Cellular Metabolism and Nutrition: A Powerful Model for Self-Healing

Transcript

Hello and welcome to the Institute of Nutritional Endocrinology's course on *Cellular Metabolism and Nutrition: A Powerful Model for Self-Healing.* I'm Dr. Ritamarie Loscalzo. I am excited to welcome you here to study the basics of energy, the basics of cellular metabolism and how that affects every function in the body, and how it affects the energy of the person you are working with. We are going to study the in-depth work of the cell, how it creates energy via the mitochondria, and how you, as a practitioner, can help your clients to increase their energy using nutrition.

Before we begin I just want to make sure that you are aware that the information I am presenting is not intended to replace a one-on-one relationship with a qualified healthcare professional. It is also not intended as medical advice. It is intended as sharing of my knowledge base and my clinical experience working with thousands of clients and patients, to you. It is in no way intended to replace medical care. If you are on any medications, or you are working with a healthcare professional that has prescribed those medications, just make sure that anything you decide to do or change in your current nutrition and health regime, is discussed with that professional.

As functional nutritional practitioners, you also need to be aware when you are speaking with your clients, that when you pass on this information, everything you are doing with them is education, that you are not diagnosing anything, that you are helping them to assess the status of imbalances in their body, and you are educating them about alternative ways to approach these that will help to restore their balance using nutrition and lifestyle.

When I think about energy I am not always talking about the type of energy where I feel really energetic, can go do this and that, run around the block and do all of this work. Energy is also energy on a cellular level, and that is what we're here to talk about. On a cellular level, if your cells are low in energy, or specific organs are low in energy, they are going to have malfunction.

I was speaking at a seminar that I was giving. It was a two-hour free seminar, introduction to health. Someone had come in just out of curiosity. She thought she was fine, but she wanted to see what I was saying. I said, “Okay, what is lack of energy?” and people would say it is more than that because if your cells are low in energy, you may be low in energy and not really know it. You may not think about it as low-energy because maybe you are running on adrenaline.

If you are getting a lot of skin breakouts, your skin may not have enough energy to do the healing and turnover. If you have constipation, the gut is sluggish. If you have slowed detox responses and every time you drink green juices you get a headache because your body can't detox fast enough, that's low-energy. Low-energy can affect all of the cells in your body. Low energy in your heart is poor contractility of your heart, an inability to really get your heart rate going during exercise; and same thing with lungs and sinuses and head, there are all sorts of places where you can get low-energy.

What things affect your energy? Mitochondria. The mitochondria are present in every cell in your body. They produce the energy for you. They take oxygen and sugar and they convert it into energy. What affects your energy? You have to have enough oxygen. What does that mean? You need to be breathing fully and not shallow breathing. You need to work on your breathing and respiration.

You can get oxygen in foods. Some foods are high in oxygen: live foods, a lot of green foods with chlorophyll carry oxygen. That goes into your system. Good clean air, that goes into your system. If you are indoors all day, you are not getting enough oxygen.

Oxygen is cornerstone as well as glucose. Glucose is plentiful. Unfortunately, sometimes it does not get into the cells because of insulin resistance. We will talk more about blood sugar imbalance for those of you who have not been through the B4 Be Gone program. Other things affect your energy levels: neurotransmitter imbalances, hormones imbalances.

Your immune system can be imbalanced and not have enough support. If your digestion is either sluggish or impaired, or your elimination, or absorption, is not working properly, that affects your energy. As well as impaired detox pathways. All of these things can affect energy. This is why, throughout the course of our time together, we will be breaking it down and going through each and every one of these parameters that affect energy.

Some of the causes of fatigue are exactly what we just talked about: imbalances in oxygen, neurotransmitters, hormones, mitochondria, immune system, digestion, and detox pathways. Hormones that contribute to fatigue would be thyroid and adrenal; but also sluggish liver, so the detox pathways are slowed down.

Poor digestion or eating foods that really harm your digestion, cause inflammation in your digestion causing sluggish digestion. That can cause you to be tired. When you are recycling toxins. When your immune system is not strong enough to handle all of the toxic assaults that come in: the parasitic, fungal and bacterial assaults. When it overreacts and acts allergically, that exhausts you. When there is autoimmunity going on, that exhausts you.

