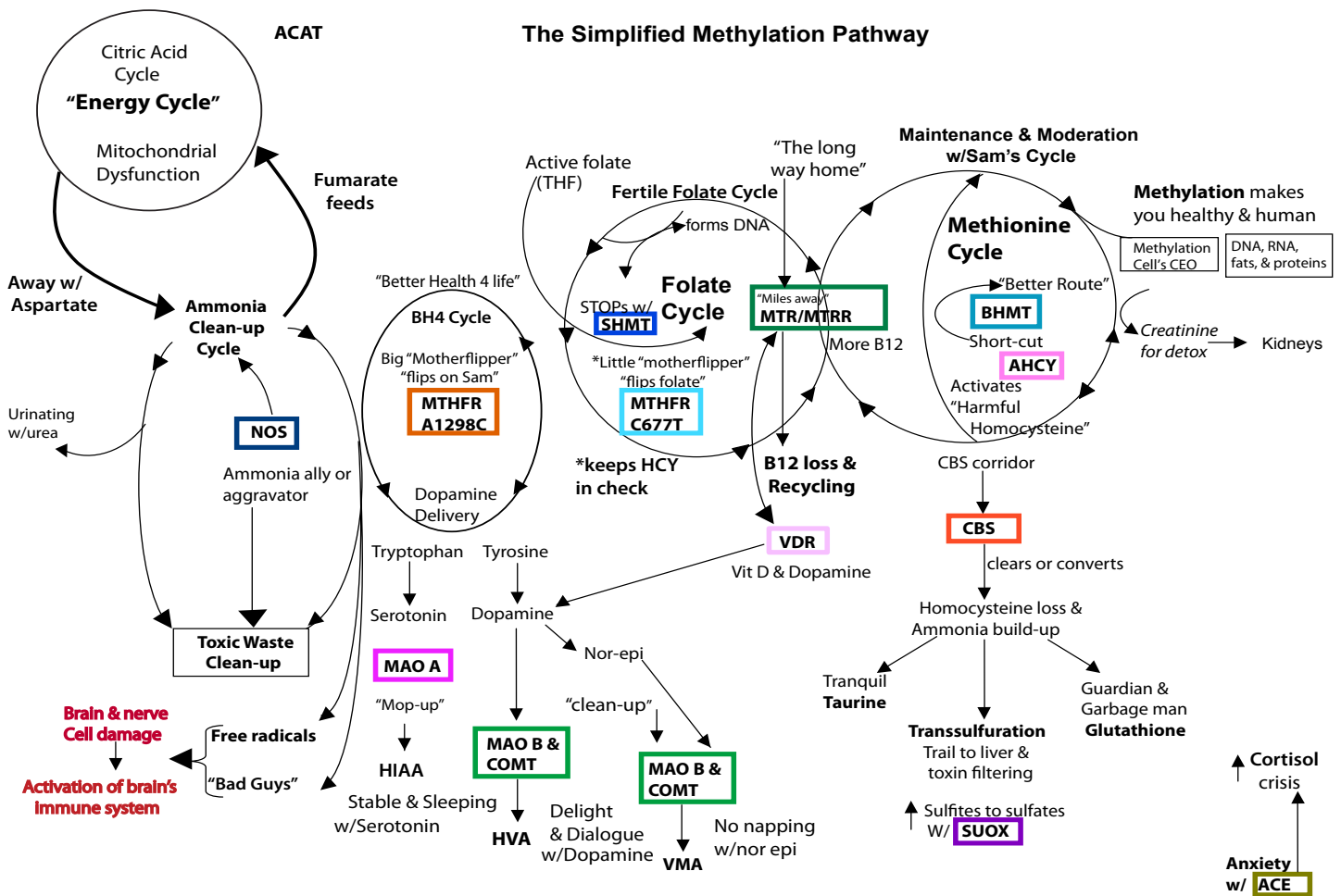


The Methylation Community & Your Body Chemistry

- 1). The Technical, "Simplified" Methylation Community
- 2). The Further Simplified, Less Technical Methylation Community
- 3). The Meaning of Methylation
- 4). The Most Simplified, Non-Technical Methylation Community
- 5). When Methylation Breaks Down
- 6). The Energy Cycle, AKA, The Citric Acid Cycle
- 7). The Waste Facility, AKA, The Urea Cycle
- 8). Table: Summary of the Cycles
- 9). The Better Health 4 Life Industry, AKA, The BH4 Tetrahydrobiopterin Cycle
- 10). The Organic Farming & Chain Gang, AKA, Folate Cycle
- 11). Table of Methyl Donors & Ammonia Provokers
- 12). Table of Lipid & Sulfur Donors
- 13). SAM's Corporation, AKA The Methionine Cycle

The following information is based upon 'The Yasko Hypothesis of Neurodegenerative and Autoimmune Disease' as well as the extensive research conducted by Dr. Jill James & colleagues on the Methylation Pathway (Folate & Methionine Cycles).

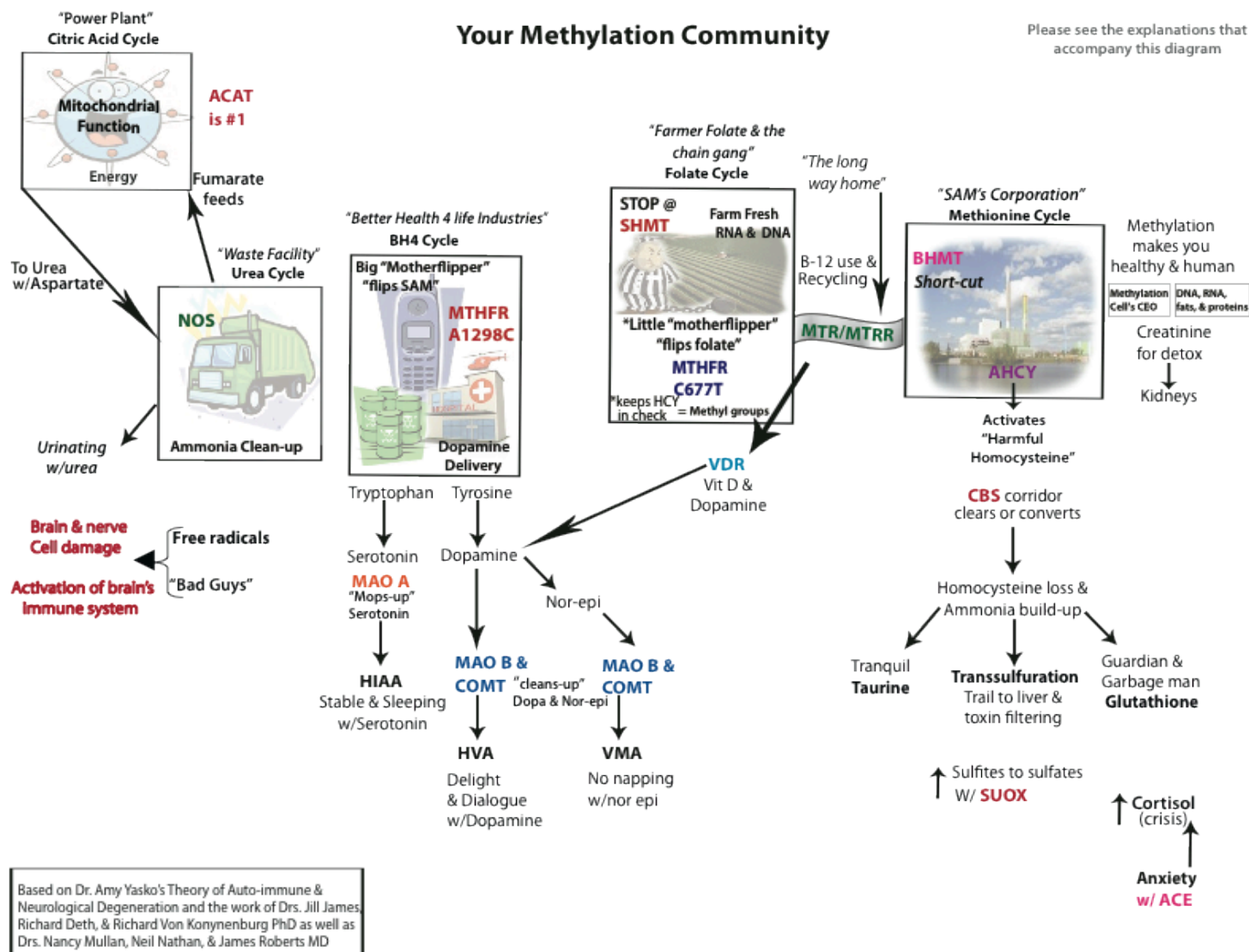
Technical, Simplified # 1



Adapted from the Neurological Research Institute's Diagram and simplified by April Ward-Hauge MS, NP

