A Special Interview with Dr. Richard Johnson  
By Dr. Mercola

DJ: Dr. Richard Johnson  
DM: Dr. Joseph Mercola, DO

DM: Welcome everyone. I’m just absolutely delighted to have the opportunity to have another discussion with Dr. Johnson. I’ve discussed this amazing research he’s doing on fructose and its impact on the health of the country with high blood pressure and more importantly, the most likely leading risk factor for developing obesity.

So, we’re just delighted to have him back today. I’d like to extend the discussion that we had earlier and then provide him with the opportunity to share some of the upcoming new details of the research that he’s been involved with since the last interview.

So welcome, Dr. Johnson.

DJ: Thank you Joe. I’m glad to be on.

DM: Well for those listeners who hadn’t viewed or listened to the first interview, could you just describe your professional affiliation. I believe you are the chairman of internal medicine at the University of Colorado.

DJ: Well that’s not actually correct. I’m the chief of the division of kidney disease and hypertension at the University of Colorado.

DM: Your primary focus is on -- about two-thirds of your work is directed toward research and you actually have about a third directed towards clinical practice. Is that correct?

DJ: Yes, I do some clinical work. I also do some teaching. I’m involved in administrative work. But my passion is my research which probably does take up about two-thirds of my efforts.

DM: Well great. We’ll discuss that too because you’ve just got back from trips to Africa and you’re on your way to Europe. All involved with your research. We’re really excited to have you share some more details of that.

Actually, the first time I interviewed you, I just gotten your book and haven’t had the chance to review your book. And now I’ve read it and reviewed it carefully and as a result of that, I had some questions for you.
**DJ:** Great.

**DM:** It was a real surprise in our first discussion to learn of the impact of fructose on uric acid. And it seems that’s just really essential to the damage that its doing and fortunately is an excellent marker for toxicity from fructose. You had mentioned in the last interview that there are a number of researchers who believe that uric acid is actually needed in small quantities because it serves as an antioxidant. So if your levels are too low, it’s a problem.

You had mentioned the range. It should be somewhere between 3 and 5 or 5.5. And I’m wondering -- because to me it’s an important topic -- if you think that the optimum should be closer to the 3 and really further away from the 5.5. So if you could design a precise marker for optimum level within a tenth of a degree, do you have any opinions on that?

**DJ:** Sure. Well we do think that the safest range of uric acid is between 3 and 5.2 or 5.5 milligrams per deciliter and it does look like there is a steady relationship between uric acid levels and blood pressure and cardiovascular risk down to the range of 3 to 4. I would suggest that the ideal uric acid is probably around 4 for men and probably around 3.5 for women. I really think that’s probably correct.

**DM:** Okay great. Well thank you. So it’s really nice to have a target to shoot for. So I mean, if you get a 5.5, I guess the take home point is that you haven’t really won. You still got some work to do. You may want to consider some of the points that we’ll discuss in a few minutes to optimize that level and get it down even lower. And of course one of the potent ways is to reduce the intake of foods that cause your body to make uric acid. You really are one of the key researchers out there to help us understand that really this fructose restriction is really one of the important and of course the beer.

So I’m wondering for the typical person that is, you know, two-thirds of the country is overweight and most of these people have elevated uric acid levels above 5.5 and some even closer to 10 or even above 10. So I’m wondering if you could -- you’ve developed a program to help people optimize that which essentially involve complete elimination of fructose. I’m wondering if you can review that and maybe focus and concentrate on how aggressive one needs to be on the fructose restriction and elimination.

**DJ:** Well, its perfect timing because we’ve just finished a clinical trial where we’ve given a low fructose diet to overweight and obese adults from Mexico City. And we did try two different low fructose diets. But first, before we go into that, just briefly, again, we think that the effects of fructose are independent of its energy intake.

So that although sugar which contains fructose and high fructose corn syrup -- although there is a caloric component which is obviously important if you’re eating a lot of calories from this. We do think that the effects of fructose to cause its metabolic
mechanisms are not specifically related to the calories but rather to its mechanism of which uric acid is driving part of that.