We are going to go into a little bit more about the mitochondria and the cellular metabolism because that is at the heart of all of this. I think when you understand this, all of the other topics are going to come through brilliantly.

Let's talk about cells. Inside of every cell it looks pretty similar, and outside it looks pretty similar. They have different functions based on where they are located. What you see in this picture, are these little round balls on one side and these little balls on the other, and in between are channels. That's how stuff gets in and out of the cell. You can see a protein molecule finding its way in, and the protein and carbohydrate chain making its way through. In between is what is called a lipid bilayer. That is made of fat.

You know how people say ‘you are what you eat’? It especially applies to your cells and the fats you eat. Whatever fats you eat become incorporated into the lipid bilayer. What you want it to be is rich in phospholipids and really high-quality, good structural fats. If you are eating a lot of trans fats, there is no way your body can create that. So fats are really important. Then there are channels. It is highlighted.

Those channels are where the nutrients come in and the wastes go out. On top of the cell on the top of the outside of the cell are variant receptors. There are receptors for insulin. There are receptors for thyroid hormone. There are receptors for estrogen and progesterone. Different parts of the body have different concentrations of the various receptors depending on the function of that cell. So it is important to have good cell integrity.

This is giving you more of a look of what is inside the cell. We have all of these various parts. The blue things with the swirly swirls, those are the mitochondria. They make your energy. They take the glucose and the oxygen that go in and they pop out ATP, which gives you energy. So it is really important that there are lots of them in your cells.

You can see on the outside where it says cell membrane, which is what we were just looking at on the previous slide. This is the up close of the cell membrane. Once we are inside the cell this is what you see: the mitochondria right there. The cytoplasm is not really liquid, but is a gel-like substance within the cells where all of the organelles float around. There are functions for each of these.

The only place that I really found anything good about the cells is in textbooks. I have this really cool textbook called *Advanced Nutrition and Human Metabolism*. So far I like it a lot. I found it for $17. It is a $200 textbook. I will put up the link to the name of the book. It is really good to have a reference book so you can look things up (with the Internet, it is not as critical as it was years ago). I will also put up the names of the authors.

It is good to have. If you already have a good nutrition book, even if it is old, it is okay because it is really about understanding the structures of things. If you have a *really* old textbook it may be out of date, and not have leptin or ghrelin or some of the hormones that has been discovered over the last 10, 20, or 30 years.

It is still really good to have a reference book, but nine times out of ten you can find what you are looking for on the Internet. I like having books that you can touch, and flip back and forth through the pages. It goes into a lot more depth than you need, but if you are the type that likes to have that depth, it is good for you to have.

We are here to talk about cellular metabolism. We are looking at the mitochondria, and we will give you a little bit of background about where you can go to find out more about the rest of this stuff. You could just Google each one of these things: lysosomes, Golgi apparatus, ribosomes. But we do not have time to go through all of this. We would be here for five hours.

I wanted to give you this picture because I really liked it. They have what is called the hydrophilic region, which is the water loving; and the hydrophobic region, which is the water fearing. It means that certain parts are attracted to water, and other parts repel water. It has a lot to do with how things are transported into the cell. It is important that things are able to be transported into the cell. Damage can happen from free radicals, chemicals, excess sugars, and other things from our food supply. They can damage our cell membranes. They can damage the layer of lipids in between the inner and outer layer of the membrane, and that is what will get you into trouble.

The powerhouse of your cell is this Mr. ATP. I took this from one of my presentations that I did for patient populations. The thing to understand about ATP, they are wonderful, we need them, they take the sugar and oxygen and convert them to ATP; but as a byproduct we get a lot of free radicals. It is really important when you are looking for your cells to be energetic, to create more energy, and when you are using and expending more energy; that you make sure you protect yourself from free radical damage: things like SOD, catalase and lots of others. They eat up a lot of your glutathione. It is really important that we have good antioxidant status, to have good ATP.

