Advanced Clinical Focus: Detoxification and Biotransformation
Transcript – Class 1 Part 3

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Moving on to talk about sources of toxins. Where did these things actually come from? In order to avoid them, in order to make sure they're not entering our body, we need to know where they're coming from, and this is something that most people don't know or realize. I've been in so many cabs, where they have that little thing hanging, which is like the tree with the smelly stuff in it or the little smelly thing on the vent. And I've sort of made it my policy that whenever I get into a cab, and they have one of those, to let the cab driver know that those things are toxic. And I don't think one of them has actually known that that's toxic. We just think this is normal. So just a little example, but we're going to go on to see many more examples as we go through this section, and dive a little bit deeper into toxicology as well.

0:57
So a few facts to start us off. Firstly, in a study conducted by the EPA, Environmental Protection Agency, benzene derivatives were found in 98% of subjects. So I've already talked in great detail already about the ubiquity of these toxins. They are everywhere, and they're found in pretty much everyone. Febreze is another one of those examples of something that people think is okay, but is actually toxic. And they have these commercials where people are spraying Febreze all over the place to mask bad odors, like dogs and animals and kids and whatnot. Let me ask you this question. What does clean actually smell like? Think about it for a moment. When something's clean, when something's washed, when there's no bacteria, mold, or anything growing on it, what does it smell like? And if you really think about it, you'll realize that the answer is nothing. It smells like nothing; there's really nothing to smell, there's no scent. So clean should not smell like lemon, clean should not smell like orange or perfume. Clean is just nothing. And if it's not clean, it's going to smell, and then we have to actually clean it properly.

2:20
The average woman uses 12 different personal care products per day. This exposes them to 160 chemical ingredients daily most of the time before they even get out of the house. So they go into the shower, they clean themselves. And then they go and put on all these products, which is actually putting more toxins on the body. There's a great book called There's Lead in Your Lipstick and the title really says it all. 75% of all brand name cosmetics contain phthalates, chemicals that have been strongly linked with hormone disruption. And we're going to explore a little bit further on in the course how these chemicals actually affect our body.

3:06
One of the ways is that it affects the whole endocrine system. So many of these companies, their goal is to make money and to make products that work. And phthalates, for example, make foundations, lipsticks, powders and things like that creamier, which gives it a much better consistency, but that's associated with more toxins. There are over 75,000 chemicals approved in the US now; I've cited 80,000, I've seen 85,000 and other places. This was this study was published in 2011. Every year thousands of new chemicals are being introduced. I've spoken about the wonder chemical Roundup, and how we make corn that is Roundup Ready, where we've altered the gene so we can spray as much of that chemical as we want on to the food and it won't die. It'll be fine. So we've introduced pesticides, herbicides, fungicides, larvicides, all these different 'cides' right onto our food supply. Not even onto our skin but right into the stuff that we consume.

4:19
Low Level lead exposure can result in serious mental and behavioural problems. Leads most insidious effects is its poisoning of the development of the nervous system. Way back in the day, there were lead levels that were astronomical. One of the reasons why this was so was because the lead was in gasoline and it was being released into the environment. That's why now we have unleaded gasoline. Lead is toxic and they actually don't know a level that isn't toxic. Back in the day many years ago, they had a pretty high level set as the set point for toxicity. And they've been decreasing it all through the years as they realize that lower and lower dosages are damaging. As I mentioned, there's a great book called There's Lead in Your Lipstick, and it's true, there is lead in lipstick.

5:24
People who have trouble detoxifying are more prone to cancer. Now, mold fungus, yeast, parasites, and cancer, don't like to live in very clean environments with lots of nutrients. They thrive in dirty environments. You can think about a pond. If you look at a pond that is spring fed, and that maybe has an outgoing river from that where there's this constant flow, you see that the pond is nice, it's clear, it's swimmable. There are fish in it, it's lively. But then if you see a pond that is stagnant, where toxins have accumulated, there's lots of algae, it's kind of gross, you wouldn't really want to swim in it. That's what our body is like. It's either a nice clean environment with stuff coming in and moving out, or things become stagnant if you have trouble detoxifying, and it creates an environment that harbors disease, that harbors, bacteria, fungus, parasites, all that can create byproducts that can even promote cancer. And also these chemicals, when they accumulate in the body, they create more inflammation and inflammation is known as a cancer promoter.