And we do realize that uric acid has a dual side with being too low is not good either. But being too high seems to really increase the risk for diabetes and high blood pressure, kidney disease and obesity. And in fact, there are more and more papers coming out showing that connection

But the proof which is to reduce fructose to block the effects of metabolic syndrome are still pending but there have been some clinical trials with lowering uric acid to reduce hypertension that have been positive.

We published one at JAMA (Journal of the American Medical Association). There is another one that’s being submitted by Dr. (inaudible 6:42). So we do have evidence coming.

Now we just completed our first low fructose diet trial. And one of the questions in the trial was whether or not you need to reduce all fructose in the diet or just reduce the fructose primarily in added sugars like high fructose corn syrup and table sugar.

So we compared two diets, one that is strictly low fructose and the other one that had low fructose with natural fruits allowed.

And interestingly, both of them had very remarkable effects in reducing features of metabolic syndrome. Both of them were associated with improvement in triglycerides, insulin resistance and blood pressure that were more significant than that observed by other diets.

The paper has just been submitted and it’s led by Magdalena Madero from Mexico City, an assistant professor there. But interestingly, when the two diets were compared, they were pretty equivalent in their ability to block the metabolic syndrome. And so it looks like natural fruits even though they have fructose, they may not confer the same risk as fructose from added sugars. And the reason maybe because natural fruits contain a lot of antioxidants and a lot of things that are very good that help counter the effects of fructose.

DM: Well that’s a very important point and most of the readers of our newsletter are really passionate about health and really have been adopting diets that are far better than this typical average American. One of the biggest push backs we got was the admonition that I had taken from your information and research and the recommendation to limit fructose even from fruits to less than 15 gm a day.

So I’m wondering if in that research that you just cited that there was a quantitative difference? In other words, they both produced improvement because clearly fructose from fruit is far superior to that in table sugar or high fructose corn syrup. Do you think there is a quantitative risk or it really doesn’t matter or is there a threshold? Some
threshold that which if you start to exceed that, you’re going to I guess start to suffer some consequences?

**DJ:** Well I don’t think we know the complete answer to that question. I can tell you some things. Like, for example, fruit juice where you can get a very high concentration of fructose very rapidly by drinking it very quickly. It will give you a very high blood level of fructose which may counter the effects of the antioxidants. Studies that have been published particularly in the pediatric journals have shown that children who are drinking large amounts of fruit juice actually have increased risk for obesity.

And so the pediatric societies are now recommending limiting fruit juice to children and this idea of like limiting six-year-old children in under 4 to 6 ounces a day and for children over six to 6 to 8 ounces a day probably makes very much sense because if you do drink large amounts of juice, you dramatically increase your chances for becoming obese. So here is an example where natural fruit juices may not be so good.

On the other hand, if you eat a natural fruit, you don’t actually get that much fructose from a fruit maybe only 6 to 8 grams and you eat it slower and it’s also associated with antioxidants, fiber, potassium, resveratrol and other very good compounds; vitamin C that help block the effects of fructose. So it looks like natural fruits themselves are probably better than fruit juices.

When I originally wrote my book, I was concerned that if you eat large amounts even of natural fruits you could get into trouble and I have had cases where people were eating very large amounts of natural fruits. And when I cut it out or reduced it, they’ve had dramatic weight loss. So I’ve had a number of people like this who are eating almost a pure fruit diet and I don’t think that that’s particularly good but I think that the normal individual eating two to four natural fruits a day probably is going to be fine.

**DM:** It would seem to me that there is obviously genetic variability. That some people they in fact may tolerate large amounts of fruits for variety of different reasons. To me it would seem -- I’d like to run this by you -- a reasonable approach to use uric acid as a marker to identify your susceptibility.

In other words, if you happen to be one of those individuals who are passionate and love fruit and you seem to do well with it. And you suffer perhaps one of the symptoms or consequences you mentioned earlier that you think it’s wise to try that and just measure your uric acid level. And if in fact, you’re above 5 or if you really want to become obsessed with it; 4.0 if you’re a man or 3.5 if you’re a woman, then you may want to consider lowering your level until you’re able to optimize your uric acid levels.