Here is good old Mr. Mitochondria. We have taken off the outside shell and are looking at the inside. These swirly things are called cristae: they are folds similar to folds we have in our intestinal tract. This increases surface area, and allows the DNA to expand and the activity within the mitochondria to expand. There is the outer and the inner membrane. The DNA is inside of the mitochondria and we have the ribosome, which is the RNA carrier. Then we have the matrix of the ATP where the Kreb's cycle takes place. It is actually called cellular respiration. We will look at that in a little more detail.

In your mitochondria you have the outer membrane, which is semi-permeable. It is made of phospholipids. Do you know what kind of foods contain phospholipids? It is really important to have good phospholipid content. This allows the passage of ions; ATP, which is your energy, adenosine triphosphate; ADP, which is a precursor to ATP, which is adenosine diphosphate and nutrients. Lecithin is one of your best sources of phospholipids.

Of course you need fats to make phospholipids, but it is a type of fat, it is a phosphorylated fat. They are really important for mitochondria function and also super important for brain function.

The *inner* membrane is permeable and allows oxygen, water, and carbon dioxide to pass through it. The cristae, the shelf like folds that are in the inner membrane, help in expansion of the mitochondria. Sometimes it really needs to expand because of the high amount of glucose and oxygen flooding in; it is as if you are running a marathon and you need more energy. There is also the *inter*membrane space. That is the space between the two, which is important for the transport from the outside to the inside.

First of all, you've got the foods that people are eating, then the nutrients that get into the bloodstream. The nutrients have to be able to go through the cell wall and into the cell itself. That includes glucose, amino acids, and some of the minerals.

What is the hormone that helps everything move from outside the cells to the inside of the cell? There is a particular hormone that helps nutrients and sugars go from the outside of the cell to the inside of the cell.

Once it is in the cell, it also has to be able to pass through the mitochondrial membrane and into the mitochondria. Again phospholipids are really important. Insulin, yes, insulin is the hormone that is important for the passage of nutrients from the bloodstream into the cell. You have to get nutrients from the bloodstream into the cell, and then you have to get the nutrients from the cell into the mitochondria. We're going to see shortly what some of those very important nutrients are to help with the production of energy that goes on inside the mitochondria.

Then we have the cytoplasmic matrix: a kind of gel inside of the DNA that contains the DNA molecules, enzymes, oxygen, carbon dioxide, and recyclable intermediates, which are basically energy shuttles: they shuttle energy from one molecule to the next to the next until they actually produce these buckets of energy that powers us; and then water. The cytoplasmic matrix is like the sea in which all of these pieces are floating inside of the mitochondria.

What are the functions of the mitochondria? The main function is cellular respiration. That is the term that is used for the production of energy from glucose. Actually, it is the release of energy from glucose. Glucose, which comes in as a six-carbon sugar, has all of this energy in its bonds. But you cannot do anything with it at that point. The glucose itself cannot be used for energy. It has to go through three stages of cellular respiration in order to have usable energy at the end.

Glycolysis is the first one, the citric acid cycle is the second one, and the electron transport is the third. Glycolysis is the one that does not require oxygen. It produces the net result from one molecule of glucose of two ATPs. It actually produces four ATPs, but it uses two of the ATPs to go through the process, so you end up with just two.

If there is a backup in the citric acid cycle (also called the Kreb’s cycle), for example, you do not have enough of the nutrients to help make it all the way through because you are low in B vitamins or amino acids or magnesium, or you are low in oxygen (meaning you are in an anaerobic exercise state, you are not exercising aerobically), you only create two ATPs from each glucose.

That is inefficient and is why you get tired so quickly. When you get up to that really high maximum level and you cannot get enough oxygen to exercise, you do not get enough energy and you have to stop. That is why you hit the wall.

The citric acid cycle is pushed into the electron transport chain and that is where you need nutrients like CoQ10 to produce the ATP from the NADH, which is also another energy source that we will look at that shortly.

Other functions of the mitochondria are: cell signaling, managing apoptosis: controlled cell death. As the cells get to their natural end-of-life you want them to die off. You do not want these old ragged cells that don't function anymore to still sit there in your body. That is a source of toxicity and pollution. So it manages controlled cell death. Another function is controlling cell cycle: the regulation of detox versus metabolism and nutrients. It also monitors cell differentiation meaning the cells themselves are going to reproduce and differentiate into the grown-up version of the cell in growth and development.

