A Special Interview with Dr. Robert Barry
By Dr. Mercola

DM: Dr. Joseph Mercola
DB: Dr. Robert Barry

Introduction:

DM: Welcome everyone. This is Dr. Mercola. Today, we are here with Dr. Robert Barry. He has earned his Bachelor’s Degree in Biology from Boston College. He received his PhD in biochemistry from the University of Maryland.

He is an active member of many professional associations including the American Chemical Society and the American Association for the Advancement of Science. We’re really delighted and privileged to have you with us here today. Thank you for coming Dr. Barry.

DB: Dr. Mercola, thanks for having me.

DM: I’m wondering if you could explain to our audience the journey you took in your research with CoQ10, how it started and if you could describe some of the initial findings that you encountered that motivated you to pursue it further.

DB: I have some experience with CoQ10 in academia and in clinical research but the majority of the information that’s coming out on ubiquinol specifically…

DM: Ubiquinol is the reduced version of coenzyme Q10.

DB: Right. That’s the electron rich form of coenzyme Q10 as opposed to the conventional coenzyme Q10 that most people are familiar with and has been commercially available for the past 30 years.

Ubiquinol was first introduced commercially around 2006 even though researchers have known about ubiquinol as long as they have known about conventional coenzyme Q10 since the late 50s. But it just wasn’t stable enough to be put into a pill or a capsule.

DM: So there was some research improvement that allowed it to improve the stability and make it available commercially?

DB: Right. A company called Kaneka Corporation was able to develop the technology to stabilize ubiquinol. The thing with ubiquinol is because it’s electron rich, it’s called reduced. It’s a chemical term just meaning that it has a couple of extra electrons on it. It’s unstable in light and air. In other words, it will oxidize.

If you had ubiquinol, if we had in front of us now, it’s an off white color and put it on the table here. By some time tomorrow morning, it would be bright orange. Bright orange is the color of conventional coenzyme Q10, oxidized CoQ10.
DM: Or electron deficient.

DB: Right. That’s a better way to put it actually. But because of that, they haven’t been able to put it in to a pill or into a capsule but they have come up with a technology to keep it stabilized in bulk so it can be incorporated into soft gels. Around 2006, was actually the first time in history that it was commercially available.

DM: Before we go into that though, let’s just talk a little bit about the reason why the abundance of electrons in a product like coenzyme Q10 is important. Can you describe some of the biological functions and what these extra electrons would provide for the individual?

DB: Sure. I’ll try. Structurally, in terms of the molecular structure, remember when we are talking about oxidized and reduced coenzyme Q10, it’s the same molecule rather either with or without those two extra electrons. The fundamental importance of ubiquinol and coenzyme Q10 is metabolic energy. There is a production of ATP. It’s an essential component of the electron transport chain in the mitochondria in the generation of ATP.

The mitochondria are responsible for production of around 95% of the ATP that we produce in our bodies. CoQ10 is an essential component of that. We could talk about that a little bit later but that’s one of the main functions. The other one is and specifically for ubiquinol, not ubiquinone, the oxidized form, ubiquinol the reduced form…

DM: And ubiquinone is coenzyme Q10.

DB: That’s right. Conventional coenzyme Q10. Ubiquinol, it has that two extra electrons. Because it has those two extra electrons and it can donate it, it’s a very strong lipid soluble antioxidant, in fact, one of the strongest lipid-soluble antioxidants that is known, strong enough to actually help regenerate vitamin E and vitamin C in our bodies. So those are the two main functions.

There are other functions such as cell-to-cell interactions, gene expression and a test that have been done with ubiquinol and CoQ10 showing that it has to do with cell signaling as well. But the two main functions is cellular energy and cellular protection.

DM: Terrific. So Kaneka was able to develop this process to essentially provide the more beneficial oxygen rich form of coenzyme Q10.

DB: Electron rich.

DM: I’m sorry, electron rich.

DB: Actually, they had it for about 10 years. Almost a decade and conducted a number of studies on it and perfected it so that it could be stabilized and put into a capsule form. But during that process, it also went through all the toxicity studies and human clinical trials for safety that was required by the U.S FDA before it was ever made commercially available.
So in terms of safety, it has the same safety profile as conventional coenzyme Q10 which is actually a pretty clean slate. There are no known drug-drug interactions in terms of safety in large dosages. There has never been any issues.