6:45
In addition, a lot of these chemicals are direct carcinogens themselves. For example, benzopyrenes are carcinogens, which will promote cancer growth. People who have trouble getting these things out of the body will be more prone to cancer. And a wonderful example of this is with smoking. There are people

who smoke two packs of cigarettes, and they live to 110, and there are people who smoke two packs of cigarettes a day, and they live till 40 years old and die of lung cancer. And it's all based on our ability to detoxify and clear those toxins out of the body. The average American has 91 chemicals in their body; these things are unavoidable. The Environmental Working Group has done tremendous research in the area, looking at different samples. This was a sample of nine random Americans and seeing which chemicals were in them and what systems they actually affect. So that's quite an interesting study on how these different chemicals are working on different body systems. So again, they're everywhere, just to really drive that point home.

8:00
Where do toxins actually come from? There are two main places where we can find toxins if we categorize it. The first are endogenous toxins, and endogenous toxins are toxins that are made inside the body from within. This comes from normal metabolism and various biochemical reactions, which we'll talk about in a moment. And then we have exogenous toxins, or sometimes toxicants, and these are both naturally occurring and synthetic. So exogenous toxins are toxins that are coming from outside of the body and having an influence inside the body. So we've got endogenous inside and we've got exogenous outside, we're going to hone in on both of them in a bit more detail and explore them.

8:57
Let's talk about endogenous toxins. Here's a bit of a list as to where they may come from. So firstly, we have byproducts of intestinal microorganisms. So we've got endotoxins, endo referring to the digestive tract and toxins. We've also got lipopolysaccharides, and these are toxins that are created by the bacteria in our gut as they process food, as they process various chemicals, and they have byproducts, which are toxic to us. Luckily, we have a very strong barrier in there, and our cells are tight together, held together through tight junctions, something that we discussed in detail in the Advanced Clinical Focus on Digestion and GI Health. But our gut is our protective barrier to make sure a lot of these toxins (we have about 5 grams in our gut), don't go systemic, don't go into the bloodstream and cause issues in the peripheral tissues. As long as our gut is intact, we should be free from being exposed to a lot of those chemicals.

10:06
We also have intermediate metabolites that are created. So intermediate metabolites are chemicals that are created as they move through Phase I, and Phase II liver detoxification. There's actually a point right in the middle after the toxins have been acted on by Phase I detoxification, it gets converted into what's called an intermediate metabolite, which can sometimes actually be four to five times stronger than the original toxic. Then you might be thinking, well, why would our body do that to us? We're going to go into a lot more detail as to why that's a critical process in detoxification when we get into the liver section and discuss liver detoxification in more detail. For now, understand that part of the liver detoxification process, we can actually create toxins that are stronger than

the original toxin. If we don't have the appropriate mechanisms in place to protect us from those toxins, they can cause damage.

11:11
We also have non-end product metabolites. So chemicals from our metabolism that may not be end products, may be mid range products, but can cause harm if they get into much higher levels, and an example of this is homocysteine. So when we eat protein that contains the amino acid methionine, we break off that amino acid and methionine will convert into something called homocysteine through methylation. Homocysteine now has two options, it can either go back into methionine, or can go into cysteine, and we need specific nutrients in order to do that, like B 12, folic acid and B6. These are very important methylators. If we don't have those nutrients and adequate stores, that homocysteine can build up to levels that are much higher than our body would be happy with. When homocysteine gets up to higher levels, it can actually cause damage to tissues because it prevents collagen from forming properly, and that's actually part of the beginning process of atherosclerotic plaques building up. So interestingly enough, we can look at these markers like homocysteine as an indication for possible cardiovascular events, for example.

12:40
There are other non-end product metabolites as well; another is methylmalonic acid that can become toxic if we don't process them through. We also can have hormonal overload. So hormones are wonderful messengers; we just live in a chemical soup, everything's a chemical. And hopefully, that chemical soup tastes really good, which would equal health, but we all have these chemicals doing different things. We've got these great messengers, which can communicate within organs and glands, but can also communicate between organs in glands, and these are hormones. When a hormone is produced, it needs to go do its job at the site, and then be processed, detoxified, and eliminated. If those hormones aren't processed appropriately, they can build up to much higher levels. When they do, we can get an imbalance in our hormonal system and those endogenous hormones that we're creating, create an imbalance in the body.