Let's focus on cellular respiration. We start out with glucose, which is a six-carbon sugar (my understanding is it is not in the heart of the mitochondria). The enzymes in the cytoplasmic matrix initiate glycolysis. That six-carbon glucose is oxidized down to two molecules of a three-carbon sugar, giving us two molecules of ATP, two molecules of pyruvic acid, and two molecules of NADH (nicotinamide adenine dinucleotide). That is a niacin dependent substance. You have to have niacin: the nicotinamide is from niacin. If you are low in niacin, which is one of your B vitamins (which a lot of people are because they eat a lot of processed foods), then you cannot make enough NADH to fuel the next part: the Kreb’s cycle (the citric acid cycle). The whole point is to carry electrons to the next stage.

Stage two is the citric acid cycle, and I have a couple of good pictures. You will go ‘ahh help!’ It is worth studying and looking at them. You are not going to memorize them for long. If I give you a test you will memorize them for the test, then you will probably forget them as soon as the test is over. But you will get the general idea of it, that nutrients are important, and why it is important to understand this. It is also known as the Kreb’s cycle.

Those three-carbon molecules that have been produced during glycolysis are converted into acetyl compounds: Acetyl CoA is one of them. The intermediate of this produces ATP and NAD plus FAD (flavin adenine dinucleotide). These are some molecules that can be fuels in and of themselves, and they are produced as part of the cycle.

Remember we talked about the intermediates, the transporters: they are electron transporters because these electrons go through a cycle to come out the other end as energy molecules. I'm glad I did not have to design is.

Stage 3 is the electron transport where there is a series of electron carriers generated in the membrane of the mitochondria that comes from the Kreb's cycle. I believe what happens is: the Kreb's cycle takes place inside the heart of the mitochondria, and then in the membrane the electron transport takes place. The ATP molecules are created and it produces 36 ATPs. If you look at the very top, this is Acetyl CoA. Up here is where glycolysis produces the Acetyl CoA and two ATPs. Then those two ATPs can get burned or put into the cycle. These are the names of the molecules. This is two-carbons, then you have six-carbons, then it changes as it goes through the cycle.

You will see it in more detail in the next chart. It goes from citric acid to isocitric acid. Then it needs niacin in this step, it gets carbon dioxide produced which is a waste, then it produces NADH, which can be a fuel in and of itself, and it can be helpful for cellular metabolism: in fact it is sold as a supplement for that purpose.

Then you go into alpha-ketogluterarate (alpha-ketogluteraric acid). That is another substance that is taken as a supplement. When you take these substances you fuel this electron transport Kreb's cycle (citric acid cycle). Again you have carbon dioxide as a waste, and you have more NADH produced. Then it goes down to succinic acid, GTP, and FAD. FAD is flavin adenine dinucleotide. It is fueled by vitamin B2 (riboflavin). So you need to have adequate B vitamins. (Note: FADH is the reduced form of FAD)

Then if goes down to fumaric acid; then malic acid, which is another supplement that is given a lot with people who have fatigue. When you see some of these supplements now you will understand that they are Kreb's cycle intermediates. That is why they say they are good for energy production. NAD comes in a lot. Niacin is really important. Then it goes into oxaloacetate, and then it goes into the electron transport chain. The next picture will show you better detail. Before we go into the next picture let me tell you about the nutrients needed for ATP production.

You need to be able to get all of those two – three-carbon glucoses produced from the first part, the glycolysis, through the cycle. If you are missing any of these nutrients you will be in trouble. Vitamin B3 is niacin-dependent. That is nicotinamide adenosine dinucleotide hydride (NADH). Hydride is when they add on an H (hydrogen) to it.

Flavin adenine dinucleotide (FAD) is made from riboflavin (B2). There are a number of amino acids you will see in the next picture that are required for the Kreb's cycle intermediates to take you through. CoQ10 is important in the last stage: oxidative phosphorylation or the electron transport chain. Magnesium activates many of the nutrients throughout the steps of the cycle. Carnitine shuttles fat into and out of the mitochondria, which is important: you need to be able to burn fat for fuel. Ribose fuels the Kreb's cycle.

