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DR Naturopathic Clinic, where I work, treats a single condition: Metabolic Syndrome (MetS). Now if you understand what MetS is, you understand that the above statement is not exactly correct. This is because MetS is not a single condition but a cluster of human woes that share a common cause. That cause is unknown but the cluster of woes is:

- A large waist (truncal obesity)
- Elevated triglycerides
- Decreased HDL cholesterol
- Increased blood pressure
- Insulin resistance or elevated fasting blood sugar

These are the big five signs associated with the syndrome as reported most commonly in mainstream medical articles. But MetS is much more than that, it is also associated with hypothyroid, atherosclerosis (hardening of the arteries leading to heart attack), gout and other inflammatory diseases such as deep vein blood clots. So you see, when we say we treat a singe condition, we are being a little misleading. The article below explains what is missing in mainstream thought regarding this important condition. It is my hope you enjoy it.

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Metabolic Syndrome

What is it, do I have it and if so, how do I get rid of it?

This article describes *Metabolic Syndrome* and my approach to its treatment. That approach is an integration of the mainstream bias and naturopathic medicine. I have written this article in two parts so the reader may better evaluate the approach with his or her own prejudices either for or against mainstream (allopathic) and/or naturopathic medicine. Allopathy is the treatment of disease with drugs and surgery. Naturopathy is the treatment of physiological imbalances using nutrition, lifestyle, physical medicine and pharmaceutical agents; both herbal and prescription.

Part I is my interpretation of mainstream literature doing my best to withhold alternative editorial. Treatment of metabolic syndrome in the allopathic model is included in Part I and, for many, this may be the best approach. If the allopathic model is required for more than temporary relief I recommend referral to a medical doctor because that is what they do.

Part II presents an approach to the cause, criteria, and treatment from a perspective alternative to the mainstream allopathic perspective. I, of course, prefer this alternative approach; I am after all, a naturopathic physician.

Imbedded in Part II are hypotheses, which are shamelessly my own. They are based on well-researched scientific principles but are hypotheses nonetheless. Evidence is offered in support that I believe you will find compelling and please find relief that the treatment of metabolic syndrome works with or without these hypotheses being proven with further research. Let's get started, shall we?

The answer to the questions posed in the title are presented in this article, but first a little back-story…

Back Story

Out of Africa

Seventy-four thousand years ago there were none of us. Fifty thousand years ago we burst out of Africa, travelling in all directions, surviving every environment. We have traveled to the deepest parts of the oceans, walked on our moon and sent wonderful machines to land on and report back information about our red neighbor Mars. Voyager has sent messages to us from the black edge of the solar system and beyond; the "Parker Solar Probe" has been launched on its mission to land on the sun! (You must be joking! Land on the sun?) We peer through our wonderful machines toward the expanding edge of the universe itself and our footprints have been placed on every part of the Earth. We are Homo *sapiens, sapiens* and we live under the surface of the oceans, in the skies above us and on every square mile of the Earth's surface. What manner of god are we?

We are Homo *sapiens sapiens*. Homo, meaning man or same, is the genus. The first *sapiens*, meaning wise, is the species, the second the subspecies. We are really quite young — only about 50,000 years old. Our immediate predecessors were Homo *sapiens idaltu* (idaltu means elder in the Afar language of Ethiopia) who, in their turn, descended from Homo *heidelbergensis*. Fossils of our *idaltu* ancestors dated to around 160,000 years before the present have been found in the Afar region of Ethiopia. They had skeletons just like ours, with the same volume in the cranial vault, which means Homo *sapiens idaltu* had the 86 billion neurons that we modern Homo *sapiens sapiens* have. However, tools found with these *idaltu* fossils are no more advanced than those of Homo *sapiens neanderthalensis* and there is no hint of art or music. In other words, *idaltu* could not innovate. They were not yet us, and yet 50,000 years ago, a mere 25,000 years after a disastrous change in the climate of Africa, *idaltu* became *sapiens.*

Seventy-four thousand years ago Mt. Toba, the enormous volcano on the island of Sumatra, produced one of the most catastrophic volcanic eruptions in Paleolithic history — blowing itself into the stratosphere leaving behind the largest crater-lake on the planet. The ash and dust diminished the sun's light and photosynthesis was compromised across wide swaths of

the Middle East and Africa. We Homo *sapiens sapiens* were not there to witness the catastrophe, but our immediate predecessors, Homo *sapiens idaltu*, were.