**DM:** No reported side effects?

**DB:** None at all actually. It showed significant benefit. That is the reason I guess I don’t pay that much attention to the commercial aspects but from what I understand for the past if not decade close to 20 or 30 years, coenzyme Q10 is always one of the top 10 supplements that people take. I think there is a reason for that. That it actually it does something. It really does work. There is a significant health benefit that is tangible and associated with it.

**DM:** And the neurodegenerative diseases, what does the research show? Does it just stop the progression? Does it actually reverse some of the pathology?

**DB:** It would be great if it reversed it. I don’t think it went quite that far. In most of the studies that were done especially on Huntington’s disease and Parkinson’s disease, it showed that it slowed the progression of the disease. Those are tough areas to work in clinically.

**DM:** Absolutely.

**DB:** They are slow, insidious diseases, tough to determine significant clinical biomarkers that you can use, or research to show that something actually affects it in a positive way. But a number of publications are out that show that both with Parkinson’s and with Huntington’s that it significantly slowed the progression of the disease. And it has just gone forward from that.

There is a number of studies that are ongoing now in major medical centers throughout the U.S. Now most of them are employing ubiquinol though because they want to get a look at ubiquinol and see if there is any significant differences with that. Like I said, it’s fairly new just since 2006.

A couple of statements that I could make that I think are fairly true is that in all the publications on ubiquinol to date, in every one of them, bioavailability has always been higher with ubiquinol in direct comparison with conventional coenzyme Q10. In some cases, it’s a very small difference. In some cases, it’s very large.

**DM:** What would contribute to those differences? Is that the way that the coenzyme Q10 is prepared because there are some commercial versions of coenzyme Q10 that claim to have greater bioavailability for whatever reason?

**DB:** You have to remember, this is a lipid soluble material. Just in terms of straight chemistry and physiology, lipids are absorbed much less so than water soluble materials in our systems. So typically it’s going to be low to begin with in terms of what’s bioavailable. But ubiquinol is funny and then coenzyme Q10, it’s literally in some cases on metabolic demand.
There are studies that show – in healthy individuals that are young compared to older individuals.

In some of the studies, young was defined as 25 to 35 and old was defined as 65 to 85. Given the same dose of either conventional coenzyme Q10 or ubiquinol, the older population always absorbed more than the younger population. And it was more so in each case with ubiquinol even in the younger group more was absorbed and are bioavailable with them but in the older group as well.

It’s also seen in terms of health state. Healthy individuals tend to absorb a little less. But if you suffer from chronic or acute disease, oxidative stress and that type of thing, you start to see the bioavailability – and this is again in terms of plasma levels upon supplementation seems to go up significantly. So it’s metabolic demand. Your body actually needs it more. These are in cases like hearth disease, neurodegeneration, diabetes, those type of scenarios.

DM: You bring up a very good point because it’s highly likely that anyone listening to this conversation will be motivated to take either coenzyme Q10 or ubiquinol if they aren’t already taking it. If they make that choice then clearly because it’s a lipid soluble supplement that it’s important to enhance the absorption of that and one of the ways they can do that is with fat.

I’m wondering if you could perhaps comment on the range of absorption that you see in your trials and what is the best thing that someone can do to increase absorption? What type of food would it be? Would it be eggs? Would it be butter? Coconut oil? And the timing and amount if you can comment on that.

DB: The main thing especially with the formulations that they have nowadays always suggest that you should take it with a meal if possible because again, it is lipid soluble. Let’s say it’s between a meal or something like that. I always say just take it with a teaspoon of peanut butter. It does pretty well as opposed to (indiscernible 10:33).

DM: So you don’t really that much. A teaspoon…

DB: No, not at all.

DM: It just stimulates the body’s production of the enzymes or it just piggyback on the actual fats?

DB: I think more like a piggyback. If you look at the way that fats and lipids are digested it follows that same pathway. Piggyback is a good way to put it. But definitely with a meal. It seems to be absorbed that much better.

DM: Is there any benefits to taking more fat or you just need a relatively small amount?
DB: No. A small amount is fine. It could even be a teaspoon of olive oil or something like that. It depends on which type of oil you think that is most healthy or is worth taking.