Let's look at this in more detail. This is where we come in from glycolysis. Glycolysis provides the acetyl CoA. There are byproducts and toxins produced all along the way here. So we go to citrate, then in order to do the conversion from cis-aconitatego to isocitrate, we need cysteine and iron, they are really important. To go from iso-citrate to alpha ketogluterate, we need vitamin B2, magnesium, and manganese. You will see here the NADH is on the other side. The first one, it just showed it off to the side but here we are showing you how this NADH actually goes down and fuels the electron transport and the final process. So you are feeding that NADH and using it.

That's why some people will take the NADH. In case they are deficient in some of these steps it helps them to fuel this a little bit better.

When we go from isocitrate, in addition to the B2, magnesium, and manganese, in order to gets down to the next level we need glutamine, histidine, arginine, proline, and glutamate. These are amino acids and they help you to produce alpha ketogluterate.

We have a number of B vitamins that we need to go to the next step, which is Succinyl CoA. We need B1, B2, B3, B5, and lipoic acid. Then we also need leucine, isoleucine, valine, and methionine. You can see the importance of taking amino acids or having efficient protein digestion so you can produce amino acids to having your electron transport chain work. Then you need more magnesium to fuel the succinate. From succinate we go to fumarate and produce FAD, which is the flavinoid that is B2-dependent. You see the B2 right there. That FAD goes back and fuels the final production.

Then we have fumarate, which needs threonine and phenylalanine. You can see why I listed amino acids because just about all of the essential amino acids and some nonessential ones are important in this chain. Then we go to malate and again we need B3 to produce the niacin, the NADH, and aspartate to get to oxaloacetic acid and back out here, back around, so this is the recycling, and this is the actual production CoQ10. CoQ10 is really important.

You don't have to memorize everything, but understand how they are produced, why some of these supplements are sold, and why people are told that they help with their energy. Of course we want to really fuel and feed the mitochondria and keep them from being damaged. Mitochondria are very delicate. This pathway can get very sluggish. You know what that feels like, your brain can't function, your body can't function, and you don't have enough energy to make it through the day because you can't make enough ATP. We damage our mitochondria daily.

The difference between us, and practitioners that push supplements, is that we know how to work with food, and we're going to be learning a lot more about how to work with food. It is a really important piece. There are a lot of functional medicine doctors who are out there and telling people to take some amino acids, take some NAD, take some alpha ketogluterate. But they are not sitting down with the person and saying, "you know, if you keep eating that bread and the pasta and the sugar and the Cheetos, you cannot fuel the cycle, and you are actually damaging the cycle." It will get to the point where if you keep damaging the mitochondria no matter how many nutrients you throw at it, if they are broken they are not going to work properly.

As I said before, the mitochondria produce a lot of free radicals. They produce superoxide. Superoxide dismutase (SOD) is the antioxidant that helps to protect us and break down the superoxide radicals. Superoxide radicals are super damaging. Glutathione helps protect us. There are a lot of free radicals that are produced and it is really important that you protect yourself from free radicals. The nutrients that are important are: zinc, selenium, vitamin C, vitamin A, manganese, copper, and sulfur-containing amino acids including cysteine, methionine, and the things that help you produce more glutathione (the master antioxidant). When you are talking with people make sure they are eating a whole food diet.

In addition we saw all of the nutrients that are required for inside the Kreb's cycle. If people are eating Wonder Bread, not only are they not getting enough B vitamins, but also the Kreb's cycle is just taking whatever it can find.
If you are constantly having a diet that's low in B vitamins, it will say 'okay I found some here' but it is stealing various B vitamins from different parts of your body to the point where it cannot get enough. Then that cycle just stops and it builds up with toxic intermediates and a lot of those toxic intermediates cause free radical damage.

Free radicals come out of the Kreb's cycle anyway. If, in addition, you eat a depleted diet, it will be low in antioxidants, you will not have enough energy and fuel to go to the Kreb's cycle, and you will not have enough of the B vitamins, amino acids, magnesium, manganese, and CoQ10. So you produce all of these free radicals and you don't have the nutrients to deal with it. You need to eat enough foods that are high in these nutrients, and counsel people to get these supplements if they need them.