Before this eruption, there was a small out-migration of *idaltu* 100,000 years ago into the Near East and these poor souls must have perished from cold and starvation precipitated by the eruption. The remaining Homo *sapiens idaltu* population was reduced to 10,000 females of reproductive years all living in what is now Kenya — humanity very nearly came to extinction. Then, in less than 25,000 years from Toba's eruption, *sapiens idaltu* became *sapiens sapiens*, with musical instruments, improved weapons and tools, complex language and most importantly the ability to innovate. However, with our understanding of the time required by the rules of evolution this seems impossible and yet this is exactly what happened. This rapid change from subspecies *idaltu* to *sapiens* is called the "question of questions" in paleontology and named the "Great Leap Forward" by Dr. Jared Diamond in his book The Third Chimpanzee. As the surviving idaltu changed into sapiens, they slowly recovered population numbers. Then following this "great leap" *sapiens sapiens* began to emigrate out of Africa following in the footsteps of their *idaltu* predecessors some 50,000 years earlier.

This dual migration theory is generally accepted and the second human migration of 50,000 years ago left Africa as fully modern Homo *sapiens sapiens,* with all the cognitive skills we possess today, and immediately moved north and east into Eurasia and Europe. Another group of modern human Africans may have migrated east, and somehow made it across the Bab-el-Mandeb ("Gate of Tears") Strait between Djibouti and Yemen, then skirted around the Arabian Peninsula settling in the Near and Middle East. The lands into which they immigrated were shared by several species of pre-modern humans. It seems unlikely that we will ever know whether through violent conflict or successful competition, but about 30,000 years ago, our fully modern ancestors, Homo *sapiens sapiens*, were the only humans left on the planet. Within the blink of an eye *erectus, floresiensis, denisova, heidelbergensis* and *neanderthalensis* were all extinct — as we strode out of Africa in all directions becoming the masters of our world.

The extinction of the archaic human species left us the only mammals that use bipedal locomotion exclusively. Thus we radiated out of Africa in all directions, taking four unique attributes that allowed this to happen: (1) our precise mechanism of thermoregulation (which is why you are reading this), (2) precise control of muscles in the forearm and hand allowing delicate manipulation of tools, (3) bipedal locomotion and (4) the all important ability to innovate. So, why is this important to *Metabolic Syndrome*? Well, hang on, I'm getting to that.

Metabolism

The word "metabolism" refers to the chemical reactions that occur within a living organism in order to maintain life. These reactions usually involve breaking down compounds (catabolic reactions) usually releasing energy, or building up compounds (anabolic reactions) usually requiring energy. Each step in these metabolic reactions is played out on the surface of a series of specific enzymes. (An enzyme being an organic catalyst.) An enzyme can speed up a chemical reaction 10 – 100 times — occasionally as much as 1,000 times.

Metabolic Syndrome is a short list of woes arising from the slowing of these metabolic reactions caused by micro temperature changes within our enzymes. Had our ancestors had the wit to remain in Kenya, the syndrome very likely would never have developed.

Kenya, on the Equator, has little seasonal change, providing stable food sources, but when humans left Africa they settled in lands with seasonal changes and were confronted with times of food shortages. We know this from analyses of fossil bones from Cro-Magnon shelters in Paleolithic Europe. Within these fossilized bones were signs of hunger and starvation even in regions with vast animal migrations and an abundance of seasonally edible plants.

It is quite likely that a change in survival strategy evolved in people surviving famine. We can surmise from a study conducted by Claude Bouchard, a professor at Louisiana State University, which was reported in the *New England Journal of Medicine* in the early 1990's, that there are two strategies used by humans to deal with conditions when food is scarce. The study had subjects eating 1000 calories more than was needed to maintain their body weight and one of the findings was that subjects put on differing amounts of weight. Dr. Bouchard's study has multiple ramifications but the mind-blowing finding relevant to this discussion is that the participants who put on the least weight converted most of their excess calories to muscle while those putting on the most weight converted it directly into fat. The implication is that survivors of the Mt. Toba climate catastrophe had a single metabolic strategy: When food was scarce, convert calories to muscle so you can travel to where the food is. When people began to travel out of Africa to lands with seasonal changes in climate, a second strategy emerged: convert calories into fat so one can hunker down until food returns.