DM: Typically phospholipids are used to form these liposomal preparations to improve absorption. The basic ingredient of that is typically in eggs. I’m wondering if eggs – have you found if using egg yolks have been particularly helpful in increasing absorption?

DB: I haven’t done a study in terms of different foods and absorption that type of thing although it might be a good one to do. I would think so. I would think that that would make sense as long as the yolk is included.

DM: Okay.

DB: One of the best ways to look at ubiquinol because a lot of times I’m asked to kind of define or explain what the difference is. Actually, the best way to look at it is that you and I’m sure that your patients and people who maybe listening or viewing this are familiar with vitamin E and vitamin C. They probably buy that (indiscernible 12:06)

DM: The classic antioxidants.

DB: Sure. Coenzyme Q10 is very much like them. It’s an antioxidant also. The vitamin C and vitamin E that you buy is the reduced form. After it acts as an antioxidant in your body it becomes oxidized. That’s the oxidized form. No one would ever sell oxidized vitamin C or would ever sell oxidized vitamin E nor would you want to buy it. If you took your vitamin C pill and put it out on the counter today tomorrow morning it would be brown. It would be oxidized. That’s the difference between ubiquinol and ubiquinone, conventional coenzyme Q10.

So you would expect that while it’s regenerating in your body but so is vitamin E and vitamin C. So you would expect that if you take conventional coenzyme Q10 and there is thousands of publications over the last 30 or even 40 years on coenzyme Q10 and its health benefits in a number of different areas.

There has also been some controversy. It’s been on the fence in a number of different publications where either they can’t reproduce it or maybe statistically it isn’t quite as far long as some other studies that showed a positive effect. My guess is because one of the things that we found is that as you grow older, and this has been known for a long time, you produce less and less coenzyme Q10.

DM: What is that range of age that you start to notice a decline in the production?

DB: After your 20s.

DM: Twenties, so really it starts in the 30s. It’s only the 30s.
DB: Yeah. One of the things I was going to say is that not only do we make less coenzyme Q10. Probably the most important aspect is that the conversion in our bodies, in our cells from oxidized coenzyme Q10 to ubiquinol to electron rich form goes down as well. That is diminished. That’s also very closely associated with mitochondrial dysfunction, oxidative stress, all of which has been associated with aging and age-related diseases. The real story is why should you take ubiquinol as opposed to conventional coenzyme Q10?

DM: Which is two-thirds cheaper typically.

DB: Sure. Actually, I can address that a little bit too because it seems that in most cases and in most studies done so far, you can use significantly less ubiquinol as opposed to conventional coenzyme Q10 in terms of dose and get either the same or better health benefit. It isn’t necessarily, you know, on the face of it, it looks like it maybe more expensive but so far it’s pretty consistent.

DM: You don’t need as much.

DB: Typically you don’t.

DM: How much less would you say milligram per milligram?

DB: The way I put it is and in studies that have been done and shown that usually around a third of what you would take. Studies show that in terms of the conversion, again, like to me, I emphasize it a little bit what we’re talking about here, your body in order to utilize this both for energy production. Oxidized coenzyme Q10 accepts electrons in the electron transport chain in the mitochondria that helps generate ATP.

If that doesn’t happen then ATP production goes down, cellular energy goes down, fatigue sets in and those type of things but also in terms of antioxidant protection. If you convert less and less oxidized coenzyme Q10 to the electron rich form, you have less and less protection against oxidized lipids, proteins and DNA.

A number of studies have shown that this is very tangible by the age 40. That both of these have declined – both the production of coenzyme Q10 as well as…

DM: Almost universally by the age 40.

DB: Pretty much. These are in healthy individuals. But there are a number of studies also that show that this starts in the 20s with this slow and continuous decline. And again this has been directly associated with the aging process as well as age-related disease. Ubiquinol is pretty important.

Some important studies that have come out have shown – because people always ask, as a supplement, you know, you should be able to get some of these in food and our diet. Why should I supplement with ubiquinol? A number of studies have shown two things; is that ubiquinol – it’s often called QH supplementation – is absorbed and assimilated in our bodies and
metabolized exactly the same as ubiquinol from a food source just a lot easier to get at least in a
decent dose. You would have to eat about 3 lbs of sardines a day to get a typical dose of
ubiquinol. I guess most people wouldn’t be willing to do that.