What do you do to protect your mitochondria? You really have to keep your sugars balanced. Too much refined sugar, including grains and flour products, throw off the sugar balance as well as not providing enough nutrients. You need to be able to get a lot of the co-enzymes that are needed such as B vitamins, B5, B6, B3, and B2, really important.

We need to be getting enough antioxidants and these are in your really colorful veggies and herbs and wild greens they are loaded with antioxidants and flavonoids that help protect. You need to keep your fats in balance. We saw in the lipid membrane, that for in order for the channels to be open and allow the nutrients in and the waste products out, we need to have good fats. If we are eating hydrogenated fats, if we are eating heavy duty saturated fats, heated fats that are loaded with free radicals and oxidized fats, then that is going to cause damage to those cell membranes and then we become those cell membranes which means that you are not going to get the transport in and out that you need and it is going to damage the mitochondrial membrane as well.

I really will strive to have everybody on a whole foods diet with lots and lots of vegetables and avoid the environmental toxins. What are those? As much organic foods as you can but also what you do around the house? Have people look at that, and we will be going through modules about that as time goes on in the program because those environmental toxins, air fresheners that they spray in the air, and pesticides that they use on the lawns, or the perfume that they put on their bodies, and the products that they put on the skin to keep it moist, you don't need all of that stuff, you can just use coconut oil on your skin, it provides much better nutrition to the skin and it does not have all of those toxic chemicals. So avoid those things because they poison the mitochondria.

Certain medications poison the mitochondria. Caffeine poisons the mitochondria. Alcohol poisons the mitochondria. Certain medications like aspirin can poison the mitochondria and if you want a complete list just go Google 'what poisons the mitochondria'.

Why do we want to prevent the free radical damage? Because the free radicals basically cause rusting of our cells which leads to more free radicals which leads to more rusted cells which actually damages your DNA. If your DNA is damaged inside of the mitochondria, especially if damaged DNA is not able to produce more healthy mitochondria, it is not going to be able to create a blueprint for healthy mitochondria.

It is going to damage the cell membranes, the free radicals. They are going to create oxidized cholesterol, which lead to stiff arteries, which can lead to wrinkles. Oxidized cholesterol and oxidation can lead to wrinkles and it can lead to brain damage, which can lead to depression, dementia, brain fog, etc. So we really want to control the free radical damage. Design a little handout to give to people that says these are all of the things that happen during free radical damage, and these are all the things that cause free radical damage. “So let's get you motivated, which of these things are you going to start with first?”

Here is a list of things that can damage your mitochondria. Sugar, just plain sugar because you don't have enough of the nutrients to make it all the way through the Kreb’s cycle, you get buildup of the toxic intermediates. Trans and heated fats, we’ve already talked about that. MSG (monosodium glutamate) is very, very damaging to mitochondria; as are pesticides, and preservatives and artificial flavorings that are added to your foods. It’s best if we stay away from foods that come in packages and we teach our patients and clients to eat foods that don’t have labels to read. How do I read a label? First of all we should be eating foods that don't have labels.

There are a few exceptions. There are some good raw food crackers that come in packages. Sometimes people are in a hurry and they will look for a can of garbanzo beans, but it should just say garbanzo beans on it. It should be very simple ingredients. All of those artificial flavorings, preservatives, and pesticides are damaging to your mitochondria. When you damage your mitochondria you are damaging everything, because if the mitochondria cannot produce energy in your liver, your liver will not be able to detoxify.

If the mitochondria cannot produce energy in your adrenal glands, they will not be able to make adrenal hormones sufficiently and your adrenals will develop fatigue: adrenal fatigue.

Processed grains, like the sugar, are depleted of all of those nutrients that your body needs. Acid forming foods and inflammatory foods: inflammatory foods are usually those fats that cause an excess production of arachidonic acid. We will look at inflammation shortly. Cortisol is one of the biggest killers: it damages everything. Meanwhile we are running around 24/7 worried about everything.