This second metabolic strategy could explain what diabetologist Richard Bernstein M.D., refers to as the "thrifty genotype," which Dr. Bernstein reports observing in his type II diabetes patients. The "thrifty genotype" runs in families (therefore the word "gene"), presents with lowering metabolism (with an attendant low body temperature), insulin resistance, carbohydrate craving, and fat distribution over the stomach — four criteria central to *metabolic syndrome*.

Before we proceed any further, let's take a deeper look into what *Metabolic Syndrome* is and discuss its history.

Metabolic Syndrome Part I

What is it?

There are a variety of different criteria from a variety of sources describing *Metabolic Syndrome*. The reason for the differences lies in the word "syndrome." If a cluster of signs and symptoms occurs repeatedly but the cause is unknown, the condition is called a "syndrome." If there are objective tests and the cause is known, the condition is called a *disease*. *"Metabolic Syndrome"* is a syndrome because the cause is unclear, however, the signs are fairly straightforward:

- Insulin resistance
- Truncal obesity (waist circumference of 37 inches or more among men and at least 32 inches among women (or there abouts)).
- A blood pressure level consistently 140/90 mmHg or higher.
- Elevated LDL (low density lipoprotein) cholesterol (considered bad though it isn't)
- Low levels of HDL (high density lipoprotein) cholesterol (considered good — and it is)
- Elevated triglycerides (the storage form of fats) in blood
- Elevated uric acid in the blood that can lead to gout (also bad)
- A tendency to suffer from inflammation, which causes pain and swelling in the tissues and can risk developing clots in the deep veins (and that's really bad)
- Fatty liver disease

But the cause itself lacks this clarity. In Part II, I will offer a plausible mechanism I think you will find compelling. Before we discuss what *Metabolic Syndrome* actually is, let us look at its history.

History

Risk factors associated with diabetes were noted in the 1920's. This form of diabetes would have had to be type I because the very existence of type II diabetes was unknown until Harold Percival Himsworth, a British scientist, differentiated type 1 and type 2 diabetes in 1936.

Hippocrates described the diabetic patient as "melting into a pool of honey." The Greek word diabetes means to "flow through" and mellitus means "sweet ". The physician making the diagnosis of diabetes, until early in the last century, made it by tasting sweetness in the patient's urine. (Thank God that was before my time.)

Glucose, the sugar used by cells to produce energy, is abundant from the digestion of carbohydrates in our diet and from glucose manufactured in the liver from amino acids. Specialized proteins in the cell membranes called GluT (glucose transporters) move glucose from areas of high concentration to areas of low concentration. When the concentration of glucose is in equilibrium between the glucose inside the cell and glucose in the fluid outside the cell, the GluT transports glucose both into and out of the cell equally. That is unless an enzyme called hexokinase slaps a phosphate group onto one of the carbon atoms in the glucose molecule inside the cell thereby trapping it. Another specialized protein floating in the cell membrane is the insulin receptor. When glucose rises in the blood, beta cells in the pancreas release insulin into the blood, which attaches to the insulin receptors in the cell membrane initiating the mechanism that activates hexokinase, which results in increasing the concentration of glucose inside the cell and lowering glucose in the blood.

The distinction between types I & II diabetes is in the amount of insulin produced by the pancreas. In type I diabetes the cells that make insulin in the pancreas fail and the lack of insulin allows blood sugar (glucose) to rise unchecked. In type II diabetes the insulin receptors become resistant and the pancreas responds by producing greater and greater levels of insulin to compensate for the rise in blood sugar until the insulin resistance

overwhelms the pancreas' ability to compensate. Either way glucose fails to enter the cell and we starve.