DM: Are sardines one of the highest known food sources of ubiquinol?

DB: Yes. Especially oily fish like sardines, blue fish I would imagine but also dark leafy green
vegetables and organ meats are loaded with CoQ10. But specifically at least in the raw state it’s
ubiquinol. People say, can you get ubiquinol from your diet? You can but with the Western diet
especially when you cook any of these foods it’s oxidized and you end up with conventional or
oxidized coenzyme Q10.

DM: Interesting. I was noting with respect to the potency and needing less of the ubiquinol
versus the CoQ10. I find it somewhat similar to our use of krill oil which still has DHA and
EPA. Because it’s phospholipid in this case, it seems to get much better absorption and much
better utility. So you need a lot less of it than you would for fish oil – the equivalent dose of fish
oil.

You also mentioned the use as an antioxidant and how it recycles. Is it true that ubiquinol
actually helps to add those additional electrons to vitamin C and vitamin E? So it actually
recycles or regenerates those antioxidants?

DB: Yeah. There is a number of studies showing it.

The commercial availability of ubiquinol isn’t important just in a clinical setting. I mean there
are some prominent researchers and clinicians in major medical centers. I remember one of them
saying after he was introduced to ubiquinol, he came back to me and said, he doesn’t know if lay
people realize this so much or even researchers yet. This was back in 2006. But this was the
first time in history that there was enough ubiquinol available to do a clinical trial on two people.

DM: That was 2006.

DB: There is a number of publications that were done before that where ubiquinol would be
generated within the system that they were studying where there was a cellular system and that
type of thing. So there is a number of publications on ubiquinol through the 60s, 70s, 80s, and
90s. In fact, a couple of very important papers in the late 80s and early 90s came out by Bruce
Ames at Berkeley showing how strong an antioxidant ubiquinol is even back then.

DM: This is the same Ames that came out with the Ames Cancer Test?

DB: Yes. So there is a number of studies that have been produced even prior to it’s being
commercially available. Researchers have known about it for a long time but now that it’s
available there is hundreds of studies that are being conducted now not just for clinical benefit.

To get back to your point in terms of regenerating vitamin E and vitamin C,
even more interesting for me is on the academic side and the basic biochemical research side. There are studies that are coming out that are elucidating the mechanism of regenerating vitamin E. In fact, one of the studies that was just published this past year showed that there is a proton tunneling effect that is associated with it. So there is a lot of information that is yet to be gained on ubiquinol but so far all of it is very consistent and very positive.

**DM:** Kaneka is a big company, a multibillion dollar company out of Japan.

**DB:** Yes. My first introduction to Kaneka was about ubiquinol before it was commercially available and to work with them in developing it for commercial availability but also for research uses.

Actually, I have to admit I was very impressed with Kaneka. It’s a scientific based company.

**DM:** How does that compare to other supplement companies that might be out there or what other aspects of the company impressed you?

**DB:** In terms of comparison and I’m not familiar with that many companies here in the U.S. I’m familiar with the names but in terms of their infrastructure, I’m not that familiar with them. My guess is that Kaneka is more closer aligned with a pharmaceutical company. They do have divisions that work in pharmaceutical intermediates and whole healthcare division and that type of thing as opposed to some of the supplement companies here that maybe a bit lighter on the science side.

I always thought it was very important that people are ingesting this. They are taking it hopefully to derive some health benefit. The technical aspect, the clinical aspect for all this is very important. Kaneka goes to great lengths not only for safety but also for efficacy and they promote a number of clinical trials throughout the world. But basically with hands off is at arms length with them. They are not biased studies at all. These are done by independent researchers at major medical centers and major research centers throughout the world.

**DM:** Kaneka appears to be a really high quality, very committed scientifically oriented company that has produced this, the world leader for the last three decades.

**DB:** Pretty much. To learn more about Kaneka, and to learn more about coenzyme Q10, they are really the experts on CoQ10. They have been working with it for 30 or 40 years and of course ubiquinol. You can go to their site and it’s [www.KanekaQH.com](http://www.KanekaQH.com). It will bring you to the ubiquinol site.

