Interview with Raymond Peat, Ph.D.

THE THYROID

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JR - Josh Rubin
RP - Ray Peat

JR: *In a lot of your articles and your science you've got a lot on the thyroid. So maybe you could enlighten us on why you study the thyroid so much and why you feel the thyroid hormone is so important or the most important hormone in the body?*

RP: Looking at life in general, plants and funguses and amoebas are the organisms that apparently don't need or don't want thyroid. But, as soon as you get to what we think as real animal life, that includes corals, coelenterates, echinoderms, mollusks, crustaceans, insects…just about everything that has an organization to it uses thyroid. And the basic function of thyroid is to energize cells and to give them enough energy and efficiency to allow them to differentiate so they just don't concentrate on eating and growing, the way plants, and amoebas and fungi and such do. So, if you look at some of the older experiments, like in an aquarium with developing frog eggs, as soon as the eggs would hatch in the tadpoles, they would either add an anti-thyroid chemical, or a little bit of thyroid hormone to the water. And if you added the anti-thyroid chemical, the tadpole would never turn into a frog; it would just get to be a huge tadpole. But if you added thyroid to the aquarium, the tiny hatchling tadpole would turn into a tiny, spider-like frog, just about the size of a fly, showing that the thyroid, which energizes the cells so that they use oxygen and produce a huge amount of energy. This energy allows the cells to realize their function. But when it comes on too early, they neglect to grow, so that, without thyroid, all you have is growth. And that's fine for amoebas, and mushrooms, and trees, and so on, but in humans, it can lead to things like tumors and malformations, and so on.

So, the energy production is really the basis of all organized life. And that makes the thyroid, in a sense, the main gland. If you take out the pituitary gland, which people have talked about as the master gland....many different animals, if you remove that, and give them thyroid hormone, in some cases the animals live ten times as long as normal, usually about twice as long as normal, from the lack of the pituitary gland, as long as they had adequate thyroid.

JR: *So you're saying, what most people say, is that thyroid's the master regulator of metabolism. It's the thing that's going to keep your body in an efficient state or an anti-inflammatory state, where you're producing energy more efficiently that you're expending energy.*

RP: Right. The inflammatory state means that something has gone wrong. It's interesting that doctors very often go entirely on the basis of the amount of pituitary thyroid-stimulating hormone in diagnosing your thyroid status. But the thyroid-stimulating hormone creates all sorts of inflammatory processes. And when you have enough actual thyroid hormone to completely shut down your pituitary, you turn off practically all of these toxic, inflammatory processes.

JR: *Right. It's interesting, because at least from our standpoint, there are so many*

people coming to see us in our clinic. And I would say that from teaching all over, there are people that are being diagnosed hypothyroid. What's your take on all these labs that people are doing? You know, what's the validity of these, and what do you recommend when it comes to measuring thyroid function itself?

RP: In the 1930s, it was standard medical practice to have a little apparatus to allow the person to lie down, usually with an empty stomach, and to breathe oxygen for two minutes, and they would measure how much oxygen was used. And people who had the standard symptoms of low thyroid function would often consume only half the normal amount of oxygen in the allotted time. And that usually went with their hands and feet being cold and their core body temperature being below normal and their heart rate being somewhat slower than normal. And as they looked at the more biochemical indicators, they saw that cholesterol was almost invariably high in proportion to the reduced consumption of oxygen and lower body temperature. So the increasing cholesterol was like a mirror image of the decreasing metabolic rate and thyroid function. And if you would give a thyroid supplement to someone with excess cholesterol, it would immediately come down, exactly in relation to the increasing oxygen use.

Carotene excess was another identifying feature. The doctor would look at a person's palm of the hand, looking at the calluses. A hypothyroid person typically would have cold, pale hands, but usually with orange in areas where the skin was thickened, in the calluses. That's because vitamin A is used directly in proportion to your metabolic rate, protein turnover and thyroid function. And if your thyroid is low, you barely use your carotene, hardly converted to vitamin A. And so the carotene typically would accumulate enough to show up as orange areas where the skin was thick. And in the ovary, it was found that the normal corpus luteum - or yellow body - where progesterone is made, in these women who were hypothyroid, the corpus luteum would be dark red because of accumulated beta carotene. And that carotene would block the production of progesterone, causing amenorrhea in the typical hypothyroid woman.