The Yasko Hypothesis of neurological & autoimmune disorders

Further Simplified, Less Technical # 2



This work was streamlined in order to provide basic education for both clinicians and patients seeking recovery and/or caring for those with “incurable” chronic conditions. The first diagram is a modified version of the original, copyrighted work of Dr. Amy Yasko, PhD at the Neurological Research Institute. Dr. Yasko was kind enough to grant permission for these adaptations in order to provide patient and clinician instruction.

This work is provided by April Ward-Hauge MS, NP @ Autism NTI & Adult Biomolecular Medicine
www.autismnti.com

#3 The Meaning of Methylation

Methylation is truly a multi-tasking marvel that allows us to be “healthy and human.” Though this highly intricate process occurs within each cell as well as in the fluid supplying the brain and within the liver, it is responsible for the most vital undertakings throughout body chemistry. Methylation determines who we are, what we look like, and how we behave and it is central to our physical, emotional, and mental wellbeing. Without methylation, we could not survive; hence, it is the perfect pathway to focus on for understanding autoimmune and neurological diseases such as multiple sclerosis, seizure disorders, dementia, Lou Gehrig’s, chronic fatigue syndrome, lupus, depression, anxiety, and autism spectrum disorders.

What are methyl groups & how do they work?

Lets get the mind-numbing part out of the way first so we can discuss this in everyday terms. Methylation begins with a methyl group, which is stuck together with a carbon and three hydrogen atoms, although we will simply call these tags. These tags are like passes, or work orders, so that as “methylation” begins within each department, a work tag is passed onto another worker, or molecule. Although we go about our lives completely unaware of this elaborate process, methylation is responsible for making, maintaining, and repairing DNA, which is your genetic code. You don’t need to fully understand genetic code in order to understand the implications here. If you cannot create or mend what makes you distinctively you, there are going to be serious problems. This is analogous to crafting a car without bolts, wiring, or cables—while it might look like a car, be prepared for some surprises when you attempt to drive it off the lot. Just as a highly skilled assembly line manufactures quality automobiles, the methylation community regulates the switching on and off of the genetic codes, thereby creating a high functioning human being. Since many of us have several less desirable genetic variations, this is essential for regulating gene expression, particularly cancer causing genes. This system also silences virus and supports immunity while regulating sulfur metabolism, a major contributor in the body’s detoxification, or filtering, pathway. When functioning optimally, methylation assures that the less desired genes are switched off while the preferred genes are switched on so that the system runs successfully. This is known as gene expression and cancer and birth defects are an excellent example of where this process has gone awry.

What are those cycles?

The methylation community has specific areas, known as cycles. The cycles, designed much like well-run fortune 500 Companies, have very specific duties. Each one has a chief operating officer (CEO), that determines its’ purpose, as well as supervisors, employees, and work orders (tags), known as methyl groups. The CEO establishes protocols and delegates various tasks to each supervisor, who is really just the cycle’s enzyme (Big Motherflipper, COMT, or BHMT). The supervisor then meets with the employees to hand out assignments, via work tags (methyl groups). The employees are often chemicals, proteins, or DNA that need the work tags to function effectively. Still, once the supervisor gives each employee an assignment and hands out the work passes; the jobs should be carried out (methylation). And, just as each corporation has a time-honored system, the methylation pathway has stages for beginning, maintaining, and completing the job. Of course, this also means that problems can arise at any given juncture. Nevertheless, don’t let the chemistry names and processes intimidate you. As you review the “simplified” diagrams, remind yourself that every cycle is merely a factory that operates for a specific purpose. The CEO meets with the supervisors, who in turn, meet with the employees to pass on designated work tags (methylation). Though this is a simplified illustration of the methylation process, it includes the major elements of this biochemical pathway.

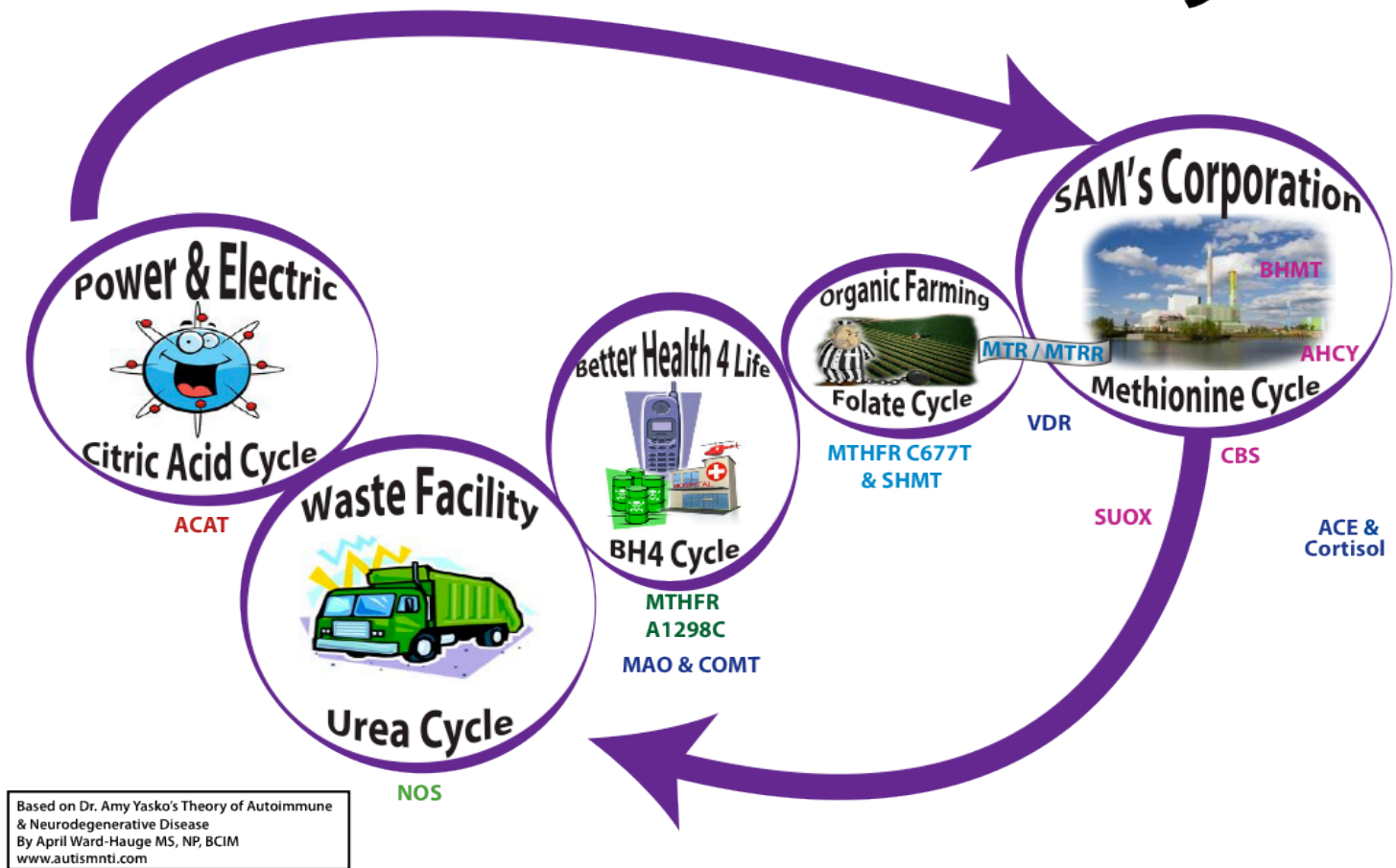
The Major Tasks of Methylation

In order to provide a brief overview, the following methylation tasks have been vastly streamlined. In reality, there is an endless array of both direct and indirect Methylation activities within the human body. Even so, this summary should provide greater understanding of this highly complex pathway, as well as the complications that can arise from various defects or toxic exposures. Methylation is responsible for the following:

1. Nervous system function (brain, spinal cord, & nerve cells). It's critical for the insulation around nerves (myelin), which allows signals to properly transmit via this sheath, or outer layer.
2. Chemical Messengers, or neuro-talkers, that provides the means for communication throughout the community as well as maintaining mood, health, & wellbeing. Methylation yields neurotransmitters such as Dopamine, Serotonin, Melatonin, & Norepinephrine.
3. Regulation of gene expression by subduing the corrupt genes and nurturing those that are beneficial.
4. The creation of new RNA and DNA, our genetic building blocks.
5. Direct communication between the nervous & immune systems so that hazards are addressed, thus thwarting would be attackers.
6. Management of sulfur metabolism, a major contributor within the detoxification system (transsulfuration and glutathione).
7. Mobilizes fat and cholesterol so that they are efficiently removed from the body and/or used appropriately for the production of hormones, myelin sheath (nerve lining), and bile salts.
8. Hormone control and production. Methylation is instrumental in estrogen, testosterone, & insulin concentrations as well as many other hormones throughout the body.
9. The allergic response including: a). Anaphylactic reactions (life threatening), b). Food or seasonal allergies, c). Eczema & hives, & d). Asthma. This is accomplished through histamine regulation.
10. The production and repair of proteins throughout the body: Four examples include a). Amino acids (building blocks of protein), b). Hemoglobin (carries oxygen to body), & c). Antibody defense such as IgA, IgE, IgG, & IgM (immune factors that defend us from invaders), and d). Collagen or Elastin, which offer structural function and support within the body via Collagen's role in connective tissue, (tendons & ligaments), while elastin is found in the intestines, blood vessels (arteries), and lungs.
11. RNA Methylation, as it permits for more accurate instruction to DNA in cell replication & identity.
12. DNA Methylation, which allows cells to operate, as they should whether skin, hair, liver, or brain cells.
13. Cell membrane fluidity, which impacts what goes in or comes out of each cell through its' outer coating. This allows cells to fine-tune their own mineral levels, allowing elements to move in & out as needed.
14. Processing and filtering of heavy metals & environmental toxins as well as phenols, glutamates, pesticides, additives, sulfites, ammonia, drugs, herbs/supplements, adjuvants, etc.
15. Oversees the removal of free radicals as well as the formation of new cells to take their place.
16. Regulates histones, the proteins that are tightly wound within the DNA. These are one of the specific proteins involved in cell division and cancer.
17. Homocysteine (HCY) regulation in order to provide adequate work tags while preventing HCY's more harmful effects (inflammation within blood vessels, brain, and heart tissue).
18. The conversion of many nutrients (i.e., folate or HCY) into more active forms (5 MTHF or Methionine) for more work tags, leading to innumerable actions throughout the community.
19. Production, maintenance, and repair of cells, which leads to peak performance within the nerve, tissue, and organ as well as healing.
20. BH4 production, which is critical for neurotalkers, waste & toxin cleanup, and nitric oxide production. The latter is used for maintaining open & clean blood vessels as well as protecting the heart & brain.

#4 Further Simplified, Non-technical

Methylation Community



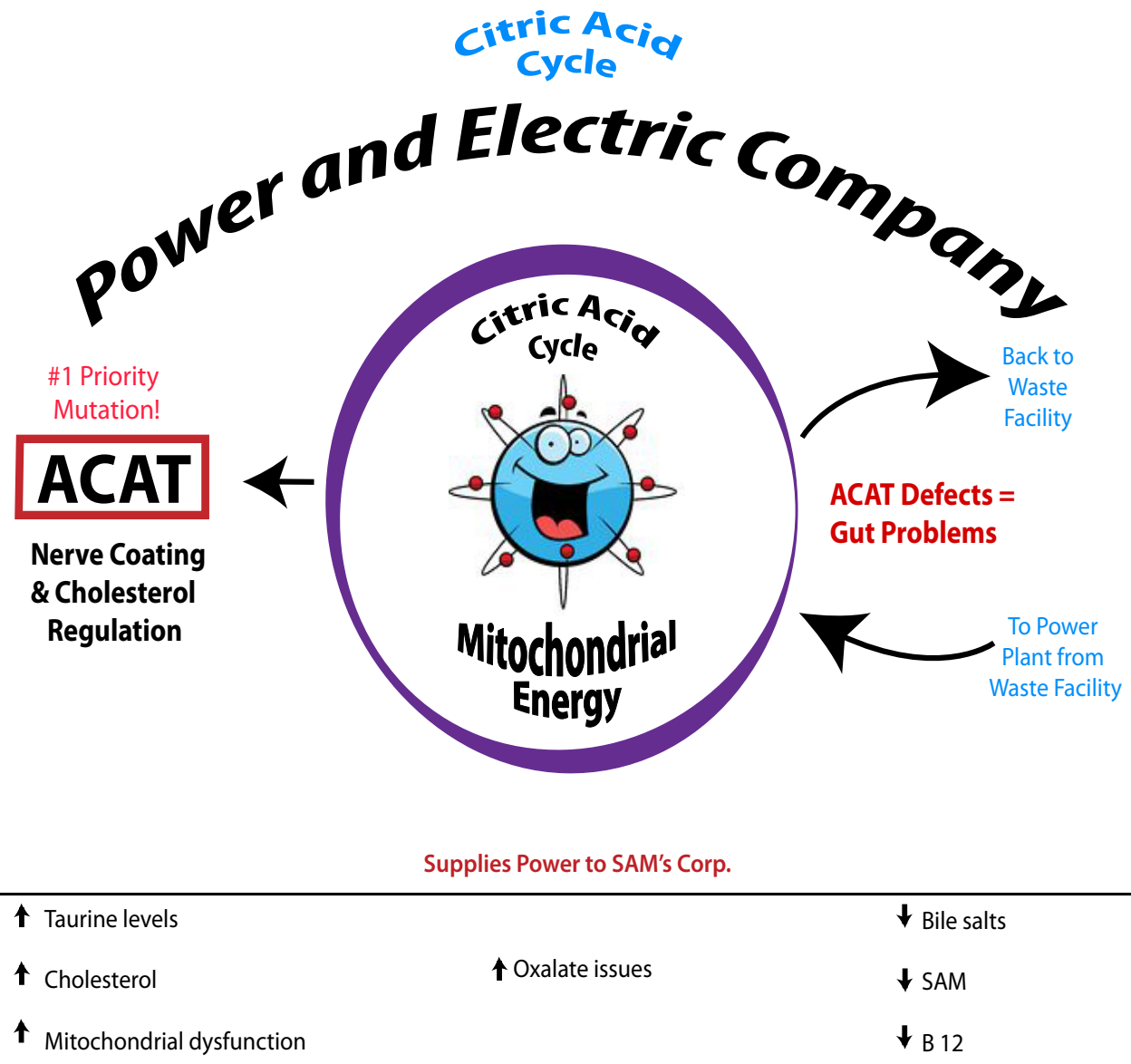
#5 When Methylation Breaks Down

What does this process look like when it's broken? After reading the following, you will be able to envision the implications of defects or mutations. The following is an example of the health problems that might occur.