Then everyone says “Okay, let's move on to the really heavy-duty stuff in the course, we don't need to spend so much time on the stress.” But we do need to spend so much time on stress management because excess cortisol levels damage everything. They damage the mitochondria. They damage the thyroid receptors on your cells. They cause excess sugar to be released from stores and that causes excess insulin, which ends up damaging insulin receptors on the cells, which ends up damaging your blood vessel linings.

So cortisol is big. We need to really learn to manage it. Listen to people. This is what I would encourage you to do since you are going to be, or are already working with people: I would like you to start listening to the tone of their voice. The tone of the person's voice alone can tell you if a big part of their problem is caused by cortisol. There is an edge to the voice.

It is kind of an irritability, kind of a skepticism, just kind of an edge versus, you know when you are talking to somebody and they just have so much love in their voice and they just have so much caring in their voice, it is really different. You can hear cortisol. I have never said that to people before but you can actually hear cortisol.

Cortisol sounds like this [speaking loudly and abruptly] “Why are you telling me that again?” “Okay I will do it. Is it going to work?” That is cortisol. Learn to hear it and then learn to defuse it and learn to talk to the person. Calm your voice down when you're talking to people. A lot of times I hear people say, “My husband does this all the time. I will hear him with an edge on his voice talking to my son. I will say, ‘what is with the edge?’ He will say, ‘this is the fourth time I've told him’…” hmmm, okay, so the fourth time, the fifth time, we all reach our thresholds, but the point is it is not good for us.

Just in mimicking I felt that surge throughout my body, I felt that rush. You learn to feel it when you learn to calm yourself down. This is where teaching people to meditate, to do heart math, to do yoga, to tap, to do EFT, to do things to defuse the cortisol levels, it is really important. Exercise is also good for cortisol. If you get really frustrated and upset, exercise to burn off that extra sugar that the cortisol just caused to be secreted.

When you are working with people to reclaim their energy, these are all of the areas (see slide) for *Restoring Your Client’s Energy*, and we will be going through each and every one of these throughout the course of this program. You need to be able to know, when you are working with somebody, what is the best place to start? Somebody comes in and they are eating this beautiful organic diet and maybe there are one or two things off with their diet.

Yes, you can tell them to fix those one or two things, or you could look for the big rock, the big thorn that is causing the problem.

As I have been working with people I realize that someone may come to see me and their main problem is headaches. I will maybe do some work with them. I treat them with acupuncture and food things. Then they get better. They tell their friends and then their friends come to see me because they have headaches. Then I start working with them on stress and food and maybe some herbs and they will say “how come you are not doing the needles like you did with my friend?” I say, “Because that is not where your main problem is.” Yes, everybody could benefit from needles but there is just so much time you can spend with people and there is only so much money they have to spend on themselves and time they have to spend with you, that you have to pick which thorns to remove first. You've got to pick the big thorn out first to get the person comfortable, and then you can work on the other thorns.

It's going to be different from person to person: it is the food, the environment, the toxins, movement, rest, thoughts and attitudes, the structure, and energetics. What does that sound like? It is another way of putting the seven pillars that I talked about over the years. I made the slide a couple of years ago and put it in here so you could see it. The seven pillars could be made to spell the word vibrant. How cute is that? We played around with the words a little but it is basically the same idea.

One last section of the cell that I want to talk about today is in the membranes of the cell. This is in particular the mast cell that has a lot of these inflammatory mediators. Mast cells get involved when there is an assault on the immune system. If you've got hay-fever and there’s pollen, and you are allergic to it, it gets into your nose and causes all of these mast cells to be activated and create all of this inflammation. They basically produce a lot of histamines, which then cause the attack and then you get sneezy, weepy, and runny eyes. But inside of this membrane, and you may recognize this slide from a presentation I did for you during the inflammation presentation when we talked about fats and inflammation, I created a presentation that went through this and this is taken from there.
They produce pro-inflammatory agents. Pro-inflammatory means for inflammation, they produce inflammation. You probably remember this chart as well. This is your inflammatory cascade, which is going on inside your cell membranes.

It takes the fats from your diet. The left-hand side is your omega-6 side and then the other side is the omega-3. Alpha linolenic acid (ALA) is omega-3, and linoleic acid is omega-6.