Another good indicator that was developed in the 1930s was the Achilles reflex relaxation speed. A person kneels on a chair so their toes hang over loosely and you thump the Achilles tendon so that the calf muscle twitches. And sometimes a low thyroid person won't have really any reflex that you can see, but if they do have a reflex so their toe twitches out, the hypothyroid person's muscle relaxes so slowly that their foot returns like a door with a pneumatic closer on it, a little jerky relaxation. And the electrocardiogram shows the same thing. The T wave is called the repolarization wave and it's exactly the same thing as in the relaxation of your calf muscle. In a hypothyroid person, the T wave is delayed and low, usually, flattened out. And the same thing happens in all of your body processes. When your brain is tired, the nerves are slow to relax, so your sleep will not be as relaxing and restorative as it would be in a high-thyroid state.

JR: *So just touching upon that, just for a lot of the people that are listening - and maybe you want to clarify this a little bit deeper - the slow relaxation of the calf muscle can give you an indication of hypothyroidism. Is it because of low blood sugar? Is it because of increased serotonin or calcium? I wonder if you could explain a little bit so people can understand that.*

RP: All of those things contribute. The thyroid allows you to take up oxygen

efficiently and oxidize it completely and in proportion to the lack of thyroid when you stimulate a muscle cell or a nerve cell, it will use its oxygen inefficiently; it will allow calcium to enter the cell and keep it in an excited state, and it will tend to produce lactic acid rather than carbon dioxide. And carbon dioxide produced under the influence of the thyroid is needed to carry the exciting calcium out of the cells and allow the cells to relax.

JR: *I see.*

RP: So all of those things you mentioned are involved in the delayed relaxation.

JR: *So, just to reiterate to people or to summarize so I understand too, so you mentioned, you know, it's almost like: you have thyroid problems - look at the thyroid. So you're really saying that high cholesterol is a huge indicator of low thyroid and that we can actually look at the contraction or the lack of thereof relaxation of the calf muscle as another indicator of…we could say, I don't want to say thyroid problem, but maybe slower metabolism or maybe a thyroid issue in a sense? Is there any other things you recommend? I know you talk a lot about pulse and temperature and things like that and I'm sure that's a huge topic but maybe we can chat a little bit about why you look at body temperature and why you look at pulse and everyone else is focusing on TSH and free T4 and free T3 and TPO and all this stuff and I don't know if you do or don't but maybe if you don't you could just touch on why?*

RP: OK, the idea of free and bound hormones, it's purely a laboratory construction and in the case of thyroid it usually has some relation to symptoms, but it's a little bit analogous to reading tea leaves, because actually, when thyroid hormone is stuck to the albumin protein - which is the main protein in the blood - it has no trouble at all getting into cells, taking the thyroid into the mitochondrion and nucleus and so on. So the free thyroid test does correspond for a variety of indirect reasons to the real available activity of the thyroid, but it's really just a laboratory construction that should be minimized.

JR: *So you've been touching upon TSH. What are your thoughts on TSH? Because I know that a lot of the different values out there are very different and they are always changing a little so if you could touch upon you know if you even would recommend focusing on TSH that much and if you do, what would you say the value should be?*

RP: Yeah, I don't recommend it as a way to diagnose hypothyroidism, but I do recommend if you're looking at a blood test, I would recommend having as close to zero TSH as you can get, because all of the known effects of TSH are really harmful in some way. The main reason doctors are giving currently for not wanting to suppress TSH, is they think because TSH reduces the turnover indicators of bone and this idea developed as a way to sell estrogen. Estrogen was never shown to increase bone growth in humans, but it did stop the osteoclast function, so it reduced bone turnover, and so they said this is evidence that estrogen is preventing osteoporosis, because it stops the breakdown of bone. And since TSH also stops the osteoclasts and the turnover of bone, doctors said "If we suppress it, that will cause osteoporosis." But in fact, it's the indicators that were used to argue that estrogen was protecting the bones. They named the protein osteoprotegerin meaning "bone protecting protein", and for several years, they were using that as a way to sell

estrogen and other drugs that would increase it, but pretty soon it turned out that osteoprotegerin is closely associated with bone loss, osteoporosis, osteopenia and calcification of the soft tissues. And it turns out that thyrotropin (TSH), like estrogen, increases osteoprotegrin, increases the movement of calcium into your arteries and heart and out of the bones. So the main argument doctors have for keeping your TSH up to not below one is often what they say but their very evidence is the opposite of what they think it is.