There are also some independent sites now online that you can Google. Ubiquinol.org is one of them. I know there is even a Wikipedia now for ubiquinol. It’s pretty popular not only as a supplement but in the social media as well evidently.
DM: Excellent. That’s terrific. In some of our previous discussions and you alluded to earlier one of the benefits of ubiquinol is in the aging process and actually slowing it down. You shared some very impressive animal data on aging that was instrumental in convincing me of its benefit clinically and actually motivated me to start taking it personally. I’m wondering if you can share that with our audience now.

DB: In terms of the study, what’s interesting about the study and actually what caught my interest as well. This was done very early on, in fact before it was formally commercially available. Some researchers in a major medical center in Japan decided to look at aging. They used an aging model to evaluate ubiquinol. What’s interesting about this is it’s a direct comparison to conventional coenzyme Q10.

They used a mouse model. I should emphasize for the listeners that it’s a very non-invasive study that was conducted. The mouse model is a very important one. It’s called the SAMP1 mouse which stands for Senescence Accelerated Mouse.

DM: These are mice that age rapidly.

DB: Very rapidly. Their lifespan is typically anywhere from 12 to 14 or 16 months maximum. Typically, a mouse will live to be three or four years or somewhere in that area. But this is a mouse that they use at NIH and other major research centers to study aging and the effects of aging and therapeutics that are hoped to address aging. So it’s an important model. It’s a proven model that they decided to use.

It’s a very simple study. They took three populations. One control group that didn’t get any coenzyme Q10 or ubiquinol. Another group that received coenzyme Q10 – this is just in their trial. And then the third group we call the QH group or the ubiquinol group that received ubiquinol. Otherwise everything else was the same. They had a pretty free environment. They are able to go out and play and have a great time and just live out their lives. What they did was just observe them.

DM: When did they start intervention? How old were they?

DB: I think it was around three year four months. I have to look at it. This was published back in 2006.

DM: About the comparable age at which humans would start to reduce their production of CoQ10.

DB: Yeah I think so. I think it would be comparable, maybe about two months. So it would be comparable to maybe around 20 years old for us. But anyways, what they wanted to do was just observe them and see if there were any differences. Again, they got the two groups that got coenzyme Q10; one was conventional coenzyme Q10 and the other one ubiquinol on a daily basis with their trial. Again, they were allowed to play and had a pretty free environment. Later on, they did look at histological examinations and that type of thing. But the main thing was they just see if there is any difference because again, they age very rapidly.
To make a long story short, what I have shown you was this short video which was conducted by the medical school to have a video record of just what was going on because this was also published so it’s also described and there are pictures in the publications that was published in a major journal. Again, I believe it’s 2006.

But what you see with the video is they are looking at a mouse that’s now I think is around 12 to 14 months old. That’s very roughly but it’s comparable to a person that is 90 to 100 years old. The first mouse that you see is the control group. The one that didn’t get any coenzyme Q10 and it’s being held in the palm of one of the researchers. You could just see that it has skeletal deformities. Its fur and skin is very patchy and dry. It has orbital lesions and that type of thing. Typically I guess how would we look at 90 to 100 years old and about ready to expire and non-responsive.

And then it pans over to immediately to the QH mouse – the ubiquinol mouse which is the exact same age which is again comparable to 90 or 100 years old. It basically is running around like a teenage mouse. It goes through mazes and everything else and is very responsive. You really have to look at it.

It’s a very dramatic comparison because both of these mice are the exact same age; 90 to 100 years old compared to a human. The only difference in their whole lifespan was taking ubiquinol. Again, it’s just very dramatic. That’s reflected in a number of the studies that had been done since then.

What we found is that in just about every study that has been conducted with ubiquinol. Every one is necessarily a direct comparison to coenzyme Q10 because they use that in some cases even as the control group. There is a very dramatic metabolic and physiological effect that you see with ubiquinol that you don’t necessarily see with conventional coenzyme Q10. That study convinced me but also convinced Kaneka.

To be very truthful, Kaneka thought at that time when they were first developing ubiquinol that it would be a nice next generation coenzyme Q10 – the antioxidant form. It would be a little bit better. It would be a nice added – I don’t know what you could call it, a stew or whatever it is, just a different type of CoQ10.

