MTHFR

WHAT IS MTHFR?

MTHFR (Methylenetetrahydrofolate Reductase) is a gene whose function is to produce the MTHFR enzyme. The MTHFR enzyme converts folate (Vitamin B9) into its active form. Because MTHFR is at a key position in the methylation cycle, if it is not working properly, it can affect the entire pathway, creating symptoms and disease.

WHAT DOES IT MEAN TO HAVE A MTHFR MUTATION?

There are two copies of each gene. We receive one copy of a gene from our mother and one copy from our father. In some cases, one or both of those copies may contain an error in the DNA sequence—called a SNP (single nucleotide polymorphism). If a polymorphism (mutation) occurs in just one copy of the gene, then that individual is considered *heterozygous*. If both copies of a gene are mutated, then that individual is *homozygous*. Genotype testing is available which can tell you if you have a mutation in the MTHFR gene and whether this mutation is heterozygous or homozygous.

It is important to note that just because a mutation is present does NOT mean that it is currently being expressed. Genes are affected by outside epigenetic factors (diet, lifestyle, environment). These factors greatly influence whether less desirable genes are turned on or off. Although you can't change a defective gene and having a mutation may pre-dispose you to a higher risk of certain diseases, the good news is that lifestyle modifications and nutritional protocols (supplementing with nutrients to bypass the mutation) can help the gene do its job better and minimize or prevent problems from developing.

When there is a MTHFR defect, the shape of the MTHFR enzyme becomes distorted and does not work properly. This dysfunctional enzyme may be performing at only 25-80% of its capacity. It is like a key whose grooves have been altered just enough that it still fits in the lock, but it can't unlock the door.

There are two main MTHFR mutations—C677T and A1298C. The type of MTHFR mutation an individual has may lead to a greater susceptibility to certain diseases. For example, mutations at the **677 position** may predispose you towards the development of cardiovascular disease, stroke, peripheral neuropathy, cancer, blood clots, anemia, miscarriage, and congenital birth defects, whereas mutations at the **1298 position** may predispose you towards depression, memory loss, migraines, Alzheimer's, dementia, bipolar, schizophrenia, Parkinson's, fibromyalgia, chronic fatigue syndrome, nerve pain, and IBS.

Enzyme Activity With MTHFR mutations (% of normal)	
677 Heterozygous: 66%	**677 Homozygous**: 25%
1298 Heterozygous: 83%	**1298 Homozygous**: 61%
Compound Heterozygous (677 Heterozygous + 1298 Heterozygous): 48%	

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SYMPTOMS ASSOCIATED WITH MTHFR MUTATIONS:

Since the MTHFR enzyme is needed to convert homocysteine to methionine, if there is a defect, homocysteine can build up to abnormally high levels in the blood. Elevated homocysteine levels have been associated with a higher risk of a number of diseases, especially heart disease and stroke.

Common symptoms include:

- Infertility
- Miscarriage
- Birth Defects
- Mood Disorders (depression, anxiety) & Addictive Behaviors
- Alzheimer's & Dementia
- Mental Disorders (bipolar, schizophrenia)
- Parkinson's Disease
- Multiple Sclerosis
- Cardiovascular Disease
- Atherosclerosis
- Stroke
- Heavy Metal Toxicity
- Migraines
- Chronic Pain
- Chronic Fatigue
- Insomnia

TIPS FOR WHEN YOU HAVE A MTHFR MUTATION PS

Because the MTHFR gene helps make methylfolate, and methylfolate is the main driver of the methylation cycle (a multi-step chemical breakdown process), having a defective MTHFR gene impairs your methylation pathway (detoxification), and you **can't break down environmental toxins well**. Since **heavy metals** are one of the main toxins that get detoxified through the MTHFR pathway, individuals with a mutation have a difficult time excreting heavy metals. **Hormones** are also detoxified through this pathway, so individuals with mutations may have issues with hormone metabolism (producing more toxic estrogen metabolites instead of more protective estrogen metabolites, for instance). Methylation is also necessary for **neurotransmitter production**, **glutathione production**, **thyroid health**, and **pregnancy**. Additionally, methylation clears excess **histamine** from the bloodstream, so undermethylators may be more sensitive to histamine.

THINGS TO DO	THINGS TO AVOID
• **EAT NUTRIENT-DENSE WHOLE FOODS** (Processed foods are often fortified with synthetic folic acid and contain chemicals and preservatives) • **EAT ORGANIC FOODS** (Look for organic/grass-fed/pastured-raised meats and eggs from animals not given hormones or antibiotics. Purchase organic fruits and vegetables as much as possible and definitely for the produce on the Environmental Working Group's "Dirty Dozen" List—*see http://www.ewg.org*) • **EAT FOLATE-RICH FOODS (ESPECIALLY LEAFY GREENS)** (Uncooked leafy greens such as kale, arugula, collard greens, mustard greens, turnip greens, and romaine lettuce, as well as asparagus, broccoli, and avocados naturally contain high amounts of folate) • **CONSIDER SUPPLEMENTING WITH METHYLFOLATE (L-5-MTHF)** (Supplementing can help bypass the MTHFR mutation. Introduce this slowly and take note of how your body responds. Dosing for L-5-MTHF is highly individualized and ranges from 400 mcg to 15 mg per day. If you have a negative response (anxiety, irritation, agitation, nausea, palpitations, insomnia, rash, headaches), you may have another mutation affecting methylation. Using a little niacin to neutralize the over-methylation symptoms can be helpful. Giving L-5-MTHF can stimulate the body to detoxify, so if supplements are not tolerated, consider working on detoxification to reduce the toxic load first.) • **CONSIDER SUPPLEMENTING WITH OTHER NUTRIENTS AFFECTED BY MTHFR** (Vitamin B2, Vitamin B6, Vitamin B12) • **MONITOR YOUR HOMOCYSTEINE LEVELS (BLOOD TEST)** (An elevation may indicate a problem with methylation or a deficiency of folate or B12) • **SUPPORT DETOXIFICATION** (Epsom salt baths, infrared sauna, dry brushing, coffee enemas, liver cleanses, exercise) • **SUPPORT ANTIOXIDANTS** (MTHFR mutations can cause decreased glutathione levels and increased oxidative stress.)	• **AVOID FOLIC ACID** (Folic Acid is a cheap, synthetic version of folate that is ineffective and actually detrimental for individuals with a MTHFR SNP. It is found in processed **fortified foods**, like bread and pasta, and in many nutritional **supplements**, especially **Multivitamins** and **B Complex**). • **AVOID EXPOSURE TO ENVIRONMENTAL TOXINS** (Since MTHFR impairs detoxification, heavy metals and other toxins are more likely to accumulate in the body. Consider having any mercury amalgams removed by a biological dentist. Avoid high-mercury species of fish and farmed fish. Avoid aluminum exposure in antiperspirants and cookware. Avoid chemical-based products in and around your home, such as cleaning products and pesticides.) • **AVOID DRUGS AND MEDICATIONS WHICH DEPLETE FOLATE AND/OR VITAMIN B12** (Metformin, Methotrexate, Nitrous Oxide [aka "laughing gas"], acid blockers and antacids, and oral contraceptives). [Note: Green Coffee Bean is extremely high in catechols which use up methylation pathway nutrients and should not be used by someone with a MTHFR mutation]