JR: *So it's interesting, because a lot of doctors focus so much on TSH, and you're saying don't focus on TSH?*

RP: That was developed by the actual biological indicators that were developed in the 1930s. About 40% of the American population showed low metabolic rate associated with symptoms which were cured by giving thyroid, enough to bring their metabolic rate up. But in the late 1940s, the drug companies synthesized Thyroxine and they tested it on 25 year-old male medical students, and in these healthy young men, they said it worked just like Armour thyroid; it worked just like the thyroid hormone. And on the basis of that almost nonexistent evidence that it was equivalent to the thyroid hormone function, they began selling it. They were developing tests to diagnose who needed it, and they didn't have tests to measure very small amounts of the actual hormone. So they measured protein-bound iodine, and it seemed that 95% of the population had enough protein-bound iodine. That idea came to be accepted as the "normal". In the 1960s and 1970s, the immunoassays were developed that could actually measure the amount of thyroxine in the blood, and it turned out that protein-bound iodine didn't have anything to do with thyroid function. But doctors had learned that the 95% of the population were not hypothyroid, so when they learned to measure thyroid stimulating hormone (TSH), they applied the measurements to this meaningless doctrine — that only 5% of the population were hypothyroid. So it's a good test, but the context and history have made it irrelevant to actual diagnosis.

JR: *[Now what about these] factors like adrenaline, cortisol, prolactin, estrogen; all of these things that are down regulating the thyroid; that are showing you that you're "hypothyroid" — it's not really the thyroid that's the problem; it's all of these other things based on the stress response, or toxins, or blood sugar that are creating the lab results? Is that correct?*

RP: About 10 years ago I started hearing people telling me that their doctors had diagnosed them as being both hyperthyroid and hypothyroid at the very same moment, and more and more people were getting this diagnosis, which really shows that a crisis of confusion had taken over the profession; that people, on the basis of their blood tests, could be both hyper and hypo at the same time. This misleading indicator diagnosis lead them to diagnose many people who were suffering hypothyroidism as hyperthyroidism without measuring their oxygen consumption, their body temperature, how many calories they were burning in a day, or looking at most of their symptoms. Looking at these other [misleading] indicators, people who were clearly hypothyroid and who would lose their symptoms if they took a thyroid supplement were being diagnosed as hyperthyroid, and either having their thyroid gland removed or being given radioactive iodine to destroy it on the basis of a complete misunderstanding of even what constitutes hyperthyroidism.

JR: *So, I guess basing your approach to the other tests, like I kind of mention, is*

really body temperature. So maybe, if you could, cause I think for a lot of people, I find, you don't have to pay a lot of money for it, it's an easy test for the practitioner to get a baseline for your client, but it's great for the client or just the average Joe that's listening to really start becoming aware of what's going on. So maybe tell us what does a low body temperature mean, or low pulse or high pulse, and why do you use these as indicators of a baseline of our metabolism?

RP: Broda Barnes, when he was working as a physician in the 30's, he was a PhD researcher who identified much of the physiology of hypothyroidism. But then he became a medical doctor and he practiced [for] most of his life in Colorado where the weather is very cool - even in the summer. And for his patients, the temperature was a very adequate way of diagnosing, and he describes the temperature - waking temperature - he thought it should be maybe around 97.8. And then after breakfast it should rise to, during the day, somewhere around 98.6. And in Eugene in hot summer weather I saw the same people who, in the winter, would have very low oral temperature. I saw that in the hot humid summer weather, these hypothyroid people were maintaining a normal core temperature. And sometimes their hands would be cold, even in hot weather. But I saw that a low metabolizing person, given some environmental support, can manage to keep their temperature pretty close to normal. And so I saw that their pulse rate, even when their temperature might be 98.5 during the daytime, often they would have a pulse rate of 45 or 55 or 65, somewhere below optimal. And that started me thinking about the factors that regulate body temperature. And I saw that some people who had extreme hypothyroidism who would oscillate between extreme depression and extreme mania. And when they were going into the depression, their temperature would be consistently low, but once they switched over to the manic phase, they would wake up with a pulse rate of maybe 75 or 80 and a temperature right where Broda Barnes would have wanted it. And besides just the average pulse rate and temperature, I saw that after those people would eat a big breakfast, their temperature would fall. By 11 o'clock they would show up a hypothyroid temperature. And during the night, everyone tends to have more of the stress hormones, alternating surges of adrenaline and cortisol, for example. And the people who went past the exhaustion phase of hypothyroidism and reached the manic phase kept extremely high levels of both cortisol and adrenaline, and usually other, transmitters like serotonin. And since food reduces stress somewhat - getting your blood sugar up - and daylight also reduces stress, if you see their temperature and pulse rate fall after a good meal, that is another thing that reveals, behind those indicators, a low metabolic rate that was just being held up by emergency stimulation from adrenaline and cortisol.