You've heard me say it before: we want to keep a balance between the threes and the sixes, because what is happening inside your membranes is this inflammatory cascade. If you've got plenty of the threes, which are anti-inflammatory, it goes through this prostaglandin (PGE3, PG13), which is anti-inflammatory. It produces a lot of nice firefighters and it puts out the fire. So you get injured, firefighters come along, they put out the fire and the injury gets healed.

If you have just the right amount of omega six, it goes down to the GLA, then DGLA, then this other prostaglandin (PGE1), which is anti-inflammatory and that is a firefighter. But if you have too much of the omega six, it goes down to DGLA and it gets converted to arachidonic acid. The arachidonic acid is what produces the fire (and you can see that down here). You can also consume arachidonic acid. It is in foods like meat and meat products, and poultry and eggs, and also in peanuts.

A lot of people are high in it because of what they eat directly, but they also eat too many omega-6s. Too much soybean oil, corn oil, sunflower oil and the nuts and seeds themselves. I provided you in that lesson on fats, with a chart where you can monitor yourself and then use the chart with your clients to see how they balanced out. Maybe they need to substitute some of the sunflower seeds they are eating for hemp seeds or chia seeds or flax seeds, or eliminate them altogether. It is a really great way to do it. This is all happening in your cells. It is really important that you have the right balance of fats to prevent the inflammation, which will destroy cells.

We know that with drugs they intervene at just a few points. Non-steroidals stop the production of one of these thromboxanes without the other leukotriene being affected. Also the NSAIDs and steroids too will kill the conversion of ALA to EPA. If you eat a lot of chia seeds, flaxseeds, etc. and you are expecting to be able to make enough EPA, and you are also taking NSAIDs like Tylenol or Advil, or you are taking steroid medication, it is not going to happen. With steroids or with NSAIDs, people need to be told that they need to increase their EPA and also their DHA intake because you are interrupting that conversion. The steroids are more potent because it interferes with this pathway further and kills both sides, whereas the NSAIDs will only kill one side.

When you look at nutritionally intervening, you see the beauty of using nutrition. We talked about the cell membranes and the mitochondria and how it is important to have all of these nutrients in there. Well take a look at some of these nutrients: they are the same ones. We keep the inflammation down; at the same time we are supporting our mitochondria and the Kreb’s cycle. We go from alpha linolenic acid, from flax seeds, chia seeds, hemp seeds and

walnuts, gets converted down to EPA and DHA, which are found in marine lipids, in algae and in fish. That works at enhancing the call pathway, which decreases the fire.

Same thing in the middle (of the chart). This enzyme is called delta-60-desaturase, the one that converts from alpha linolenic acid to EPA and from linoleic acid to GLA. If you have all of your B vitamins, especially the B3, B6, and B12, and you've got vitamin C, E, zinc, magnesium, and biotin, then you will be able to do that conversion effectively. But if you are deficient, if your person is coming in and they say, “well I just read this thing that somebody said, there is no big deal I can eat white bread instead of whole wheat bread… “ I would say you should not be eating bread at all because it is inflammatory. We have to look at where they get their nutrients. If they eat a lot of processed foods they will not get these nutrients and they will be inflamed.

The other things that are really helpful are some of the herbs like curcumin (which is tumeric), ginger, and bioflavonoids like quercetin, onions, and garlic. There are all sorts of bioflavonoids in the rinds of the citrus, and the inner white pith of the citrus is loaded with bioflavonoids. Tomatoes have lots of bioflavonoids, so do red bell peppers. You can eat bioflavonoid-rich foods like ginger and vitamin E, which you can get in non-rancid nuts and seeds. EPA you can get from algae and fish, as well as zinc and selenium. This is how you modulate the function of your cells through nutrition. This is the inflammation pathway.

We looked at the mitochondrial pathway. It is a powerful combination that we have here. There are no drugs that can do this. These drugs are just interfering at one different place in the pathway and creating imbalances in the wake. You have the most powerful medicine that you can offer. Of course, if you are working with somebody and they are on medications, you would not advise them to go off their medications and start to eat onions instead. You would work with them and work with their doctor. You have to be careful about the lines that you cross. This is the most powerful medicine, the most powerful medicine that you can get into.