13:49
We also could be exposed to free radicals in the body. We always see talk about free radicals from toxins and things out there, but we actually make free radicals in the body. In fact, free radicals are a very important mechanism for killing viruses and killing bacteria that we find in the body. Our white blood cells will make free radicals to kill those things, but we also have to have antioxidants to neutralize some of those free radicals. Yes, we can make free radicals in our own body.

14:22
Something that's not discussed as much in biochemistry, but is critical and very important, are toxic emotions and toxic memories. So for example, say we've had a traumatic event at some point in our life, and we haven't done work to get

through that or to process that appropriately. Well, every time we think about that event, it releases a whole bunch of chemicals that are toxic to our body or can be toxic to the body. So working through emotional blocks, working through toxic memories, things like that, are very critical and important to detoxifying the body and keeping it healthy. There's a lot of great work by the author, Gabor Maté, and he's written a couple of really fantastic books on how our emotions have a direct correlation to our physical body. Another fantastic author, one of the pioneers in this field, goes by the name of Candace Pert, and she first termed a lot of these molecules, the molecules of emotion. Because whenever we see, feel, think, and perceive something, that perception has a chemical consequence and these are the chemicals of our emotion, the Molecules of Emotion, which are either building up our strength in our health and our body, or breaking it down. So we need to process emotions and if we have those emotions from the inside out, they can create problems as well. So those are some of the endogenous chemicals we might be exposed to.

16:10
We also have endogenous chemicals. And these fall into a couple of categories, naturally occurring and synthetic. So things that are coming from outside of the body, and coming in. The first one is ionizing radiation. Interestingly enough, UV light is ionizing radiation that can actually damage the genetics in our cells. What's interesting is that when you're flying in a plane, if you fly at night, versus flying during the day, you're being exposed to way less radiation from the sun, because the sun is on the other side of the Earth. So you're not as close to it when you're flying. During the sunny times, you're actually closer to the sun, and it hits you with a lot more ionizing radiation. And in fact, pilots have a higher rate of melanoma, because of this exposure to the sun. We also might be exposed to radioactive elements like radon and uranium and these can just occur naturally in the ground. A couple of years ago, up north here in Ontario, I went to go see this piece of land. There is a gentleman that bought this piece of land 40 years ago, and he discovered more recently, I think, 10 years ago, that there were vast mineral deposits on his land, so much so that people come from all over the world to study it, and now he does tours on it. What he actually did as part of some of the research was they mapped out his land to see which minerals and which chemicals were in the soil. They used things like Geiger counters to actually measure how much radiation was coming from the ground. The ground that you walk on, and even the water that you drink that comes from the ground can have radioactive elements naturally occurring. We can also be exposed to free radicals and oxidation, which naturally occur in our environment.

18:22
Animal and plant mycotoxins, so I talked about earlier how on peanuts there's a mold that makes aflatoxin, which is carcinogenic. Products of combustion; so when whenever we burn something, whenever something combusts, it's going to release certain toxins. Of course, before modern technology, there would be something like a forest fire, and when that's burning; it's going to burn things that go airborne. When we breathe them in, those can become toxic. Heavy

metals; they're on the periodic table; they've been around for a long period of time. They're in our environment and we can be exposed to those naturally occurring toxins as well.

19:15
Then we have synthetic exogenous chemicals, so things that come from the outside that are manmade, that we've actually produced in the chemical industry. We've talked quite a bit already about pesticides, herbicides, fungicides, larvicides, things that we use in farming to help our crops, or to hinder them, so to speak. Industrial Chemicals; the reason why there is so much mercury in our waterways is because industry just releases it, or has more in the past just released right into the water. It's a byproduct of the coal industry, for example.

19:56
Food toxins, so we've put a lot have additives and preservatives and things to give food a really long shelf life, BHT, all sorts of things, all these weird names. If you don't recognize the name, don't eat it. But we have a lot in our food. I wonder what's in a Twinkie? What keeps that Twinkie so plush and moist and never lets it rot? Maybe I'll look that up one day.

20:28
Drugs, of course, can be life saving sometimes, but drugs are synthetic. They're created by man and they're a toxin to the body. so we have to process it. Inhalants; we talked about some of the bromines that can off gas from carpets and upholstery. Cars are a really bad one; you know that new car smell that you smell when you get into a new car, those are all off gassing chemicals coming out into the air. EMFs or electromagnetic frequencies, which, of course, are a lot more common these days with routers, Internet, and Wi Fi signals crossing and always exposing you. That's a non-ionizing radiation, but still has effects on the body. They found that people who use cell phones for a long time or speak on cell phones for many hours during the day, over about 10 years are at a much higher rate of brain tumors.