JR: *So, just to summarize again for everyone, I'm assuming what you're saying is if we're not eating the right foods - if we're not eating the foods that provide the body with the right about of protein, sugar or carbs, and fat, or if for any reason our body goes into that sympathetic stressed state, we need to provide our body with more oxygen and glucose. So if we don't get that from our foods, or if we're not down regulating our inflammation, you'll see these specific hormones inhibit how the thyroid works so you're going to get a lower body temperature. So even though you think you're eating healthy foods, if your body temperature does go down, it could be the ratios but it could actually be the quality of the foods inhibiting how your metabolism should work; same thing with the pulse.*

And then you're saying - I want to clarify 'cause a lot of people think the opposite - that if someone has a low pulse, our society believes that that actually means their

healthy. And I always used to use the example of like Lance Armstrong, everyone says well his resting heart rate is - whatever it is - like 40. And everyone thinks that's super healthy. But you're saying that people with a low resting heart rate, that means they're actually down regulating their own metabolism because of the foods they're eating, or the wrong foods they're eating.

RP: Yeah, and it tends to go with fertility problems, hormonal problems, low testosterone, increased estrogen, a lot of degenerative problems.

JR: *Right. So that's great - I think that's important for people to, to understand 'cause it's such an easy tool, you to do, at home and during the day to see what's going on. Let's talk about the hormones a little bit, so people get an idea of...(yeah ok we know where the thyroid is). Let's talk about some of these hormones like T3 and T4, and where does most of this conversion happen in the body? Because everyone thinks it's the thyroid, and maybe you can kind of enlighten us as to maybe where most of this is happening?*

RP: Broda Barnes was one of the first people to notice the importance of the liver in thyroid function. The Biskins, in 1942 to 1945, were showing how the liver regulates hormones, but they were concentrating on estrogen. If the liver was lacking thyroid or protein or some vitamins, the Biskins showed that your estrogen would skyrocket in proportion to the reduced function of the liver. And there's this antagonism focused on the liver between estrogen and thyroid. And the thyroid works partly by increasing protein synthesis, but partly by simply energizing the liver so that it is able to detoxify everything that shouldn't be in the body. The liver should remove 100% of the estrogen that reaches it in circulation. So, the body should be able to produce estrogen in the ovary for example, send it to do its work in the uterus and breast and so on, but then it should immediately be destroyed by the liver. And if your thyroid is low the liver loses the ability to detoxify estrogen and practically everything else harmful. And the liver happens to also be the source, as Broda Barnes discovered, of the most active thyroid. He said it's about two thirds of the thyroid used by the body is produced in the liver. And if your liver isn't getting enough sugar, enough glucose, or if it doesn't have enough selenium, it is unable to convert thyroxin into T3. If you can completely knockout the liver, and your thyroid will excrete about this ratio of 3 parts of thyroxin to 1 part of T3, and so as long as your thyroid is working, your liver will be getting a little bit of T3 and will be able to keep functioning, other things being equal. But if you are under stress for example, don't have anything to eat for about 24 hours, or are exerting too much energy in proportion to what you are eating, your liver isn't getting enough glucose to convert the 3 parts of thyroxin produced in your gland into the active T3, and so you will have this drastic decrease in production of the active triiodothyronine (T3), most of which comes from the liver when it's well fed with sugar. If the doctor prescribes only T4, it will work fine in anyone who doesn't need it (such as 25 year old healthy men). But women, because of their higher estrogen level, have many times the incidence of thyroid problems and liver problems than men do. And it's because of the centrality of the liver to the activation of thyroid hormone, and the liver's essentiality for eliminating estrogen, that a little problem with either thyroid or estrogen means that your liver will allow estrogen to increase in the body as it decreases its production of active thyroid hormone. And that in turn slows the liver even more so it has a vicious circle.

JR: *So, we need selenium to convert T4 to T3. We need glucose to make the*

conversion: this is important, as most people today stay away from the right types of sugars. But at the same time - from maybe exogenous sources, or the body's inability to detox it, blood sugar issues, excess stress - the estrogen itself will block the T4 to T3 conversion as well.

