. There are also milder, yet life changing conditions associated with elevated homocysteine in adolescence, where the outcome is not as serious as homocystinuria, but the inefficiency with which the individual's methylation cycle functions can lead to developmental abnormalities.

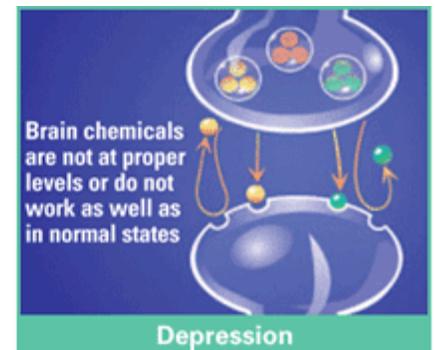
There have been many studies seeking to determine the link between methylation and DNA expression in early development, and it is now accepted across the medical community that the integrity of the methylation cycle can modify or add epigenetic information to the offspring's genome. These alterations can result in neural tube defects, and with further clinical research, may even prove to be responsible for the increased incidence of ADD, ADHD, and Autism that has integrated itself into the fabric of our society over the last several decades.

Just as the methylation cycle plays an important role in DNA expression and protein function, the degree to which the body produces neurotransmitters and detoxifies depends on if the body has adequate amounts of the nutrients necessary to recycle homocysteine back into a methyl donor. If the required nutrients are not there, homocysteine levels increase and SAME levels decrease. This decrease means that in short order, not as many neurotransmitters are produced and the body begins to detoxify less efficiently.

Decreased neurotransmitter production includes Serotonin and Norepinephrine (dopamine), anti-depressant neurotransmitters, GABA, a calming neurotransmitter, and acetylcholine, which regulates memory, cognition, and muscle function. The result is that depression sets in, accompanied by anxiety and an inability to remember or collect one's thoughts or concentrate on any one thing for an extended period of time. This chemical imbalance is often treated with prescription anti-depressants and mood stimulants that help to manage the symptoms, which persist as the root cause is routinely never addressed.



Normally brain chemicals* carry messages from one brain cell to the next.



An imbalance of brain chemicals can change the way brain cells communicate. This can change a person's mood.

So, now that you have a thorough, yet oversimplified, understanding of the importance of the methylation cycle and how important it is for maintaining a normal life, you should be encouraged to know that restoring your methylation cycle can be as simple as providing your body with the nutrients necessary to reduce your homocysteine level. In supplement form, take adequate amounts of all B Vitamins, especially B12, B6, and folic acid (in the form of 5-MTHF if possible), as well as Vitamin C and betaine HCL. This way you will instantly provide your body with a significant amount of methyl donors and the road to better health and healing can begin. Vitamin B12 in the form of methylcobalamin dissolved daily under the tongue is the optimum way to replete your B12 level. Remember that too much of anything can become a bad thing. Eat less processed foods and refined sugar, and more fresh fruits and vegetables. Try to quit smoking for good. While the occasional soda or alcoholic beverage is ok, if you can help it, try not make it a routine part of your daily life. It is all about making good choices.

For more specific questions about how to repair and normalize your methylation cycle, your body and mind, please speak with Patty Frieda, the Pharmacist in Charge and Certified Clinical Nutritionist. **With all of this information in mind, think about this centuries old Hopi Indian proverb: Before you make any decision, consider its effect on the next seven generations.**

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