**DM:** Improving the (indiscernible 28:54).

**DB:** That you could talk about. When I saw that video and when I looked into the publication and talked with the people who conducted that study, and they realized that there is something very profound going on here. There is a very dramatic difference between the two and a very significant difference between the two. That’s when we knew we really had a tiger by the tail. We were looking at something that’s very different from conventional coenzyme Q10. Again, that’s been reflected in almost every study either to a slight degree, in some cases, a very dramatic degree in every publication since then.
DM: Thank you for sharing that in the way you did because you do it so darn well and far more effectively than I could possibly do that.

It’s basically impossible or virtually impossible for an animal to have a placebo effect. This is real authentic improvement that was noted. I don’t know how anyone could not be compelled if they have any interest in anti-aging to start this immediately as soon as they can.

DB: Sure.

DM: It doesn’t make sense not to when there is no side effects. The only limitation would be finances.

[----- 30:00 -----]

DB: Right. It makes sense from what he had talked about earlier in terms of cellular energy production we explained which diminishes as we get older. If you think about it, I mean, that’s what makes this machine (indiscernible 30:16). Every cell in our body is loaded with either hundreds or thousands of mitochondria. There is a reason for that. As that energy generation goes down, diminishes as we age, that’s when you start seeing chronic and acute disease associated with aging and the aging process itself.

DM: Can you expand on ATP as a source of energy because obviously it’s something that you know quite well. Most of our viewers or listeners are not as familiar with the biochemistry of it.

DB: I’ll try. Basically, I mean for all the metabolic functions, in every cell on our body, if you think about it, most people don’t and there is really no reason to. – every second, every millisecond of everyday, every hour, every year, every decade, pick an organ or a tissue in your body like the heart, it’s going constantly when you are asleep, when you are working, whatever you are doing.

It’s sort of like letting your car run all the time. If you think about it in those terms actually. You let your car run all the time, you never stop it. It keeps going. Sometimes it’s going faster, sometimes it’s going slower. How would the car be running let’s say within a year of doing that? We hope to live maybe longer than a year or so, let’s say within two or three years, let’s say a decade.

Let’s say a 20-year-old car that’s been running every day and going places not just standing there. What kind of shape it would be in. In terms of efficiency, how efficient and how optimal would it be as a machine? The impression would be and if you just think about it and you get a visual of that is probably about ready for the junkyard or definitely ready for a new car.

But when you think in those terms and you really get an idea of what is going on on the cellular basis in our bodies everyday. I mean, it’s being pounded on a regular basis not only from running normally but also from environmental effects. From something that you hear a lot about in media as free radical damage and oxidative stress and that type of thing and that’s real.
Without the efficient production of ATP, of energy, for each cell in our body that deterioration is even faster. We’re more susceptible to the effects of aging much more susceptible to acute and chronic disease. So it’s very important to keep those energy levels up. Very simple things – it doesn’t even have to be acute or chronic disease, it is something like fatigue. If you’re in your 30s never mind, your 60s, 70s, or 80s. Fatigue is one of the top five complaints by adults in the U.S. to their physicians. There is a reason for that and there is a connection with ubiquinol in terms of energy production.

Basically, what you would ask is just how essential is it for energy production? I mentioned before the mitochondria. Mitochondria are called the powerhouse of the cell. Most people remember that from high school biochemistry or their college biochemistry and that type of thing.

In the mitochondria, there is a thing called the electron transport system. What happens in the transfer of electrons in that electron transport chain is fundamental to ATP production in every mitochondria in every cell in our body. Ubiquinol is an essential component to it. If ubiquinol is not there, if ubiquinol is not produced in the electron transport chain, you don’t get the ATP production. So it’s not that it’s this intangible thing that may or may not work that we may or may not need, it’s absolutely critical.

We do produce it in our bodies as I mentioned before but again that diminishes as we age but importantly the conversion – I can’t overemphasize that – the conversion of oxidized to reduced coenzyme Q10 to ubiquinol in our body. If that’s not efficient then we have problems.

**DM:** Thank you for helping us understand that better. I’m wondering also if you could comment on the actual ATP because you made it very clear that ubiquinol is essential for the production of ATP but I think many of us still fail to appreciate how ATP serves as the ultimate fuel source and actually generates most all of the biochemical reactions in our body. If it weren’t for ATP we would cease to exist very shortly.

**DB:** Right. That’s our fuel. Basically ATP is the basic fuel for every cell in our body. That energy is translated for all the metabolic functions for each cell.