RP: And once that happens, the estrogen can reach the point at which it starts inhibiting the thyroid gland itself. The thyroid gland, to produce the proper ratio of three parts T4 to one part of T3, it does that by breaking down the thyroglobulin, a colloidal kind of glob of protein inside the follicles of the gland. This has to be digested as needed, breaking each protein molecule down and releasing these free thyroxin and T3 hormones. And estrogen inhibits the proteolytic enzyme that releases the hormones. So, first, it slows down the liver function, but then it reaches the point where it will even block the thyroid itself. And this is where women tend to have high frequency of goiter, thyroid enlargement. They call it Hashimoto's thyroiditis, but most often it's what they used to call a colloid goiter, where, since estrogen stimulates the stress hormones in the brain, increasing TSH, estrogen causes the pituitary to drive the thyroid harder, meanwhile it's blocking the ability of the thyroid gland to secrete it, so it tends to enlarge the thyroid, and, then they get diagnosed as having thyroiditis.

Progesterone happens to activate these proteins that allow the thyroid to secrete, so I advise women who have an enlarged thyroid not to take progesterone until they've taken care of the enlargement of the thyroid. Because progesterone will normalize the proteins so fast that sometimes they will go into a slightly hyperthyroid state for a few weeks.

JR: *In your books, you talk about hyperthyroidism; it's probably the only time - and correct me if I'm wrong - you recommend people having small amounts of cauliflower juice or cabbage juice, to actually use the estrogen and the excess cortisol to down regulate the thyroid. Is that true?*

RP: Yeah, except that's mostly for the person's relationship with their doctor. Several people have told me that before they had their thyroid destroyed by surgery or radiation, they said they had a chronic pulse rate of 125 per minute, but they've never felt so good in their lives. After having their thyroid gland treated, they were back to feeling their normal bad self. But people usually feel great when they're in the so called "hyperthyroid" state. It's the reason why I tell the people how to use cabbage juice and such to slow their pulses that their doctors become a danger to them, tending to bully them into having their thyroid gland suppressed.

JR: *Right…so let's talk about TSH, T3, T4 what I know a lot of people out there come in with lab values where they have a high T4 reading. What is, what does that mean and what are some of the symptoms and what are most doctors recommending?*

RP: It very often goes with hypothyroidism because if your liver can't activate it…if you aren't producing so much estrogen that your gland gets shut off completely, your gland will go on producing hormone and you'll get along in your daily life with a little bit of T3 coming out of your thyroid gland. But that gradually allows the T4 to accumulate 'cause your liver isn't using it up. And that tends to slow down even the production of T3 if you get a very high T4 level.

What originally got me interested in this interaction of T4 and T3 was a patient at the medical school in Portland who was a slightly hypothyroid woman who was prescribed T4 for a few months. On 1 grain equivalent of T4 (100 micrograms), she got even more hypothyroid symptoms. And her doctor increased it to 200 micrograms and a few months later she was even worse. I think he reached 4 or 500 micrograms of T4 at which point she went into a myxedema coma and was taken to the hospital unconscious. They injected T3, pure T3, and she came right out of the coma. But her symptoms got worse directly in proportion to the increased dose of T4. And after seeing that extreme example I have run across probably a hundred women with less extreme effects but it isn't rare at all for a woman to get worse symptoms, noises in their head or electrical sensation in their body or swollen muscles or any of the thousand symptoms of hypothyroidism as a result of taking too much T4.

JR: *Great stuff here. So let's talk about going back towards hypothyroidism and talking about how, you know we know, or I should say I know and maybe people don't, but things like blood sugar dis-regulation, adrenaline, cortisol, pituitary…all these things can create hypothyroidism. At the same time, how does hypothyroidism affect these things which is blood sugar, adrenaline, cortisol, your pituitary, parathyroid, digestion, liver, I mean how does it really affect our physiology?*

RP: When you aren't able to oxidize your sugar all the way to carbon dioxide you produce lactic acid very easily. Even at rest, a person will keep producing lactic acid as if they were under strenuous exercise. And the lactic acid turns on a lot of inflammatory mediators which have systemic effects on your bone and skin, hair growth, everything. Lactic acid itself acts as a toxin. Gradually if you are experiencing that year after year it leads to a tendency of fibrosis, arthritis, and so called connective tissue diseases in general from an imbalance of the inflammatory mediators (histamine and serotonin especially) and a tendency of the soft tissues to calcify, so it contributes to hardening of the arteries and heart failure.