1. Poor nerve function leads to muscle twitching, numbness, and weakness yet misfires can cause seizures, fatigue, memory loss, word groping, clumsiness (with falls & injuries), and visual or hearing loss in those with MS, CFS/ME, or Autism Spectrum Disorders.
2. Depending on the neuro-talker, imbalances often lead to a variety of disorders including: depression, anxiety, panic attacks, irritability, mood swings, OCD, ADD/ADHD, Parkinson's, schizophrenia, bipolar, spaciness, insomnia, and poor concentration and focus.
3. Gene expression can lead to many unwanted disease processes such as Malignancy/cancer (melanoma, breast/uterine/ovarian, prostate, MDS, leukemia), Neurological (ALS, MS, Parkinson's), Autoimmune (CFS/ME, Lupus, Ulcerative colitis, mixed connective), Endocrine (diabetes, pituitary, thyroid, adrenal), Gastrointestinal (Pancreatitis, Crohn's, stomach/colon cancer, Hemachromotosis), or Heart/cardiac (blood vessel disorders, high cholesterol, high blood pressure, heart attacks), etc.

4. Deficiencies in RNA & DNA lead to poor growth & development, poor healing, and lack of bowel or brain cell regeneration so that as cells die, they cannot be readily replaced.
5. Poor communication between the brain and the immune system means the difference between successfully fighting off a simple cold vs. allowing the virus to develop into a more severe bacterial infection, such as meningitis or pneumonia.
6. Inability to utilize sulfur leads to toxic sulfites and can substantially reduce glutathione production. As the backbone of the immune system and major antioxidant, glutathione deficiency leads to poor immunity & inability to naturally clean up accumulating toxins, leading to widespread collateral damage.
7. Cholesterol accumulation leads to fat deposits around organs and within blood vessels, which may cause strokes or heart attacks, whereas inability to use cholesterol can lead to Vit D shortages as well as imbalances within testosterone, estrogen, & insulin.
8. Lack of hormone regulation leads to diabetes, as is the case with insulin, or breast & endometrial cancer, as often occurs with high estrogen levels.
9. Too much histamine allows for an overactive allergic response, such as the near fatal reaction to eating peanuts or strawberries, whereas low levels may lead to anxiety disorders.
10. Poor protein repair and production has far-reaching effects including: a). Shortages in amino acids allow for poor detoxification, immunity, healing & growth, b). Lack of oxygen via hemoglobin leads to poor cell & tissue repair and more infection & damage to tiny blood vessels, c). Low antibody formation causes Immune deficiencies due to lack of T & B cells, d). Without sufficient elastin & collagen, there's greater risk for injury & musculoskeletal dysfunction with weakness as well as poor healing.
11. RNA acts as both a translator and chemical messenger to DNA for cell identity so that any interference allows room for error within genetic coding. This contributes to genetic typos or SNPs (snips).
12. DNA methylation allows for accurate cell identity & errors here may impede proper cell function. Diseases include cancer cystic fibrosis, sickle cell anemia, & Hemophilia.
13. When the cell isn't able to regulate its' contents, electrolyte imbalances (potassium, calcium, magnesium, sodium) occur, limiting cell communication. Alzheimer's, Autism, MS, and Crohn's Disease are all cases in which poor cell membrane fluidity plays a significant role.
14. Without filtering, toxic accumulation of heavy metals, ammonia, sulfites, phenols, glutamates, & other substances, leads to toxic threshold. Many feel this is a significant factor behind regressive autism, CFS/ME, MS, ALS, neuropathy, dementia, cancer, and many other chronic diseases and disorders.
15. The inability to govern and repair free radical damage causes widespread cell, tissue, & organ damage and is instrumental in the aging process as well as headaches, lethargy, and symptoms of fatigue or disorders such as Autism, CFS/ME, neuropathy and chronic pain.
16. Improper methylation of histones is a known trigger behind tumors & malignancies such as leukemia and a variety of cancers.
17. High homocysteine (HCY) levels are related to heart disease, strokes, and cancer. Recent studies reveal an association between mothers with high HCY levels & children later developing schizophrenia.
18. The inability to convert nutrients into useable forms is highly associated with heart disease, strokes, clotting disorders, infertility, spina bifida, cancer, and a multitude of diseases and disorders.
19. Poor cell turnover, repair, and maintenance are a prime example of why so many have developed inflammatory bowel disorders, leaky gut syndrome, and yeast overgrowth as well as neurodegenerative disorders such as dementia & autism.
20. Without adequate BH4, we cannot make the neuro-talkers we need to maintain health and happiness, neurological function, waste cleanup, or nitric oxide in order to protect the heart and brain. (See # 2).

6 The Citric Acid Cycle, or “The Power & Electric Plant”



The Citric Acid Cycle—“The Power Company” is essential for processing and converting all dietary nutrients (vitamins, minerals, fats, amino acids) into useable forms of energy just as the power industry processes coal, gas, or oil for energy production. If you visualize this cycle as a clock, each hour represents an area in which one nutrient converts into a more compatible form of energy. Depending on digestive function, diet, rate of absorption, and the presence of any genetic quirks, a problem might occur at any point within this clock. This may lead to significant metabolic (chemical processing) imbalances within your body chemistry as well as mitochondrial dysfunction or disorders. In fact, mitochondrial imbalances are estimated to occur in at least 50%+ of those with autism and chronic fatigue syndrome. Moreover, when considering a child who only eats a handful of foods and has chronic gastrointestinal issues, the potential for malfunction greatly increases. Similarly, those with leaky gut, Celiac disease and/or inflammatory bowel disorders will have a difficult time meeting their nutritional needs to keep them going.

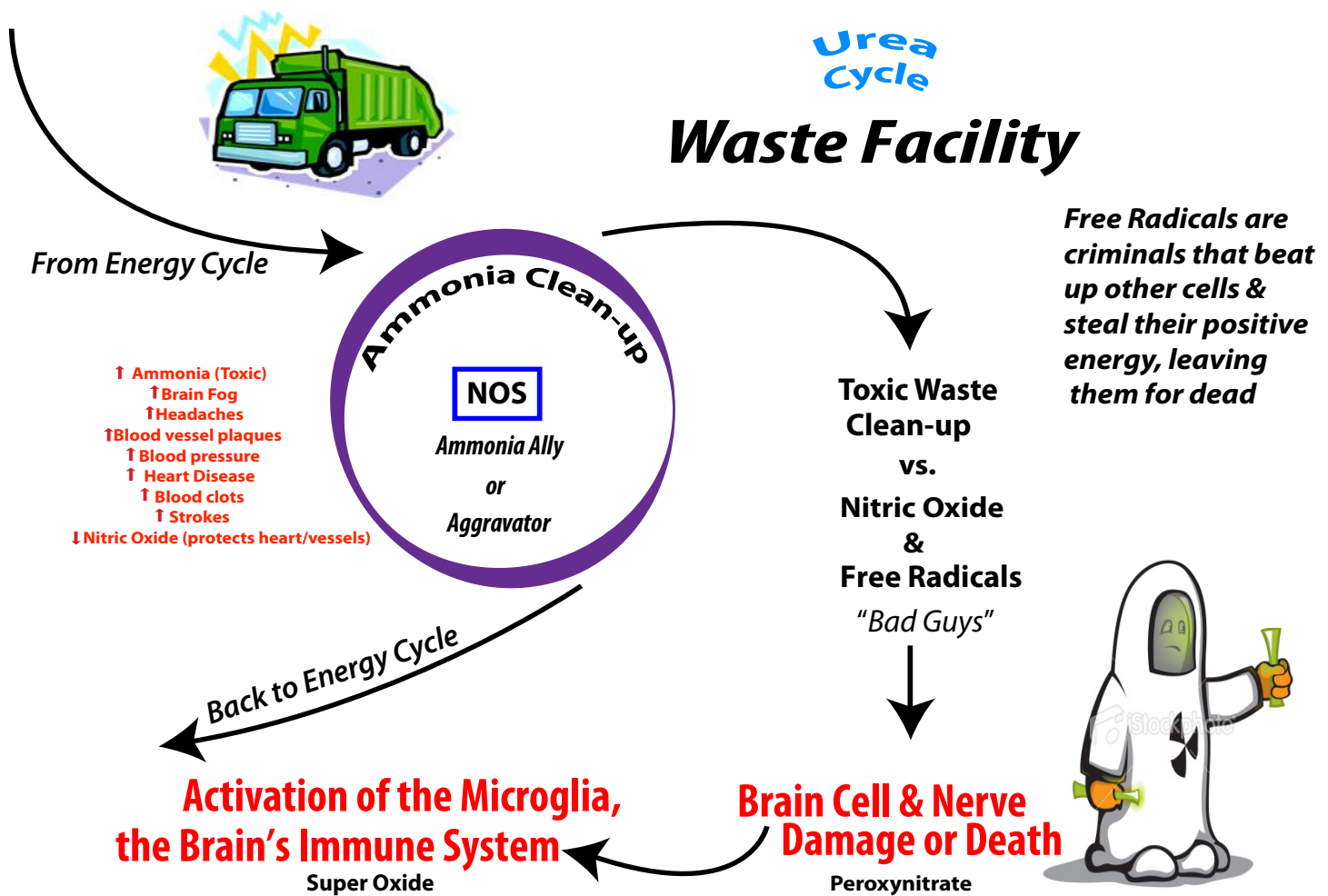
Yet short of having a blatant mutation, most medical practitioners have overlooked any lesser imbalances. Since many known mutations lead to death and/or serious disability, such as muscular dystrophy, it was generally an all or nothing approach in treating mitochondrial disorders. Despite having abnormal test results and significant health problems, those without recognized mutations were simply sent home. However, in the past two decades, there has been a tremendous shift toward recognizing these less serious defects. This is due to the gradual, yet substantial, number of illnesses and disorders that have surfaced, including certain types of heart disease, CFS/ME, regressive autism, learning disorders, and many other problems with growth and development. Many innovative practitioners now understand the value of assessing for milder genetic typos as well as an individual's fuel source and ability to utilize and process nutrients.