In the 1950's, once type II diabetes was recognized and its cause understood (more or less), the term "metabolic syndrome" was coined and came into common use in the 1970's, helped along by the work of other research. In France, Dr. Jean Vague associated upper body obesity with atherosclerosis[1] (occlusion and hardening of the large or tortuous (twists and turns) arteries). The term "metabolic syndrome" gained traction in 1977 when German physician Herman Haller used the term to associate obesity, diabetes, high blood lipids, a high uric acid level (predisposes to gout and kidney stones) and hepatic steatosis or fatty liver disease, and how these factors increase the risk of atherosclerosis. Then in 1989, New York physician Gerald Phillips described the same metabolic cluster with the wonderful phrase: "constellation of abnormalities." And so as medical knowledge traveled down this path, elevated blood uric acid and fatty liver disease were added to our syndrome. Then in 1988, the late endocrinologist Gerald Phillips of Stanford University put forward that insulin resistance alone could link this "constellation of abnormalities" and named it "*Syndrome X*" — a catchier name than *"Metabolic Syndrome."*

Treatment of *Metabolic Syndrome* in mainstream medicine is straightforward allopathic care. Allopathy is the treatment of the symptoms of disease with drugs and surgery. A central belief in Allopathy is that diseases cannot be cured so the best approach to a patient is to provide pharmaceutical agents that will manage the symptoms. Therefore, the treatment of Metabolic Syndrome is to prescribe:

- Blood pressure medications
- Statins to lower blood lipids
- Metformin to decrease insulin resistance
- Sulfonylureas and insulin to lower blood sugar
- Add to these a couple of medications to lower uric acid thereby reducing the chances of gout and throw in Coumadin to prevent blood clot formation

A recipe for vital good health.

Now having said all that, In the words of my Asian mentor, Sum Ting Wong, all this falls a little short in our understanding so back to the question: What is it?

Metabolic Syndrome Part II

Four factors stand out: (Remember these four factors, we will see them again later).

- Drop in metabolism

[1] Atherosclerosis, named by da Vince himself, from *Athere,* which in Greek means groats or porridge, *sklerosis* means hardening. In his human dissections da Vinci gave this name to the hardened nodules in blood vessels because the appearance reminded da Vince of hardened porridge. The name "atherosclerosis" stuck.

- Insulin resistance
- Carbohydrate craving
- Fat deposition

Let's take these one at a time.

First a drop in metabolism

If you have *Metabolic Syndrome*, you have a drop in metabolism with an attendant low body temperature. The signs and symptoms of low body temperature are those of hypothyroidism, which are many. I'll just list the most famous hits:

Fatigue	Lethargy	Depression
Constipation	Cold intolerance	Weight gain
Dry, brittle hair	Hair loss	Dry skin
Decreased libido	Puffiness around eyes	Increased LDL cholesterol
Atherosclerosis		

There are many more, but consider this: Thousands of people go to their health care provider every day complaining of some number of these unpleasant symptoms and every day thyroid blood tests are run, but in only 15% of cases are these blood tests positive. Think about that — 85% of people suffering the symptoms of hypothyroidism have normal thyroid function. That is what we call — a clue. This fact begs us to consider that the majority of the signs and symptoms of hypothyroidism are not caused by low functioning of the thyroid gland per se, but rather some other condition that in just 15% of cases is caused by hypothyroidism.

This other condition is the low body temperature that accompanies "low metabolism," and low body temperature is genetically coded, which is why heart disease, obesity and other chronic health conditions run in families. The drop in basal metabolism (metabolism when the body is at rest) with an attendant lowering of body temperature is found in people suffering *Metabolic syndrome* and has a deleterious effect on biochemical efficiency, which is the underlying cause of the "constellation of abnormalities." Herein lies the rub: The mechanism by which the human controls its metabolism is not understood. This fact is pointed out in virtually every endocrinology textbook; here is the text from mine:

> *"The rat, when exposed to cold, increases secretion of TSH. The resulting increase of thyroid hormone in the blood is taken up by brown fat increasing non-shivering thermogenesis. The analogous mechanism is not found in the human. In fact, the mechanism by which the human controls its metabolism is poorly understood."*