JR: *So, I don't wanna say that it's kind of like an end all be all, but...you know, for me, yourself, and you know, chatting with you, it's almost like if we can get people to regulate their blood sugar, eat the right foods, or, you know, regulate their thyroid, its almost like you can affect so many systems in the body, which can actually help with joint pain, digestive problems, lack of energy, menstrual problems, edema…I mean the list just keeps going on and on and on, is that true? I mean it's almost like we're focusing on one system, but it's like killing two birds with one stone kinda thing; we're focusing on this one system but we're getting so many other benefits.*

RP: Yeah, because the energy production in the proper way, is really what shapes everything. The body is constantly renewing itself, moment by moment. Like, overnight, people have measured that there is a 60% turnover of brain substance in one night, just because the brain has a high metabolic rate, and if you aren't renewing yourself at a high rate, you're allowing errors to accumulate, and, one of the reasons thyroid and other problems get worse over time, is that our diets, on average, contain a significant amount of thyroid inhibiting substances, especially the polyunsaturated fatty acids. And the French did a series of studies that really define how that works. Long ago, people knew that polyunsaturated fatty acids blocked proteolytic enzymes, and in this French series of studies, they saw that the first effect of too much polyunsaturated fat is to block the ability of the thyroid gland to

secrete the hormone by breaking down the thyroid globulin. Then, if the thyroid manages to secrete it, the transport of it on proteins in the blood is inhibited in proportion to the unsaturation. So, the fish oil, [with] many 5 and 6 unsaturated bonds, are the most powerful, almost total inhibitors of thyroid transport, but linolenic acid, with 3 double bonds, inhibits about 50%, and linoleic acid, with 2 double bonds, inhibits it about 30%, so its proportional to the number of double bonds, the transport. And the same thing happens inside the cell, the responsiveness of the cell to thyroid, is inhibited in proportion to the amount of unsaturated fats. And carotene, even though its not a fatty acid, is highly unsaturated, and it has that same effect of interfering with thyroid function just because of this series of unsaturations. The accumulated unsaturated fats in the body turn on other antithyroid processes, so it isn't all immediate and correct, but they make you more susceptible to turning on prostaglandins which promote inflammation and increase the tendency to produce lactic acid, and they interfere, apart from the thyroid, they interfere with the mitochondrial oxidative energy production, so after you're 30 or 40 or so, almost everyone has accumulated enough PUFA to cause a whole range of metabolic problems.

JR: *Right…*

JR: *So, while we're on the topic, and I don't want to go to much into PUFAs, but, let's go and chat about estrogen levels, and how hypothyroidism can raise those, and I think it's a huge concern, because a lot of women are being prescribed these medications, number one, most people are having issues with detoxifying their body of these estrogens, number two, and having this unopposed estrogen in the body can lead to specific dysfunctions or diseases like clotting and edema, fibrosis, and cysts and all these things.*

RP: There are very close interactions between the increased estrogen, and you mentioned clotting, and estrogen increases serotonin dominance. And serotonin and estrogen both promote, and are promoted, by the polyunsaturated fats and the low thyroid condition. So it forms sort of a polar cluster with the energizing thyroid and the good nutrients, sugar, minerals, protein and so on, maintaining and energizing the structure. The emergency stress things, the prostaglandins, serotonin, histamine, cortisol and estrogen are all on the short term defensive side, but when they become dominant, they deform the proper regulatory systems.

There's a special problem with the basis for diagnosing estrogen deficiency, because in the absence of anti-estrogen substances such as progesterone, the estrogen in the blood can go to a very low level, because the estrogen is staying inside cells, and progesterone knocks it out of cells, inactivates it, but causes it to appear in the blood stream on its way out the kidneys. So, in the absence of progesterone, doctors will measure a low level of serum estrogen, and prescribe it, even though, under that situation, it's very likely that their tissues, breast and uterus in particular, are actually overloaded with a chronic supply of estrogen.

JR: *Ha, I wish I could summarize that. I'm going to move on, I highly recommend everyone re-listening to these shows over and over again because it's an hour plus of information that you could literally sit down and probably take fifty pages of notes on. I want to talk about CO2, carbon dioxide, in the thyroid because I know you're a fan of CO2 but from reading your stuff, you talk about the thyroid and you talk about carbon dioxide, how do thyroid hormones raise CO2 and what are the*

advantages of having higher CO2 levels?