**DM:** It’s really kind of shocking to me and I think most anyone listening to this that there is such a dramatic difference in the aging study between traditional reduced or oxidized or electron deficient coenzyme Q10 versus the electron rich ubiquinol, I mean, just dramatic profound differences. That was only five years ago since we had this information. It’s relatively new with respect to the research scene.

I’m wondering in light of the fact that many of these studies take years to complete, to fund, to plan and publish, there are likely a large number of trials in progress that you’re most likely aware of. I’m wondering if you could give us any indication as to what might be on the horizon for some things we might that we find published in the near future or even further beyond as to some of the benefits of ubiquinol.
DB: Typically, some of the areas that are being concentrated on is certainly heart health. That’s probably the big one. Your heart is the most energy demanding organ in your body. Ubiquinol and coenzyme Q10 is very important for heart function but also neurodegenerative diseases and diabetes. There is actually a fairly long list even if you were to Google, go online for studies that were published and there are thousands of them over the past 30 years for conventional coenzyme Q10.

All of those that were looked at now they are going to look at it with ubiquinol especially those that showed significant benefit. So you could kind of follow what’s going on there. Unfortunately, research and clinical research especially with live humans takes a significant amount of time. It’s typically two to three years from initiation until the conclusion of any of these studies before we get to really see what’s going on. Most of these are necessarily pilot studies because again ubiquinol is fairly new commercially but also on the clinical scene as well.

There are so many different areas where this has a positive impact even for periodontal disease. There is a study that just came out recently that evaluated ubiquinol and periodontal disease and showing a very significant health benefit there.

Another one that’s fairly new was improvement with kidney disease with renal disease; again, with ubiquinol. But predominantly I think it’s heart health is what they are looking at first. I guess that’s really where coenzyme Q10 has the most work done. There is a number of very important studies that are being conducted right now and they are funded by NIH.

DM: That was another question for you. Because many supplements they tend not to get a lot of much research published because there is no researchers that are studying this and they really have to be funded by the manufacturer. Kaneka has funded certainly many studies. What is your guess as to how most of the new studies now are being funded? Is it through the manufacturer Kaneka or is it through the government?

DB: Predominantly through the government. Most of the studies are being done on ubiquinol throughout the U.S. and worldwide actually are in major universities, research universities and major medical centers. So they are normal grant process. Again, this has to be approved by National Institutes of Health, FDA, etc. Already NIH and FDA are very familiar with ubiquinol. There are so many studies that are being conducted.

Some of the highlights are for statin users. There has always been a discrepancy in terms of some of the side effects of statins and whether or not coenzyme Q10 will actually help. There was a study that published about two or three years ago using conventional coenzyme Q10 looked at statin induced myalgia and showed that myalgia was reduced. I believe it was around 38% to 40% after just a month of supplementation with conventional coenzyme Q10. Again, this was a small pilot study but done at a major medical center and published in a peer reviewed journal.

So there is a number of studies that are going on now being conducted again in major medical centers looking at statin induced myalgia and evaluating ubiquinol to see if there is a benefit in helping to alleviate or help to diminish some of the side effects of statins.
DM: But even from a biochemical perspective as you know the function or the mechanism of which statins work is to actually inhibit the production of coenzyme Q10 from the liver. So it wouldn’t make sense since it’s already diminished normally as part of the aging process that we would want to put it back in.

DB: Yeah, it’s kind of ironic. Statins are a very important therapeutic. It’s been a blockbuster drug for some time. There is controversy about it. I think you have probably mentioned that a few times. But aside from that just biochemically, it makes a lot of sense because as you know it reduces cholesterol very effectively but not very selectively.

What I mean by that and what you know is that it inhibits an enzyme called HMG-CoA reductase which is right in the metabolic pathway for the biosynthesis of cholesterol. Unfortunately, it’s a shared pathway for the biosynthesis of coenzyme Q10.

So the more statins you take the less coenzyme Q10 you produce which is again kind of ironic because your heart, as I mentioned earlier, is the most energy demanding organ in your body. Probably it needs coenzyme Q10 especially ubiquinol more than any other organ in your body and you’re depleting it of that.

DM: This could be one of the reasons why statins contribute to heart failure.