So what is the mechanism by which the human controls their basal metabolism? To understand this we first must discuss the mechanism that controls the metabolism in rats (and all mammals save us). The control of metabolism in other mammals is in the purview of the Krause corpuscle. The Krause corpuscle is a sensing organ at the end of "cold" sensory neurons distributed throughout the body. These neurons are dedicated to transmit a drop in

temperature to the hypothalamus located at the base of the brain. In other words the Krause corpuscle senses "cold." When the hypothalamus receives this transmission it releases stored thyrotropin-releasing hormone (TRH) that travels to the pituitary gland, which in turn releases thyroid-stimulating hormone (TSH). The stimulated thyroid gland then releases stored thyroid hormone into the blood, which is taken up by brown fat producing non-shivering thermogenesis. If this sounds a little cumbersome it's because it is. The problem for the developing human brain is succinctly stated in a quote from a paper written by Dr. Larry Crawshaw PhD, professor of biology at Portland State University:

> *"It is impossible to conceive of the human brain with its billions and billions of neurons and trillions and trillions of electrical connections having ever evolved in a thermally unstable environment."*

If Dr. Crawshaw is correct (and he almost always is), then the Krause corpuscle control could not deliver the thermally stable environment needed to produce a brain capable of composing the "Eroica symphony," landing a man on the moon, or developing a thermo-nuclear weapon. A different mechanism had to evolve and it did — in a crushingly short period of time — less than 20,000 years. This is far too short to allow evolution to develop such a mechanism from scratch. That leaves us with but a single conclusion: The genetic change that allowed our unique thermoregulation was a simple tweaking of an already existing complex system. A female in a small Homo *heidelbergensis* clan, very simply, produced a minor change in her genetics of hibernation.

How do I know this? In truth, I don't, I can't, no one even knows how hibernation works, but this much we do know:

- There is general agreement that humans have the genetics of hibernation and indeed all mammals share these genetics, which come from one of the few survivors of the meteor strike 66 million years ago that wiped out the dinosaurs. A small number of burrowing shrew-like creatures, plesiadapiforms, sporting strange teeth that could chew a variety of foods thus allowing excursions into ecological niches just vacated by the unfortunate dinosaurs made it across the K/T boundary. For the next million years — as Earth licked its wounds, the sky cleared, sunlight returned to the surface, and oceans replenished their bounty — these scurrying rodents ushered in the age of mammals. Hibernation genetics came with them. Over the next several millions of years, evolution developed over a thousand mammalian genera and tens of thousands of species. The fat-tailed lemur of Madagascar is a true hibernator and we share 97 percent of its genetics.
- Medical research is currently attempting to unravel hibernation genetics to help slow metabolism while treating serious illness and injury, as well as induce hibernation for deep space exploration. When I suggest we contain the genetics of hibernation, I am in good company.
- Humans, albeit young, are occasionally capable of being revived after modest lengths of time under cold water. I believe the record, set when I was still involved in emergency medicine, is of a young man whose snowmobile broke through the ice of a lake. He and his snowmobile were recovered after over one hour — he survived and recovered without

neurological deficit. Add to this that according to an FAA report, that since 1947, 25 high-altitude baggage and wheel-well stowaways survived out of 105 attempted. Recently, Yahya Abdi, a 15-year-old California teenager survived a 5½-hour flight in the wheel-well of a jet airliner at 38,000 feet. Having personally parachuted from a mere 24,000 feet, I can assure you that it's cold out there and there is scant air to breath at 38,000 feet. Abdi's survival has energized the scientific discussions surrounding human hibernation.

The mechanism controlling hibernation in any animal is not fully understood. Dr. Sheena Faherty, in her article published April 25, 2014 in *Scientific American* likens it to a series of switches that must be thrown in the proper order before the lights come on. It is widely held that all mammals contain the genes for hibernation and that these genetics came with our little shrew buddy following the age of the dinosaurs.

So why is this important to a discussion of Metabolic Syndrome? When a bear is preparing for deep torpor in winter, four factors stand out:

- Drop in metabolism
- Insulin resistance
- Carbohydrate craving
- Fat deposition

And please bear in mind that hibernation is a strategy of survival during inhospitable periods of weather.

Before the bear drops its metabolism to enter deep torpor, it develops a craving for berries and honey putting on a robust layer of fat and it actually develops type II diabetes. Professor Heiko Jansen at WSU is studying this phenomenon for a possible treatment of type II diabetes because when the bear comes out of torpor the diabetes vanishes.