RP: That means that you're oxidizing things completely, getting, if you oxidize fats completely, you get rid of any toxic effect from the free fatty acids. But you also stop producing lactic acid and stop that whole route of inflammatory, harmful processes - free fatty acids and lactic acid. But the carbon dioxide itself binds to all of our proteins. For example, hemoglobin. In a diabetic they look at the amount of sugar, or fragments, attached to proteins such as hemoglobin, but it's actually the breakdown of fatty acids which contribute about 95% of these glycated proteins that accumulate in diabetes and aging. But when we are producing enough carbon dioxide, it not only protects the cell by removing the excitatory calcium, but it also binds to all of our proteins that have a lysine group or another amine group exposed. And these amines are where the breakdown products, free radicals, fatty acids, and so-called glycation end products, it's where they bind. And so carbon dioxide binds protectively to proteins, keeping them in the native, youthful state, which happens to be…the things called hormone receptors are in a different state when there is adequate carbon dioxide. Insulin is in a different state, growth hormone, all of our peptide hormones, can bind carbon dioxide, becoming a different substance. So all of our hormone system is deranged if we just hyperventilate and blow out too much carbon dioxide, or if we're hypothyroid, basically, we're in effect hyperventilating even at rest, producing lactic acid instead of carbon dioxide.

JR: *So, what you're saying is the more CO2 we're essentially producing, it allows our thyroid to work more efficiently which is basically those levels are down regulating lactic acid and serotonin and all these inflammatory markers. That's correct?*

RP: Yeah, the CO2 is in itself anti-inflammatory. A lot of hospitals are now recognizing that they were killing patients by giving them pure oxygen or even hyperventilating them and they can prevent most of the hospital-induced lung failure and a lot of brain damage by giving them carbon dioxide or just hypo-ventilating them so they accumulate their own carbon dioxide to a protective anti-inflammatory degree.

JR: *Let's talk about people that don't even have a thyroid. What are your recommendations? Do you recommend them being on specific thyroid hormones?*

RP: If you lived in a non industrial culture, they would not have to remove the thyroid when they sell a chicken or a fish and they would throw the beef and pork thyroid glands into a sausage mixture and so you would get dietary thyroid if you were eating the way people did even in America until 1940 when the FDA came in agriculture department, banned the sale of thyroid in food. But looking at the natural diet, everyone would be getting the equivalent of half a grain of glandular thyroid extract just as part of their ordinary animal food diet. Shrimps, oysters, crabs, everything like that that doesn't have a vertebrate type of thyroid gland, eating those you get some thyroid in your diet. Milk contains some thyroid, so babies who otherwise would be Cretans as long as they're breast fed, they don't need a thyroid gland. They get enough thyroid in their mothers milk. After three mile island, a lot of babies were born without thyroid glands, but no one noticed the breast fed babies didn't have a thyroid until they were weaned and then they became hypothyroid drastically. So eating the right foods, avoiding the polyunsaturated fats and the hard to digest types of starch in a lot of beans, for example, have starches that we can't

digest. Those irritate the intestine, create endotoxin that interferes with thyroid function. So avoiding the toxic foods and emphasizing sweet fruits, milk, cheese, eggs, shellfish, and among the meats, beef and lamb. If you include the fibrous parts that industrial societies tend to throw away, like in Mexico, you get the skin in various preparations. In Asia, they eat the tendons, ears, snouts, tails, and everything that are very rich in gelatin which is a pro-thyroid protein because it doesn't contain the precursors to serotonin.

JR: *Beside certain meats that you just mentioned and the more gelatinous type of proteins, and the dairy, the non-inflammatory proteins, what are some other nutritional recommendations that you can maybe just enlighten us on in regard that are pro-thyroid or pro-liver even to help the liver to detox. So it's not always the thyroid, if you get the liver to work properly will get the benefits for the thyroid. What are some nutrition therapies that you recommend?*

RP: Oh, years ago I read that women had a drastic hormone change when they were taking antibiotics and I realized that was probably because of the hormonal effect of intestinal toxins and so I had some women measure their blood estrogen, progesterone, and cortisol, and then eat a carrot a day for a few days and remeasure it. The carrot has antibiotics and the fiber can't be digested in the toxins by bacteria because of these antibiotics and after just a few days of a daily carrot their hormones were back in a very favorable state, reducing estrogen and cortisol, increasing progesterone and thyroid.