21:34
Skin products, we talked about parabens that can be in skin products. Cleaning products; when I was a kid, we used to have a cleaning lady come in and she would clean and the house would smell all lemony fresh for a couple days, and I talked about how I lost my taste of smell when I was cleaning when I was in university. Plastics; you know, plastics can be found everywhere in the world, at this point, from the tips of the mountains to the bottom of the oceans.

22:10
So we're exposed to endogenous and exogenous chemicals. And we have to understand that the effects are not linear. As the dosages go up, the body effects don't go up in a linear fashion; it's much different. We're going to explore that in a bit more detail. Chemical sensitivities also vary considerably, depending on the

species. So a toxin in a rat is going to be a lot more different than a toxic in the human. A toxin in a fish, or a frog, or a whale is going to be a lot different in its toxicity in the human.

22:55
The life stage, we talked about kids, versus elderly, versus adults. Biochemical individuality we've addressed, and toxin synergy, which we've also touched on. This is more accurate, what we're looking at here, where we have the toxic potency. So how potent is that toxin? Is it very harmful or not that harmful? The cumulative exposure; so how much of that have we been exposed to over a lifetime or over a particular period of time, and then adding the susceptibility of the individual. Some people can detoxify mercury quite effectively, efficiently and quickly. Some people, not so much. So we multiply all these and then we get more of an accurate picture of what the disease risk is for that person. And of course, this takes a little bit of digging, a little bit of detective work, and it's a bit of the art of practicing holistic medicine.

24:01
We want to take into account what's called the total toxic load or the body burden. Over long periods of time, small daily doses of multiple contaminants have cumulative detrimental effects on physiological pathways that could eventually impair and cause disease. So this is what we're talking about when we refer to the total toxic load or the body burden. Let's look at this in a bit more context. The chemical body burden is the quantity of an exogenous substance or its metabolites that has accumulated in an individual or a population. So what specific chemical is in what quantity and how much of it is accumulated in this part of of the globe? The total toxic load as I mentioned, is the total body burden of an exogenous chemical, heavy metal's and toxic exogenous compounds. So when I'm working with a client, I devote a whole part of my questionnaire to asking them about all sorts of chemicals in their environment. What do they cook with? What do they clean their clothes with? What do they wash the home with? What types of animals do they have? Do they use a cell phone? Things like this to figure out their total toxic load and their chemical body burden, so I can hone in and figure out if detoxification needs to take place, which it does with most people, but also in which order it will take place in.

25:38
Then we have more of a modern term being introduced, the exposome, which I think was coined in 2004 in a study. It refers to the combined exposures from all sources that reach the internal environment. So how is the environmental exposure going to affect the genome, our genetic material, our genes? What is going to be the effect on our genotype, which will result in our phenotype, the expression of those genes? So just some different terms and different ideas to be aware of.

26:24
Now let's look at something called the spectrum of vulnerability. How vulnerable is an individual? How can we assess if someone is going to be affected by a toxin? So on the y-axis, we have the number of people who indicated that exposure caused harm. So what was their threshold of harm? And on the x-axis, we have increasing exposure to a specific toxicant. And here we have a bell curve. This is very typical for a big population; we see this with IQ, where most of the population lies in the middle. We have the geniuses on one end, and people who are very low IQ on the other end. We see this with nutrients and we see this with toxins as well as we're exploring here. We have a permitted exposure, so maybe the FDA has said that you're allowed to have this amount of a toxin. And at the bottom side, here, we have individuals harmed by the permitted exposure; these are the people that are more sensitive to a toxin. These are the canaries in the coalmine, so to speak, of society. The ones who get sick a lot easier, come down with autoimmune disease, and fibromyalgia, and chronic fatigue disorder, and just all these different diseases that might be related to even small amounts of exposure, that haven't even reached the permitted level. For me, many of these people end up in my office, because they're following their rules, they're living in society with everyone else, but they're the ones getting sick.

28:09
Then we have the average threshold of harm, so it's a lot higher for the average person, they can handle a lot more toxins. The average person can handle a few mercury fillings. And this is the margin of safety for the average individual, so they have this area of safety where, if a toxin reaches a certain level, it's not really going to affect them, it's not really going to cause harm. Then at the end of our bell curve, we have the less sensitive individuals; the ones who are built strong, the ones who have very efficient detoxification, the ones where when they're exposed to a specific toxin, they don't get sick as easily as the average person, and they can handle a lot before they get sick. So these are the ones maybe that will still be around when we completely pollute our world.