One of the supervisors working with this cycle (ACAT) will occasionally play hooky, particularly when other managers overload him (NOS, MTHFR, BHMT, & CBS). He occasionally has his own difficulties as well, which slows activity to a near standstill and influences many other areas, including:

1. More B-12 depletion, which has ramifications throughout the entire system.
2. Cholesterol & fatty acid imbalances, often leading to toxic fatty acid buildup & high cholesterol.
3. Decreasing bile salts & taurine production as well as poor cell wall function since they all rely on the proper breakdown of cholesterol through the ACAT.
4. Poor breakdown of fats, carbohydrates, & proteins to fuel other cells, nerves, tissue, & organs.
5. Rising oxalate levels that may cause painful urination and bladder & kidney stones.
6. Co Q-10 reduction, which is also necessary for mitochondrial function & energy.
7. Limited energy for the Waste Facility & SAM's Corp. due to less conversion of methionine to SAME. In having over 400 methylation functions, SAME is critical for the entire community.

As the energy factories of each cell, mitochondrial damage has significant implications. In fact, anything that demands more energy, including the gut and the brain, are particularly vulnerable. Since blocks may limit bile salts, digestion is often doubly burdened. This provides valid reasons for why so many with ACAT defects suffer from gastrointestinal problems. It also reveals the mystery behind some cases of poor growth & development and failure to thrive. Defects can also lead to serious disruptions in processing cholesterol, which leads to interference with nerve communication and hormone imbalances. Furthermore, toxins such as aluminum, heavy metals, and glutamates also greatly impact this factory, which is one reason those with known mitochondrial disorders are discouraged from eating foods with pesticides, MSG, and aluminum. Those with multiple risk factors are especially prone to mitochondrial dysfunction. Lastly, anyone with autism, chronic fatigue, ALS, or other degenerative, neuro-immune disorders would do well to heed this chemical factory.

#7 The Urea Cycle or “The Waste Facility”



Urea Cycle—“**The Waste Facility**” is responsible for cleaning up most of the toxic waste generated within the community. Think of this cycle as your local garbage dump replete with trucks transporting recyclables and trash via the liver’s main highway (CBS). Though the “Better Health 4 Life” (BH4) Corporation is charitable enough to share its’ BH4 compound in order to clean up toxins and compost, this plant must clear out contaminants in any way possible. This generous supply of BH4 also allows the Waste Facility’s Supervisor (NOS) to make nitric oxide (N.O.). N.O. maintains blood vessels throughout the body, keeping them open and free of plaque that would otherwise lead to strokes or heart attacks. This facility also produces an amino acid (fumarate), which feeds directly into the Power Plant nearby. This is a true community, in which each cycle functions to support another, making them all interdependent. When everything is operating smoothly, this facility efficiently removes ammonia and other harmful wastes through the liver and kidneys. However, several factors may impede its performance, some of which are:

1. The BHMT & CBS defects may be working overtime to dump waste into this plant’s already overflowing bins, trucks and storage units.
2. The BH4 Corp. may use most if its’ special compound to make dopamine & Serotonin.
3. The BH4 supervisor, the Big Motherflipper, becomes critically ill and is unable to produce BH4 (full defect) or is only able to make small loads (partial defect).

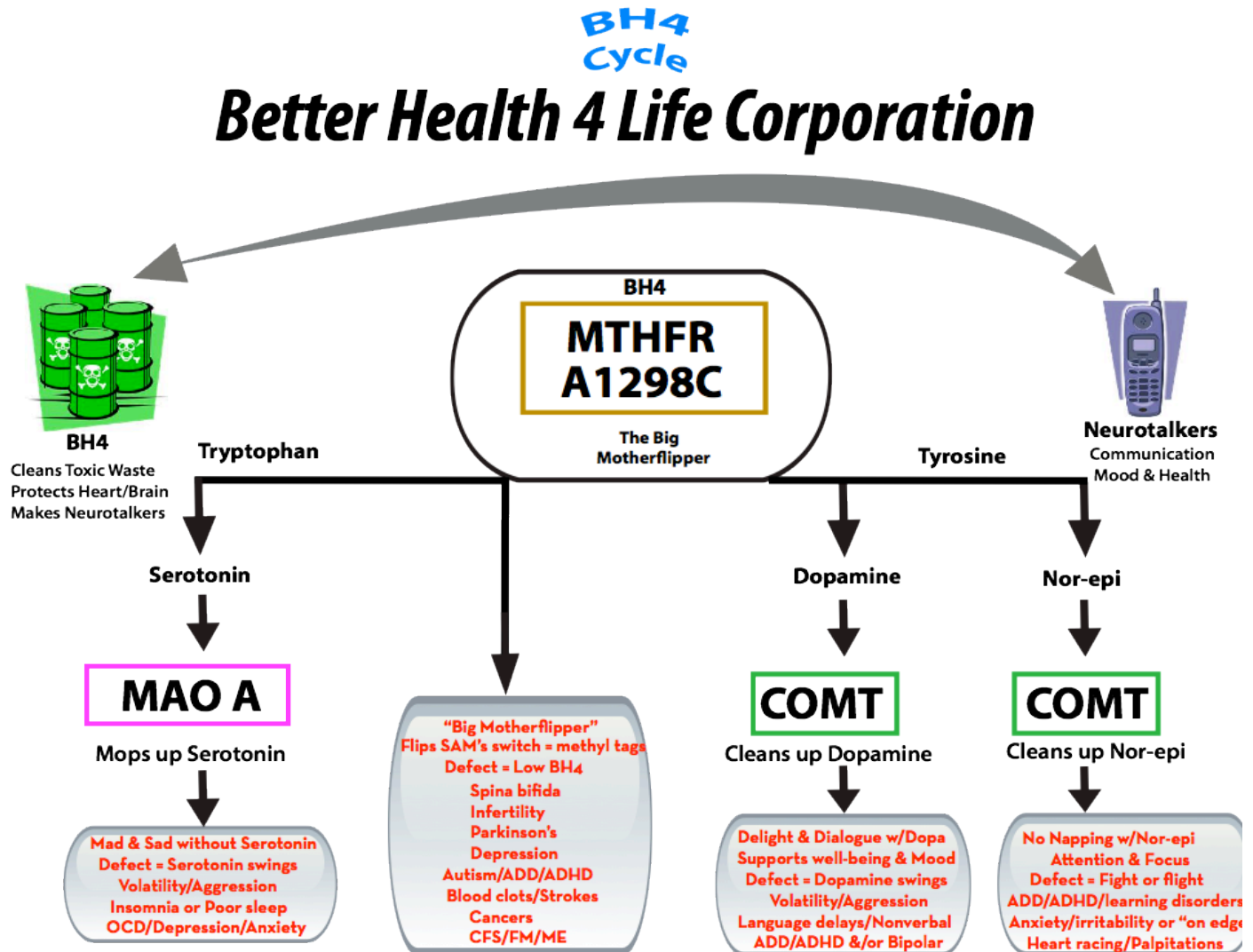
4. The Waste Facility's supervisor (NOS) has a bit of a drinking problem and doesn't feel like working too much (partial defect) or worse; he's destroyed his own liver and doesn't work at all (full defect).
5. A high protein diet creates more toxic ammonia through the CBS highway (transsulfuration), and burdens the garbage dump further.
6. Those taking a great deal of supplements, without regard for their genetic makeup, will only add more ammonia & sulfites to the growing burden.
7. Chronic bacterial issues, particularly anyone with ongoing gastrointestinal problems, as they are more likely to have too much intestinal bacteria, which release even more ammonia & toxic byproducts.