JR: *So you're saying that carrots - I mean, most people are going "this is kinda silly" - but you're saying that a carrot, because of what a carrot is made up of, actually helps the GI system and the liver to absorb toxins, and to actually detoxify them. So, you're saying that people who maybe have thyroid issues, or liver detox issues, that using carrot as a therapeutic tool will benefit them.*

RP: Yeah, raw carrot, not a cooked carrot, because the carotene is an anti-thyroid factor, but you can even rinse off some of the carotene after you have grated or shredded it. But a lot of hypothyroid people control their symptoms for years just by having a daily raw carrot, because of the cleansing effect on the intestine and liver.

JR: *What other foods are going to enhance that T4 to T3 conversion? We're hoping to do a whole show on sugar, because it's a huge topic. But, you talk about glucose, you talk about selenium…what are some other foods people should be eating to actually help to bring the thyroid to an efficient level, but also help with that conversion, the T4 to T3 conversion?*

RP: The very sweet, low fiber foods: filtered, well-strained orange juice from sweet oranges is the safest that I know of. And there are several tropical fruits, (probably a hundred tropical fruits) that are very safe and helpful. And one very odd food: if you have a centrifugal juicer, you can juice a raw potato and then cook the juice like you would scramble an egg, and you get rid of the starch, and you have a very safe, high quality protein and mineral formulation. In practice, good orange juice and a few other tropical fruits are very good for your liver and thyroid balance.

JR: *Now why do you say really good strained orange juice, [be]cause I know you've mentioned that before?*

RP: Any of the indigestible fibers, the commercial orange juices…they've learned enzymically to create new chemical substances that they sell as pulp; it's a type of fiber that can't be digested and can't be removed from the juice once they've chemically altered it. You want to avoid the commercial pulpy so called orange juices. And if you make it yourself, just running it through a strainer is enough so you don't feed the bacteria with these fibres that we can't digest.

Of the proteins, of the common convenient proteins, cheese and eggs and shellfish are very high quality, and associated with pro-thyroid other nutrients; calcium for example.

JR: *Same with your saturated fats: i know you are a huge advocate of coconut oil because it's pro-thyroid: it helps the liver store glycogen, it helps the body detox from unsaturated fats. Someone actually had a question about coconut oil: it is pro-thyroid, and I know you have a science and a philosophy on what type of coconut oil you recommend and why. Maybe you can answer that for one of the listeners.*

RP: I've had many very delicious crude simple homemade coconut oils that are great for ice cream and puddings and such. But a lot of people are allergic to those aromatic tasty things so just for safety it's good to have it completely filtered so that there's no free fatty acid breakdown product and none of the solid particulate coconut matter or even the aromatic stuff because just for safety to avoid allergies. Any of the purely saturated fats are anti-inflammatory. It's just that the coconut oil with the short chains, it's very quickly metabolized and so for things like losing weight, weight lifters have caught on to using the fractionated coconut oil to get evenly shorter average chain length because it intensely increases the metabolic rate to have those shorter saturated fats and they're anti-inflammatory, anti-histamine and so on.

JR: *Any other nutritional recommendations? You know, most of the listeners, probably some practitioners, some lay people…any other nutritional recommendations you can toss in there in regards to proteins, fats, or carbs that are pro-thyroid?*

RP: Yeah, people are going to continue eating some vegetables because they like them but I encourage them to cook them to death. Cook them as much as 40 minutes of boiling makes them a lot safer. There were experiments in the 1940's; with rats, they fed a selection of vegetables either canned vegetables or the same vegetables raw and the ones eating the canned vegetables thrived and were well-nourished. Even rats couldn't live on raw vegetables.

JR: *I'm sure there is more in regards to thyroid but of course we could spend hours talking about this. The hormonal implications, the liver, digestion, what foods to eat, but of course, we can't take up the next 6 days of your life as much as I'd love to. Is there anything else you want to add, Ray, in regards to the thyroid, you think is important for the listeners to know?*

RP: Nothing occurs to me.

JR: *Nothing comes to you?*

RP: Yeah.

JR: *All right, well, I'm kind of out of all my questions. I had a slew of questions and like I said I don't want to take up tons of your time 'cause I really appreciate you coming on and educating us on this. So we just want to say thanks - me and Jeanne, all the listeners. We're getting great emails and people just loving the shows and your information so we really appreciate it.*

RP: OK, thanks.

JR: *So I want to wish you a happy day and I guess we'll chat again.*

RP: OK, very good. Bye.

JR: *Have a good one. Bye.*