**DJ:** You’re right on Joe. We actually have some evidence from our laboratory that uric acid actually regulates the sensitivity to fructose. So the higher your uric acid, the more sensitive you are to the effects of fructose. Now we haven’t published this yet but the data looks very convincing in the laboratory. We even have some data in people that would support that.
So I agree with you. If you actually measure your serum uric acid and if it’s very significantly high, you probably will get into more trouble with fruit juices and large amounts of fruit than other individuals would. That seems to be the take home message from our current research.

**DM:** I also have another comment on the fruit juice. But before I mention it, I want to state I am not a fan of fruit juice and I personally avoid it and I don’t recommend or advice people to use it. However, I’d like to play the devil’s advocate and even though the expert committees that you mentioned earlier or referenced earlier advice avoid using fruit juices. The assumption is made that all fruit juices are the same.

My understanding of the most commercial fruit juices that that’s not the case. In fact a lot of them play deceptive games with the labeling and there may only be a small amount of fruit or even in, I think, 10 years ago apple juice the case where almost all the commercial suppliers of apple juice was being spiked with high fructose corn syrup. So there is a huge difference between the commercial one and one that you’re going to make in your home in a juicer.

**DJ:** Yes, you’re absolutely right. Many, many juices are not pure natural fruit juices. In many, many cases they’re adding sugar or high fructose corn syrup and so that, right off the bat those kinds of juices are very bad. But then in addition, the actual type of fruit may make a difference. So for example, pear juice and apple juice is very, very low in vitamin C but very, very high in fructose and so those particular kinds of juices maybe worse than like orange juice or grapefruit juice that have high amount of vitamin C. So that’s kind of the counter aspect.

Now, apples contain other compounds like quercetin which is an antioxidant that may block some of fructose’s effects. So, you know, the verdict is still out in terms of which juice is better and which juice is worse. But in general, apple juice and pear juice, I would be more concerned about those types of juices because they are very, very high in sugar or fructose and relatively low in antioxidants.

**DM:** Another idea or concept I received from our last interaction was the fact that glucose which is the other half of sucrose which is common table sugar is relatively safe. It is metabolized in completely different pathways and does not produce the same metabolic abnormalities as fructose does. I am wondering with your research or review of the literature, your recommendations on using glucose as a sweetener.

Now, for those of you who aren’t familiar, you cannot buy glucose commercially. It doesn’t say glucose but you can get it as a product called dextrose and it’s relatively inexpensive. It’s only about a dollar a pound. So it’s not as sweet as table sugar or certainly fructose but it doesn’t seem to cause a problem.

I’m wondering what your research has shown with respect to long term complications of that in moderation?
DJ: It is absolutely true that if you take a laboratory animal and you feed it glucose or dextrose or starch, it will not get into trouble. It will stay skinny. It will stay healthy.

Rice diets are high in starch and historically have been associated with being lean and so forth in people as well. In contrast, if you give sugar or fructose to an animal, they’ll rapidly develop features of metabolic syndrome, obesity, and so forth. And you can pair feed animals, so one animal can get exactly the same number of calories as the other one but it’s only the sucrose or sugar or fructose fed animals that will develop the features of metabolic syndrome. This makes one believe that starches safe and this is in fact what I wrote in the book.

Now, as we’ve done more studies, obviously if you’re a diabetic, giving glucose is not good because in diabetes you cannot handle glucose metabolism. And when you eat glucose, your blood glucose levels will go up.

This is a manifestation of not being able to make enough insulin or of having insulin that is, you know, having insulin resistant tissues.

So in the diabetic, you don’t want to give starches or glucose without really monitoring the effects of it on your blood glucose and adjusting your insulin accordingly.

Now one of the things that we’re just discovering in the laboratory and actually it’s been known but we’re trying to figure out how important it is. But in people who are diabetic and in people who are severely insulin resistant, where their blood glucose goes up after a meal, much higher than a normal person. They can make fructose from the glucose and there is a pathway called the polyol pathway.

We are now studying it and we do think that there is an endogenous fructose pathway. We don’t know how important it is yet but we do know that you can make fructose from glucose especially if you’re diabetic or if you’re severely insulin resistant.

Since a lot of people who are very, very overweight and are trying to lose weight, some of them can be insulin resistant. This does throw a new twist into the story. We’re trying to figure out the impact of this. But certainly if you’re not insulin resistant, dextrose or starch is going to be good.