Though any one of these can lead to problems, having several elements in place implies more serious difficulties. Without viable options, the facility begins to dump toxic waste into surrounding rivers, lakes, and woodlands. While this initially relieves the burden and buys time, it will always come back to haunt everyone in the community. Just as the poisonous waste products known as **free radicals**, wreak havoc within the body's chemistry by damaging and often, destroying previously healthy cells. These bad boys, known as **Super Oxide** (S.O.) & **Peroxyhydrate** (P.N.) are the ultimate villains. Following their assault on healthy cells, they steal their positive energy, triggering collateral damage and widespread destruction. These criminals work together in a highly targeted fashion. S.O. disables your brain's alarm system (microglia) while P.N. moves in for the kill, annihilating brain cells & nerve cells (neuronal death). This is one reason that antioxidants & free radical scavengers are so vital to overall health and wellbeing---they work to lessen this damage.

Table # 8 Summary of Cycles

Cycles:	<i>Power & Electric</i>	<i>Waste Facility</i>	<i>Better Health 4 Life Industry</i>	<i>Organic Farming</i>	<i>SAM's Corp</i>
Also known as	Citric Acid Cycle	Urea Cycle	Tetrahydrobiopterin BH4 Cycle	Folate Cycle	Methionine Cycle
Function:	Converts dietary nutrients for energy production within mitochondria. Provides power to other cycles & helps regulate cholesterol, bile salts, & oxalates.	Filters & processes toxic waste. Makes nitric oxide to limit free radical injury & maintains open & clean blood vessels to protect the heart & brain.	Produces the BH4 used for making neuro-talkers (dopamine, epinephrine, nor-epi, serotonin, & melatonin). Cleans up toxic ammonia in The Waste Cycle & makes Nitric oxide to protect the heart & brain.	Produces organic, homegrown RNA & DNA. Converts folate into usable forms to keep HCY* in check & sends on to SAM's for more work tags. *HCY/Homocysteine	Major work tag (methyl donor) manufacturer. SAME has over 400 functions in the community. Also serves as the main route thru to liver & Waste cycle.

#9 BH4 (Tetrahydrobiopterin), or “The Better Health 4 Life Industry”



BH4 (Tetrahydrobiopterin) Cycle—“Better Health 4 Life Industries” Though controversy exists regarding this cycle’s function, Dr. Yasko’s theory indicates that The Big Motherflipper (MTHFR A1298C) may drive this cycle in the reverse direction and several independent studies support this finding. This leads to a chemical exchange among BH2 to BH4, a multi-purpose product that is used in both the *Waste Facility* (urea cycle) and *BH4 Industry*. Within the *Better Health 4 Life Industry*, BH4 produces chemicals known as neurotransmitters, or neurotalkers (NTs), including Dopamine, Serotonin, Melatonin, Norepinephrine, and Epinephrine. NTs are central for the communication between nerves and cells as well as stabilizing the crisis response, mood, and sleep cycles. Chronically low BH4 levels increase the risk for ADD/ADHD, bipolar disorder, OCD, insomnia, depression, anxiety, and many other quality of life issues. Think of this company as AT&T with a philanthropic twist since it donates BH4 to the Waste Facility for environmental clean up as well as supporting the community in health & wellbeing.

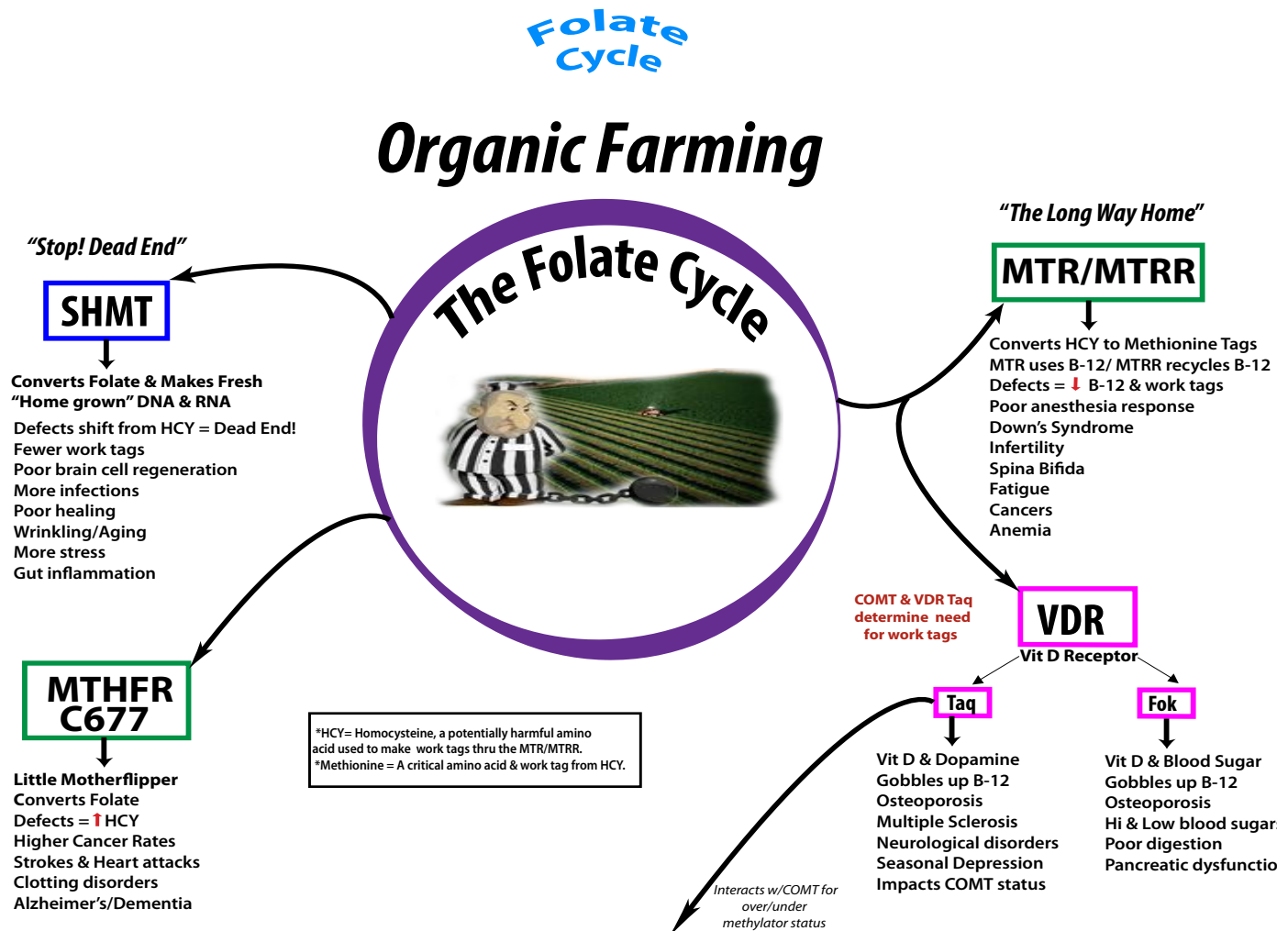
The Waste Facility uses BH4 to clean up toxic ammonia and generates nitric oxide, an element that keeps blood vessels open and free of plaque. Yet if BH4 is scarce, it cannot clean up waste or deliver vital nutrients to the Power Plant (fumarate) so that noxious chemicals back up into SAM’s Corporation.