The second of the four factors is insulin resistance.

Insulin resistance clearly has a central role in *Metabolic Syndrome*. Resistance in insulin receptors causes the pancreas to produce increasing levels of insulin, and elevated levels of insulin poison mitochondria, the powerhouses that provide us with energy using oxygen. The mechanism by which we convert our major nutrients — protein, carbohydrate and fat — into energy in the form of ATP (adenosine triphosphate) and heat was first described in 1937 by Hans Adolf Krebs and William Arthur Johnson and was named Krebs cycle. The enzymes controlling Krebs cycle are imbedded in the inner mitochondrial membrane. (There are two: an inner and outer.) In fact, *Metabolic Syndrome* is the poisoning of mitochondria by elevated levels of insulin so it may be helpful to have a short discussion of just what a mitochondrion is.

Mitochondria

The human body is made of roughly 100 trillion cells (70 to 1000 trillion cells depending on the author and the stage of development of the human, but the consensus seems to be 100 trillion in the adult). These cells are of the category "eukaryote" (with a nucleus) from the Greek meaning "true nut". In fact all mammals are made of eukaryote cells; ok, all animals are

made of cells called eukaryotes. For that matter, all plants, algae, and fungi are as well. All right, for the love of God, all complex organisms are made of eukaryote cells. Only bacteria, not having a nucleus, are of the category "prokaryote" meaning "before a nucleus". In the prokaryote, the genetic material is distributed diffusely throughout their length and breadth. In every other form of life (eukaryote) the genetic material is contained in the nucleus of the cell.

Every one of these eukaryote cells is packed with tiny organic machines, each serving a specific purpose. Collectively these tiny machines are called organelles and they float inside the cell membrane in an aqueous fluid called the cytosol. The cytosol with all of its organelles is called cytoplasm (I realize that you can live out a long productive life without knowing that). One organelle is called the nucleus that houses our DNA, another is the rough endoplasmic reticulum that is continuous with the nuclear membrane and the site of protein synthesis, and there are several others. The organelle we are concerned with here is the mitochondria, and every cell in our body has somewhere between 1000 to 2000, depending on the energy needs of that particular cell.

Mitochondria perform two tasks of paramount importance, those being the production of energy, and production of heat. It is only in the mitochondria that these tasks are performed using oxygen, and without the production of energy using oxygen, the original prokaryote cells would never have produced the energy required to form the complex organisms algae, plants, fungi and animals. Without mitochondria you would not be able to read this; in fact, you would not even exist. The fact that you do exist and are capable of reading is the result of a chance alliance, the probability of occurring so small that it has happened only once in the long history of our planet.

Mitochondria appeared in the theater of life three and a half billion years ago with the symbiotic amalgamation of organisms from two domains, Achaeabacteria and eubacteria, in an event that almost certainly should never have happened at all.

Our solar system coalesced roughly four and a half billion years ago. 99.9% of the material went into the formation of our Sun with the remaining 0.1% divided unevenly between the ~~nine~~ eight planets, their attending moons, and various other detritus whirling around the Sun. The primordial first billion years saw the assembly of atoms (following the rules of chemistry) into organic molecules until one molecule, most likely a primitive RNA, or a combination of RNA and DNA, developed the ability to self-replicate. When that molecule built a wall around itself the first cell was born and all life is descendent from that first cell — defining the cell theory of biology. That cell was a prokaryote and eventually developed into the domain "Achaea" or Achaeabacteria, most likely around volcanic vents on the ocean's floor where they still reside today. Another domain of prokaryotes appeared later, named eubacteria or true bacteria and for 2½ billion years, all of life on Earth was populated only by members of those two domains.

Oxygen, the most abundant atom in the Earth's crust at just under 50% (the second being silicone at just over 25%, third being hydrogen), was tied up in other molecules, the most numerous by far being water. A branch of eubacteria evolved into cyanobacteria, considered

to be a bad actor by everyone around them. Cyanobacteria (blue-green bacteria) developed the extremely clever ability to use energy from the sun to extract energy from hydrogen in water, releasing oxygen into the atmosphere, which annoyed all those around them. For most things oxygen is highly toxic, even for those of us that would perish without it. Air we inhale is about 20% oxygen but human physiology reduces that concentration to 2% for use in the cells. The air we exhale still contains 16% oxygen. Both the eubacteria and Achaea bacteria were happy to make ATP anaerobically (without oxygen), which is quite inefficient compared to aerobic (with oxygen) but was more than adequate for their needs. Even the cyanobacteria that were responsible for filling the skies with oxygen eschewed its presence. But then, something quite extraordinary happened.