DM: Interesting. Do you believe that dextrose in limited quantities contributes to insulin resistance?

DJ: No.

DM: Unless perhaps they have this activated polyol pathway which goes to fructose which would.

DJ: Yeah, I mean, but then you are insulin resistant.
DM: Okay. So that's only in insulin resistant individuals?

DJ: Right. Our data is unequivocal. Starch does not cause obesity. Dextrose does not cause obesity. Starch does not cause diabetes. Glucose does not cause diabetes. Fructose though can cause diabetes. We could do it in the animal. It has been reported by others. We have a paper submitted on this. If an animal eats lots of fructose, over time, they will become diabetic. Once they become insulin resistant, they activate this pathway where they can actually make fructose from other sources of food.

So it’s a little bit more complicated than we had originally thought. But the bottom line is if you’re trying to avoid gaining weight. If you’re trying to avoid becoming obese or diabetic, the best thing you can do is to try to cut back on foods that raise uric acid particularly sugar, fructose, high fructose corn syrup. That’s by far the best approach. Starch in general appears to be safe unless you’re severely insulin resistant in which case perhaps isn’t quite as safe as we had originally thought.

DM: Now for the last 15 years, I’ve had an appreciation that insulin plays a profound important role in all of health. And maybe one of the most important contributors to premature aging. The best way to assess that is through insulin resistance. You are a researcher and you have access to the research tools that can actually better define that in animal and human models. But at a practical level, I’m wondering for the clinicians out there what you would define as insulin resistance. I typically, in my patients, strive to have fasting insulin be low 2 as an ideal. But I’m wondering if you could discuss the ranges that you are familiar with or recommend or advice and the research shows.

DJ: Joe I agree with you on that. And the other thing that I would say is a simple test is just to look at your fasting glucose. The fasting glucose, under a hundred, suggests that you’re not insulin resistant. If you’re fasting glucose is between 100 and 125 mg/dl, you probably are insulin resistant to a mild extent or you have impaired glucose tolerance. You have what we would call mild insulin resistance and slightly elevated glucose levels for what you would expect.

DM: But just a caution though that’s probably typically true but I just saw a patient last week and actually reviewed his blood test with him yesterday and his fasting blood sugar was 89. Well below the threshold you mentioned. Yet, he had a fasting insulin level of 14 which to me is profound resistance. Actually, I believe was responsible for causing for many of the problems that I consulted him for.

DJ: Yeah, it’s true. If you have hypreinsulinemia in general what happens is as you become insulin resistant, your insulin levels will go up to help keep the blood sugar down. So if you have a particularly robust insulin response you could keep your glucose in the normal range for some time. So you’re exactly right. That person is maybe developing early insulin resistance.
DM: Would you classify an individual like that as a pre-diabetic?

DJ: Yeah, I would classify that individual you saw as pre-diabetic.

DM: That’s what I thought. The typical definition is a fasting blood sugar between 100 and 110. I mean that’s the standard definition but I think this is far better although less common occurrence but it’s still possible.

DJ: I think you’re right.

DM: So thank you for that. Since we last spoke, I would have loved the opportunity to talk to you about this but you were overseas doing your research. I think you mentioned this and I just took off on it. I got a lot of people angry on this. In that agave obviously a sweetener that many people interested in health use is actually -- there is a range that can be as low as 55% but in some cases as high as 90% fructose.

And many if not most, at least in my understanding, most of the commercial supplies of agave actually is processed in a way that’s not too dissimilar to the high fructose corn syrup. So I felt it important to warn people that just because the perception that agave was a natural healthy product, it doesn’t mean it was the best choice as a sweetener.

And honey falling close behind it. It's like 70% fructose.

So from the information you shared on it, I thought it was appropriate to warn people. But, you know, I’ve got a lot of pushback on that. I’m wondering if you have any thoughts or if you’ve done any research or aware of any literature on it.

DJ: We have not done any specific research with agave or with honey. But I do believe that those two compounds because they’re so high in fructose, probably will engage the same pathways that we see when we give fructose or sugar to animals. So I would not recommend those as sweeteners to use daily.