Given the fact that it takes 2 grains of BH4 to clean up 1 granule of ammonia, as well as 2 of BH4 to create just 1 bit of nitric oxide, its easy to see how problems might arise. This underscores the BH4 Industry's role throughout the community since unlike an actual factory; it isn't permitted to shut down for repairs or maintenance. While there are many factors that may impact this cycle, several are listed below:

1. A defect within the Big Motherflipper leads to lower BH4 levels.
2. Chronic bacterial infections create more ammonia, cleave to aluminum, & use up tryptophan, a serotonin precursor; leading to more BH4 depletion.
3. Though high protein diets create more ammonia, for those with Big Motherflipper defect alone, it isn't critical. In concert with other defects (BHMT, CBS, NOS), this diet becomes more of a problem.
4. Weaknesses within the BHMT, CBS, and/or NOS imply that critical levels of BH4 are being used up, leading to greater system malfunction.
5. Aluminum & other toxins greatly impact the Big Motherflipper's output, thus reducing BH4 supplies.
6. The janitors below this cycle (MAO/COMT) work too efficiently and clean up dwindling supplies of NTs.
7. Although not depicted on the diagram, there may also be a defect within the DHPR enzyme, which converts BH2 to BH4 via the Big Motherflipper.

Fortunately, this Industry has contingency plans in place for keeping communication open in times of crisis. Should the plant suffer a major decline in BH4 production, reserves may be activated in order to maintain as many byproducts of BH4 as possible. For instance, you may have inherited a stopgap that allows Dopamine & Norepinephrine conservation (COMT) or another for Serotonin (MAO A). The COMT, in conjunction with the VDR, influences the overall need for work tags. As with many things, such options can be highly beneficial or tricky, depending on the mixture of problems. In its' quest for survival of the fittest, the body's immediate goal is preservation in the here & now, rather than later consequences. In the end, epigenetics increases the odds for survival, but with a price.

#10 Folate Cycle, or "Organic Farming & The Chain Gang"



The Folate Cycle—This is the "**Organic Farming Region**" where everything is homegrown. This Region grows "organic" work tags (Methyl groups) and is instrumental in the front-line production of new RNA and DNA. Still, this plantation is a bit old fashioned, employing a *chain gang* (Homocysteine) to help them get the work done. Though rarely considered in everyday life, RNA & DNA are essential to making you unique, as well as directing health and longevity. Despite this, there must be balance between available work tags and crafting new genetic code. However, genetic typos also play a role. For example, The *Dead End* (SHMT) often traps work orders sent on from the *Little Motherflipper* (MTHFR C 677T). This results in lost work tags for the community since those normally passing through to SAM's, by way of the *Long Route* (MTR/MTRR), have been permanently detained. This layover increases the risk of losing control over the chain gang, as they cannot be processed (via AHCY) to work. Normally, The Little Motherflippers (3 & C677T) should convert folate into its' active form to regulate homocysteine (HCY) and allow for sufficient work tags. The SHMT should complete this process so that the chain gang can travel on via *The long Route*, obtaining work passes within the AHCY, and eventually performing jobs throughout the community.

Homocysteine can be likened to a "**chain gang**," or group of prisoners, which are shackled together and diligently working under the direction of the farm boss (C677T). Much like HCY, the chain gang is

beneficial in that it provides necessary, low cost labor yet if not closely supervised, they are both potentially dangerous. You can imagine the trouble a chain gang might instigate if allowed to roam free throughout the community. Likewise, when allowed to run amok, HCY can wreak havoc, triggering extensive inflammation throughout the heart, brain, and blood vessels. And, while there are many areas that impact this region further, the following can cause serious disruptions:

1. Defects within the Little Motherflipper prevent appropriate use of folate and higher HCY levels.
2. SHMT defects trap work tags (methyl groups), depriving the entire population.
3. Toxins & heavy metals such as aluminum, lead, & mercury or defects within the long way home (MTR/MTRR), typically lead to low B-12 levels & fewer work tags in SAM's Corp (less methionine).
4. Defects within the long route influence the available B-12 even while an intact VDR consumes more precious resources (methyl B-12).
5. CBS up-regulations drain the cycle of invaluable work tags & provide an escape route for HCY. Nutrients & toxins are then converted to ammonia and sulfites, further taxing the community.
6. AHCY activates the chain gang (HCY) for work so that defects here will actually help offset the Little Motherflipper (C677T) and mask a CBS defect.
7. Problems within the short cut (BHMT) aggravate the CBS/NOS as well as any farming issues, as this is the last exit through which work tags are made. This leads to fewer work tags and higher HCY levels.

Although the VDR is not specifically a part of the Organic Farm, it uses Methyl B-12 supplied by the *Long Route* in order to support the bones, brain, and nerves. For those familiar with Dr. Pfeiffer's work regarding over and under-methylators, aside from the COMT (see BH4 Cycle), the Vitamin D receptor is also instrumental in shaping the need for work tags. This is commonly referred to as "Methyl Donor Status" and refers to the level of work tags one can tolerate before detox and/or dopamine swings ensue. The VDR defect has also been implicated in multiple sclerosis, osteoporosis, high cholesterol, and diabetes.