29:08
Now, with all of these toxins, we have limits of certainty and under recognition of toxic threats. We just don't know 100% what all these toxins are going to do to our body. We know a little bit, and that's the known effects, which is our little teeny-weeny circle. But with gene environment interactions, so how these toxins on the outside are affecting the genetic makeup, the 80,000 plus chemicals that have entered our environment, the mixture of all these and the chemical synergy, the time it takes for these to build up in our body and actually create harm and the windows of vulnerability with children being exposed to much higher levels of toxins, we don't know what this cumulative effect is. We can speculate, but we don't know. So we have to act on a cautionary principle, and really do our best to eliminate these things, prevent ourselves from being exposed to them, and clear them out of the body. And that's why you're doing this course, and that's why I'm sharing this course with you.

30:28
Let's see what Dr. Richard Horton has to say; he's the editor in chief at the Lancet, a very reputable journal. He says that we must act on facts, and on the most accurate interpretation of them using the best scientific information. That does not mean we must sit back until we have 100% evidence about everything, where the state of the health of the people is at stake, the risk can be so high and the cost of corrective action is so great, that prevention is better than the cure. We must analyze the possible benefits and cost of action and inaction where there are significant risks of damage to the public health. We should be prepared to take action to diminish those risks, even when the scientific knowledge is not conclusive. If the balance of likely costs and benefits justifies it. And I happen to agree. We have a lot of great research, we have a lot of good science, but what we don't have is science showing what the cumulative effect of all these toxins are going to have on the body. So we have to proceed with caution and I think detoxification programs are an important cautionary principle. I recommend people do them at least two times a year, and have some sort of detoxification ongoing, because remember, if you're not detoxifying, you're retoxifying by default. And it's unfortunate because the chemical industry has given an innocent until proven guilty label to a lot of toxins. Like when someone is caught for doing a crime, they're deemed innocent until proven guilty; they might be held in jail in the meantime, but we give them the benefit of the doubt until it can be proven that they've committed a crime. The motto with chemicals that they're innocent until proven guilty, which really, the opposite should be in place. All chemicals should be guilty until proven innocent, and there's very loose regulations on chemicals and, thus, many chemicals have been brought into the environment that are harmful to the humans and to the human body and we only find out once it's too late.

33:05
One of the first pioneers with this was Rachel Carson, who wrote the book Silent Spring, which is a groundbreaking book, because it brought into light the effects of some of these chemicals, firstly, on animals in the environment. She was a marine biologist and conservationist. And she started to look at the effects of DDT in the environment and how it was feminizing fish and frogs and things like that. And she brought this to light over 50 years ago. 50 years this information's been out there and we're still bringing more chemicals into the environment. Now, she helped to initiate the ban on DDT, but of course, new stuff has come out even though that is gone. Also DDT is a persistent organic pollutant, so it's still in our environment to this day.

33:58
We must develop and find a better approach. We need a system in order to really hone in on where those toxins are coming from, how to address it, and how they might be affecting us. That's where we get into something beyond toxicology called functional toxicology; a system that looks at various aspects. Seeing how toxins can be antecedents, how they can predispose us to various illnesses. For

example, how genetic consequences that affect that fetus possibly for a lifetime? So what are the antecedents to your client or to you to your current state of health? What predisposed you to your current state of health? What's the tipping point? Sometimes people have stress in their life, they're maybe not eating the best diet, they maybe have poor relationships, and then they're exposed to a chemical, and that's the tipping point. So toxins can also be a trigger for an illness, they can be that straw that broke the camel's back. So they could work as predispositions and they can also be triggers. They can also be mediators; they could perpetuate a current state. So if I have mercury toxicity, and I haven't gotten that heavy metal out, that's going to greatly affect my energy production in the mitochondria and I'm not going to be able to maintain health. So toxins can work in many different levels. They can be pre, they can be a trigger, and they can be immediate or something that perpetuates the disease. And all of these can contribute to chronic disease. Acute exposure, long-term exposure can all contribute to chronic disease.

36:01
So as we continue in the next class, we'll talk about some of the clinical consequences of toxins and, of course, move in to more detailed discussions about detoxification, and eventually how to get these out of the body.