DM: It seems that there are far better alternatives available so it doesn’t make sense to use one of these when there is known potential complications. So one of the other interesting topics that we discussed last time was the use of a drug allopurinol which is traditionally used to treat gout and gout as many people know, is the traditional complication that most people think of with elevated uric acid levels.

But now, you really exposed all of us to this broader implication of elevated uric acid levels. I’m wondering if you can discuss in your use, what you understand in the literature is that the use of allopurinol therapeutically. What type of doses do you think are useful? If there is any danger to be concerned with maybe it does make sense as a short term intervention if a person is getting their lifestyle under control so they can lower this naturally by improving their insulin resistance.
DJ: Okay, so this is a really important area. So the first thing is our research suggests that uric acid may have a real role in causing high blood pressure, kidney disease, possibly fatty liver, insulin resistance and even obesity.

So we think that it's actually a very central factor.

Most of the evidence it comes from experimental animals. And then in humans, the evidence comes from epidemiologic studies that show that if you have a high uric acid, you are at increased risk for developing obesity, diabetes, hypertension, kidney disease, fatty liver, etcetera. Since uric acid is generated from fructose, this is where we think, how we think fructose largely works.

In addition, other foods like beer and so forth can raise uric acid. So this has raised the question, can lowering uric acid provide benefit? The primary drug that’s used to lower uric acid in the U.S. is allopurinol and this drug has been around since the 1960's. The inventor of it actually got the Nobel Prize. The drug is used currently to treat patients with gout where uric acid levels go up so high that they get crystals of uric acid in their joints and get arthritis

So what is the evidence that allopurinol can provide benefit in patients with high blood pressure and so forth.

Right now, there are only limited numbers of studies that have been published. There are more coming and most of them if not all of them are positive. So they do suggest there is a benefit but it’s still very early in the process. We are not recommending the use of allopurinol in the general population to try to prevent cardiovascular disease at this time. But let me tell you what some of the evidence says.

So the first one was we conducted -- Dr. Dan Feig who is at Baylor in Houston. He’s a pediatric nephrologist. He and I conducted a clinical trial in which we took obese adolescents with newly diagnosed hypertension and they were randomized to allopurinol or placebo and 86% of the children became normotensive with allopurinol alone without any other anti-hypertensive. Provided the uric acid was lower to less than 5 and only one out of 30 placebo treated children had a normalization of blood pressure.

So this was a very dramatic effect but it was only 30 children and its pilot study. Dan has repeated this in another study, has very dramatic effects which she’s going to submit again in adolescents. There has been no trial or there has been one small trial. It wasn’t randomized of giving allopurinol to adults and it did lower blood pressure slightly in people with hypertension.

And also there are some clinical trials that have been published in which it lowered blood pressure in patients with kidney disease. But there is no major trial looking at the effect of lowering uric acid in the adult with hypertension and I would have not currently give allopurinol to treat anyone with high blood pressure until we get more data.
The data on insulin resistance, there was a paper published in January of this year showing that lowering uric acid -- this was with a different drug -- was associated with improvement of insulin resistance in patients with heart failure. So this is exciting but it needs to be again, we need larger numbers of patients. We need a full clinical trial.

In terms of weight loss in this most recent trial that Dr. Feig did. There is like a 15-lb weight difference between the control and the allopurinol group at the end of the study. This was only a several month study. So this suggests that this drug could be useful in preventing weight gain in particular. But again, the study is not yet published and has to survive peer review and so forth. We need more patients before we can really say that this will work.

There are additional studies that are in press that show benefits on cardiovascular events and on kidney function. But they are not yet published yet and we have to wait to see how the scientific community reviews these findings. But it is very exciting, it does look like this could be an important cardiovascular target and as such, we need to -- or risk factor (inaudible 31:23), we need to do more studies on this.

Now, what’s the danger of giving allopurinol?

Well there are some risks because rarely allopurinol can cause a life threatening allergic reaction where you get this terrible rash and that the rash can cause the skin to flake off, you can end up in the intensive care unit. It’s very rare but it can occur. It’s called a Stevens-Johnson Syndrome and it’s really not something anyone wants.

So allopurinol is not without some risks.

You can get abnormal liver function tests from it at very high doses. It may itself cause some kidney trouble. So allopurinol is not the perfect drug.