One and a half billion years ago, a member of the domain, eubacteria, developed the startling ability to use this new toxic material to produce a nine-fold increase in ATP production over that generated anaerobically. This new bacterial powerhouse, through some inexplicable mechanism called endosymbiosis, entered and was trapped inside the cell wall of an Achaea bacterium. The issue from merging these two domains produced a third — the eukaryote, and this merger is the most important symbiosis of all time and the single most important reason that you and I have enjoyed the opportunity of existence.

Every cell in our body contains between 1000 – 2000 mitochondria depending on the energy requirements of the cell. Krebs cycle produces ATP (the energy currency of life) from the three major nutrients using oxygen. Humans can produce ATP from glucose outside the mitochondria, but only a little. It is only in the mitochondria that all three macronutrients — glucose, proteins and fats — are metabolized for energy and the production of heat in non-shivering thermogenesis. So, if you are thinking, gosh, if my mitochondria are being poisoned, I would have difficulty burning fat, you would be correct.

The third of four factors is carbohydrate craving

This is not the almost universal enjoyment of a morning pastry; this is a craving, not unlike the craving for alcohol by the alcoholic. That is not the only similarity. Once the alcoholic stops drinking and makes the difficult climb up on the wagon, the craving for alcohol diminishes to a survivable level, but if the alcoholic takes but one drink the tumble off the wagon is almost inevitable. The analogous scenario exists for the carrier of the "thrifty genotype." If the carbohydrate craving is overcome for a few weeks, it diminishes to a survivable level, but will come roaring back with that first piece of pie.

The fourth of four factors is fat deposition

One of the defining criteria for *Metabolic Syndrome* is truncal obesity — the deposition of fat around the middle. There is an apron of fat covering the intestines called the *greater omentum* whose cells never develop insulin resistance. And since insulin stimulates fat cells to take glucose out of the blood and turn it into fat, the *greater omentum* is only too happy to do so. The horror and challenge for those struggling with *Metabolic Syndrome* is that the lowered metabolism is not conducive to exercise and the poisoned mitochondria find it very difficult to utilize fat for fuel.

And that, in a nutshell, is *Metabolic Syndrome*!

This leaves us with two questions:

1. Do I have it? And if so
2. What do I do about it?

You will need to know if you have it, so the following needs to be accomplished:

- Medical history
- Physical exam
- Laboratory tests

Treatment

Once you have the diagnosis, the treatment is "mitochondrial rehabilitation" and though this is quite straight forward, it is not easy.

1. The primary goal is to lower insulin thus curtailing poisoning of mitochondria. To do this requires a low carbohydrate diet and the keto diet is ideal. Those with metabolic syndrome have the thrifty genotype and carbohydrate craving. That, therefore, is the reason for the "it is not easy" caveat above.
2. The secondary goal is to provide adequate liothyronine (T3), the active form of thyroid to support metabolism, raise the body temperature and make your biochemistry more efficient. This is a prescription medication taken once or twice a day.
3. The third goal is to provide the mitochondria the nutrients they need to aid them in their work.
4. The fourth goal is participation in routine exercise that you enjoy. One cannot beat the *Metabolic Syndrome* rap without frequent movement.

Accomplishing these four goals will, over time, right the ship, but to greatly speed up the process there are treatments that will help immensely:

- Because the creation of energy using oxygen produces reactive oxygen species (ROS), one needs to provide supplements that support the quenching of ROS.
- Enhance oxygen transport across cell membranes. Two techniques that are readily available:
    - Aerobic exercise while breathing high-flow oxygen (25 liters per minute)
    - Introducing ozone into the blood

Moving forward

The best chance of success is to find a health care provider who understands *Metabolic Syndrome* and can be your guide, order the necessary laboratory tests, provide natural supplements and prescribe thyroid and other medications.