#11 Methyl Donors & Ammonia Provokers

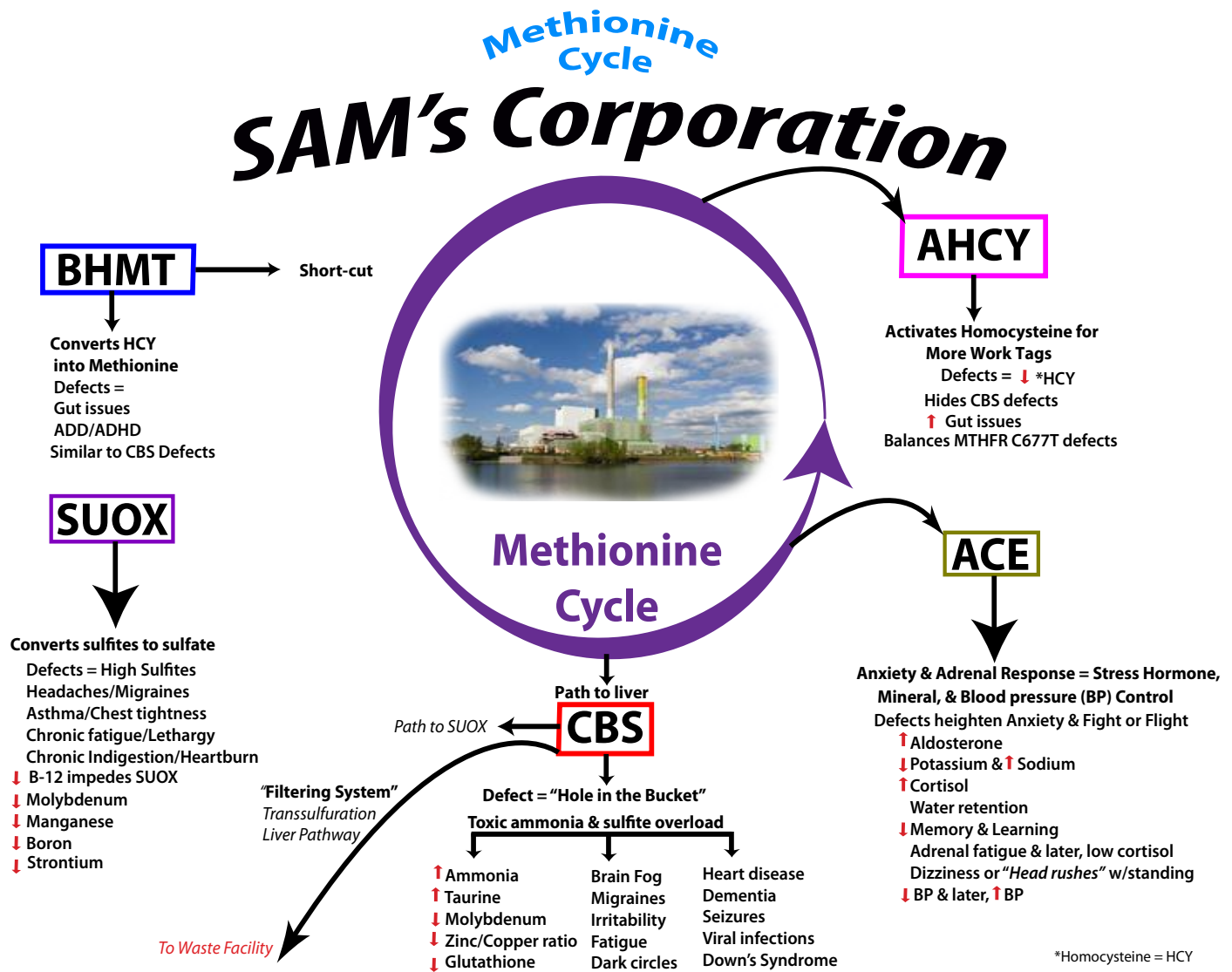
Methyl Donors: Limit with COMT+/+ or VDR -/-	Ammonia Antagonists: Limit with CBS+ and/or NOS+/+
Caffeine MSM Melatonin CoQ-10/Idebenone Carnitine Theanine SAmE Methyl B-12 Curcumin Quercetin DMG TMG Folapro, Metafolin, or Deplin (5-MTHF)	Higher protein diet B6 Glutathione Taurine NAC

#12 Lipid & Sulfur Donors

Lipid Donors: Limit for CBS + & NOS +	Sulfur Donors: Limit for CBS+/SUOX+
Foods: High seafood/fish diet Immune Factors Any transdermal creams Lipoceutical EDTA Lipoceutical glutathione EFA's: Omega 3's/DHA CoQ-10 ALA Idebenone	Foods such as: eggs, broccoli, cauliflower, cabbage, onion, & garlic Taurine Glutathione NAC SAmE Milk Thistle ALA MSM DMPS DMSA Glucosamine & Chondroitin Epsom salts/magnesium sulfate

The goal is to be mindful of accumulating methyl or sulfur donors rather than attempting to limit all of them. Whenever we try to remove everything “bad” in one category, we create imbalances in other categories. The key is balance. For instance, if you love broccoli & garlic yet have the SUOX & CBS defects, just limit the others on the list.

#13 Methionine Cycle, or “SAM's Corporation”



Methionine (SAM) Cycle--“SAM's Corporation,” As SAME has over 400 known methylation reactions, SAM's Corporation is the chief work tag producer. It's also where most of the action occurs since it contains the major thoroughfare to the liver (CBS & transsulfuration). While this often works to its' advantage, it can also pose a safety risk since failure along this route may result in calamity (See Waste Facility). When properly functioning, this passageway detoxifies much of what accumulates from the population. Still, several back ups are in place so that some work tags are always available to process the most critical needs. Traditionally, the methylation pathway has been comprised of the Folate and Methionine Cycles, while the remaining three (Urea, Citric, & BH4) works closely with this pathway to form a methylation community. This community functions just as many successful corporations have, it works interdependently. SAM's Factory directly communicates with other managers within the BH4 and Farming regions (MTHFR A1298C & C677T) as well as the Waste Facility (NOS). Aside from the CBS, there are three other exits within the community: BHMT, MTR/MTRR, and the SHMT. Each area provides an alternative when another is blocked or malfunctioning.

The closest path is the *shortcut* through the factory (BHMT), which creates alternate work tags. Though the chain gang is better served through the MTR/MTRR and on to the AH CY, this faster BHMT route allows for temporary work tags when these areas are blocked. However, the preferred method is through the joint passageway, the *Long Route or Long Way Home*. This path offers more direct access

to the AH CY supervisor, which is where the chain gang is processed to go to work. Even while these two supervisors are hard at work, if the entrance to the liver isn't working optimally (CBS) it acts as an open floodgate. The majority of prisoners and nutrients that escape along this channel often transforms into toxic ammonia and sulfur derivatives that have damaging effects. This can be likened to a toxic oil spill that poisons the community and causes collateral damage in both neighboring regions (nerves, cells, & blood vessels) and far-reaching territories. In doing so, it depletes vital supplies of glutathione, the chief guardian of the immune and detoxifying systems. It also squanders valuable work tags, thereby reducing prospects for repairing and rebuilding. While there are many issues that can lead to obstacles, the most common include:

1. CBS up-regulations drain many of the resources and nutrients from the cycles.
2. A partial block within the SUOX can cause more toxic sulfites.
3. Partial or full blocks within the AH CY prevent HCY/Chain gang activation.
4. Problems within the Waste Facility/NOS lead to significant back-ups while even minor surges within the CBS freeway add to the burden.
5. Testosterone or blood sugar fluctuation (diet & VDR Fok) may increase CBS function further.
6. Problems in the Short-cut/BHMT may cause more dumping through the CBS. When a CBS defect is also present, this acts like a double whammy.
7. Big Motherflipper defects lead to more trouble since less BH4 means more toxic waste back up within the Waste Facility & SAM's. Little Motherflipper defects add HCY, which is highly inflammatory.

Since everything in this pathway is mutually dependent, there is greater potential for a domino effect as things take a wrong turn. Just as a small town relies on its' biggest industry for progress and maintaining the economy, the methylation community depends on SAM's Corp for most manufacturing and employment (methyl groups). In order to accomplish this, the major thoroughfares and chief junctions should run smoothly. Otherwise, it drains the community of valuable resources and leads to traffic jams and toxic waste spills.

April Ward-Hauge MS, NP, BCIM
Autism Nutrigenomics Treatment Inc.
& Adult Biomolecular Medicine @ www.autismnti.com
autismnti@suddenlink.net

Diseases related to poor methylation

- **Aging**
- **Stroke**
- **Attention Deficit Disorder**
- **Alzheimer's disease**
- **Anesthesia complications**
- **Asthma**
- **Autism**
- **Bipolar disorder**
- **Cancer**
- **Chronic Fatigue Syndrome**
- **Clotting disorders: DVT, PE, stroke**
- **Diabetes**
- **Down's syndrome**
- **Fibromyalgia**
- **Heart disease**
- **High Cholesterol**
- **Huntington's disease**
- **Immune dysfunction**
- **Infertility**
- **Lou Gehrig's disease**
- **Lupus**
- **Migraines & chronic headaches**
- **Mitochondrial disease**
- **Miscarriages**
- **Multiple Chemical Sensitivities**
- **Multiple Sclerosis**
- **Parkinson's disease**
- **Poor wound healing**
- **Psoriasis & other skin disorders**
- **Schizophrenia**
- **Spina Bifida (neural tube defects)**
- **Unexplained Autoimmune Disorder**
- **Premature Menopause**