Now, there are other drugs being developed to lower uric acid. So if turns out that this is a really important cardiovascular target or risk factor that we need to reduce, there are going to be drugs that can do it and of course low fructose diet does lower uric acid probably 1 to 2 mg percent and restricting certain other foods may some impact as well. It’s still early but it does look very promising that it is an important risk factor.

**DM:** Well, I thank you for those comments and I certainly appreciate the caution of making a global recommendation without the scientific studies and peer review studies to support that recommendation. I want to preface too that those listening know that I really don’t advocate drugs at all in my goal when I see patients as really to get them off of all their drugs and using natural lifestyle alternatives to compensate for those shifts.

However, I’m wondering if you could just make a comment because on the use of allopurinol, one of the newly found derivatives that might be safer is usage of the drug as a crutch because it would seem to me that if you have this really elevated risk factor that the most logical and rational approach is to be aggressive with the fructose.
restriction and to implement some really good comprehensive exercise program to
decrease insulin resistance and ultimately, that will help and is the long term solution.

But in the interim, especially if they’re high risk for a challenge, I’m wondering if it makes
sense to lower it pharmacologically on the assumption -- this is where I’m not sure
because I don’t understand the physiology as well -- because when you lower the uric
acid, are you improving all the mechanisms that actually will lead to the maintenance of
the high uric acid. So in other words, that the lifestyle adjustments that you’re making
will even be synergistically more effective because the uric acid is artificially lowered?

**DJ:** Again, you’re right on Joe. So we believe that that’s true. I have submitted some
grants to the National Institute of Health. We have one big multicenter trial that’s going
to be reviewed in June in whom we are suggesting that lowering uric acid can be an
adjunct to exercise and diet, to help prevent the development of obesity and insulin
resistance in adolescents. This is a study that would be led by Dan Feig.

We also have put in it looks like allopurinol and metformin which is another drug that’s
often used to treat early diabetes and frank diabetes. But that the combination of these
may actually help reset the system so that you can lose weight more easily especially if
you would diet and exercise. And I should mention that low fructose diet and exercise
both lower uric acid as well. Its very true that there maybe some benefits particularly in
our society with pharmacologically lowering uric acid but we’ll have to see how the
clinical trials show but I think you’re right on the money.

**DM:** From your review of the literature and your clinical experience, what type of
timeframe would you expect to see the maximum benefit? Would it be an order of one
or two weeks or one or two months? I’ve never used it for that application before so I’m
just not sure of the timing on it.

**DJ:** We don’t absolutely know but I would guess based upon our experimental studies
that you might only need this for two months or so in the range of one to three months
to kind of help reset the system that would then allow you to become less sensitive to
the effects of sugar.

**DM:** Great. I know you as a leading expert in research in the field. You’re not allowed to
make recommendations without strong scientific support but since I’m not one of those
researchers, I personally when I consult with patients, it seems to be an appropriate
use. And clearly, using it as a crutch like one might use an antibiotic to get over strep
throat or actually literally a cast if you’ve broken your bone to allow your system to heal,
to reset to where its normal physiology. The danger of course is that many clinicians will
get sloppy and use it as the only approach and that is absolutely inappropriate in my
mind because you’re not treating the cause.

**DJ:** You’re right and actually we have a bunch of studies proposed not only in this
country but also in several other countries where we are going to be trying those exact
things, you know, short term treatments with these agents that we think will help reset the system to make you less sensitive to the effects of fructose.

So hopefully one year from now, we'll actually have results from some of these studies. So let's hope that they are positive and that we can really make an impact on this important epidemic.

DM: Well, we'll just have to wait to see what the research show but thank you for your insights on that. Those are really the end of the questions that I have from our first interview but what I wanted to focus on now, is some of your newest research.

Let me first state that much of the research done in traditional medicine is sort of relatively suspect and that's the result of the massive, I mean, massive conflict of interest that occurs with the drug companies and funding them and writing the studies and having them actually approved in the journals. It's really a questionable area and we've actually done some interviews with some experts on this to discuss it in more detail.

What I love about your research is that because there is really no drug, I mean, allopurinol is a generic drug. There is really no investment or corporate interest to promote this. I mean, really, its pure research. Really sort of the paragon, the ultimate of what science-based medicine should be with really restricted conflict of interest as far as I can see. Its one of the reasons I'm really so excited about what you're doing.

You actually told me right before we started the recording that you actually have done some research and you've submitted them to two of the finest journals in the world Science and Nature which are the best science journals in the world. Now, they haven't been accepted yet but they're submitted. And I don't want to pressure you because this is data that can't be released until it's actually published. So if you can share and give us some highlights what you can without jeopardizing any of your work that would be great.

DJ: The whole uric acid story is a very exciting story because we have incredible epidemiologic data linking uric acid with heart disease, linking uric acid with obesity, linking uric acid with diabetes and so forth. The epidemiologic studies are overwhelming. The experimental studies now confirm or actually provide evidence that uric acid isn't just a marker but may actually have a true role in that process.

But there are two aspects of this whole story that have kept it from being accepted in the scientific community and the two aspects are one, everyone would like to see clinical proof in the human that the animals studies are true. In other words, does lowering uric acid prevent hypertension, treat hypertension, prevent obesity, and treat obesity and so forth. Those studies are now being initiated.

But the other main question is how does uric acid cause these problems? Why does it cause, I mean, if it does cause obesity, what's the mechanism? On that side, although
we are doing a lot of studies, the actual cellular mechanisms by which uric acid causes these effects has really been unknown.

The papers that we’re submitting right now have identified a cellular mechanism at the mitochondrial level that seems to be the key mechanism by which uric acid works. And what are exciting about it are the mechanisms that it seems to engage have recently been identified as central mechanisms for obesity and diabetes. But honestly the way that this occurs in diabetes and obesity has not really been identified. But now we can show that uric acid engages these very key pathways that seem to drive diabetes and obesity.

So we’ll have to see how the papers do with peer review and perhaps there will be suggestions for more studies to try to prove this. But we’re hoping that we’ve identified the cellular mechanisms by which uric acid may actually induce these pathways.

**DM:** Well that’s very exciting. We look forward to having you back on again when those studies are actually published and that’s really the beauty of this.

I’ve been in medicine for not quite as long as you but nearly three decades and one of the continuous frustrations is that the magnificent research and in many cases the complete life dedication of researchers who really have been able to elucidate and bring out a central truth sometimes takes 10, 20, 30 years or more before its clinically applied. So thankfully we have new ways to interact with and educate people to shorten that time. That’s really one of the missions of our site to help shorten that lag time.

**DJ:** Thank you Joe. I have one comment to tell you too and that is when we first started studying fructose, I started going to the web and reading all I could about it and I found papers on about fructose written by you. I printed them out and that was one of my starting (inaudible 42:32). Honestly, I was reading your stuff and it was one of the starting points and of course I was reading the scientific literature and all that but I was particularly, I know that you early on realized that the high amounts of fructose may not be a good thing. I got to commend you.

**DM:** Thank you and really my focus is not so much doing the research like you’re doing, my skill set is to comb through the literature and find pearls of truth that really support the natural ways to doing this. It’s easy for me to put that on and publish it but the hard work is what you’re doing and the other scientists are really committed. You commit your whole lives to bringing this out. That’s really the only way you can establish it as a science. It’s a lot of hard time, effort and energy but you’re doing it. So I really appreciate that.

And the big reason and this is what we mentioned last time and I still think there is only this fraction of a fraction of people who get this but it was an epiphany I had when I spoke to you that this is the cause of obesity and virtually no one understands that. I mean we can just give up. I mean, yes there are other variables that contribute like
exercise and your total calories but if you can get the fructose under control the obesity epidemic would disappear.

**DJ:** I can't say it would be the only cause of obesity but I would have to say it's got to be the major cause, absolutely.

**DM:** That's why your research is so important. That's why I'm absolutely committed to exposing this to as many people as possible and really you've taken it one if not two orders of (inaudible 44:05) beyond what my limited exposure was before but that is an interesting anecdote. That was a stimulus for some of your research.

Well thank you again and I really appreciate you making the time and we'll definitely get together maybe later this year whenever your publication allows you to elucidate the details of the mechanism of this because its just absolutely fascinating.

**DJ:** Thank you Joe.

**DM:** Alright well thanks again.