DB: Yeah. It could be. There is a lot of different aspects to it but I think the ubiquinol studies would be very important and that connection is very important as well. Because when you look at the plasma levels of course your cholesterol plasma levels are low but your coenzyme Q10, ubiquinol plasma levels are lower as well. That could lead literally to mitochondrial dysfunction. That’s because it would necessarily diminish aerobic capacity, energy production, and oxidative phosphorylation.

So the next step is if it will it do that then it can definitely affect muscle metabolism as well. That’s why I think there is a connection and association with the alleviation of myopathic systems.

DM: Do statins work throughout the entire body or are they focused primarily in the liver on this effect of reducing cholesterol and coenzyme Q10?

DB: Formally, I don’t know. I don’t study statins and that type of thing but it would make sense that the liver would probably be a focal point.

DM: It didn’t occur to me until you said it that they could actually occur in the heart too.

DB: Sure. If you deplete your coenzyme Q10 production to begin with you are going to diminish levels throughout your body, throughout all the organs in your body.
DM: Even if it may be produced primarily in the liver, it’s going to transfer and be transported to the other tissues.

DB: Sure. That’s the danger. It’s the opposite of what you want to do as you’re aging as you mentioned early.

DM: In Europe, I believe, I certainly could be wrong – correct me if that’s the case – that many physicians or countries actually by choice or mandate the concomitant use of either coenzyme Q10 or ubiquinol when they prescribe a statin drug.

DB: I think it’s becoming more universal now because at least biochemically it certainly makes sense. Now that studies are being conducted to show. As I mentioned, there is a preliminary study that showed that positive effect already with conventional coenzyme Q10. But depending on regulatory, I think countries like Canada mandate that if you are prescribed a statin then it has to be at least suggested that you should be taking coenzyme Q10 along with it.

DM: Certainly a step in the right direction. Another area too that typically supplements are almost banned from having any claims at least from the FDA perspective. There are a few exceptions and one would be fish oil for heart disease where there is enough science to support that. In light of the fact that there is enormous amount of funding for coenzyme Q10 with thousands of studies already published, do you think that at some that likely it will have an FDA approved claim for any of these indications?

DB: That’s always possible. I don’t know how many supplements actually trip over to the drug area. I know there is a number of drugs that trip over to the OTC area and supplement area as well. But actually that’s an interesting question because usually when that’s brought up most people don’t realize the very first commercial application for coenzyme Q10 in the late 60s was formally as a drug for congestive heart failure in Japan.

DM: That’s interesting.

DB: Maybe it will go full circle. I don’t know.

DM: It would certainly be useful because it seems to be such a profound tool. I don’t take many supplements. My approach to staying healthy is really to focus on diet and exercise. But I do think there are some beneficial ones and ubiquinol is one of the ones I take everyday because I have been so compelled initially primarily from the study that you mentioned earlier with the aging. If there is anything we can do to help slow that process down is certainly enormously appreciated.

Are there any other diseases that it maybe useful? You mentioned quite the gamut and ran the course. Are there any obvious and more newly appreciated benefits of ubiquinol?

DB: As I mentioned, there is a number of studies going on. It’s really a matter of just picking what area eventually it will probably hit it. Some of the studies that are notable and some that
have been published already, for instance there is one on Down syndrome. It’s not necessarily just for baby boomers or adults.

One of the aspects of Down syndrome is that these kids are under a very heavy oxidative state. I know there have been trials to try therapeutically to reverse that. To try to get it into a more reduced state of health, a healthier state to begin with regardless of efficacy. I’m not sure of this heavy oxidative state is a result of the Down syndrome itself or causative.

But a fairly important study was done at Children’s Hospital in Cincinnati and this has been published in two different publications. Where they wanted to take a look and see whether or not ubiquinol would help to alleviate this highly oxidative state in some of the Down syndrome kids. Actually this is again in direct comparison with coenzyme Q10. Conventional coenzyme Q10 did not have an effect on it.

When the study was conducted they found that over 80% of the kids that were in the study – it’s a small pilot study – were brought back up to a healthy reduced state were 80%. Again, a very dramatic metabolic effect in direct comparison to conventional coenzyme Q10. In fact the FDA, if I understand correctly, came in and asked them to stop the study and go directly on to a phase 2 clinical trial for efficacy which is being conducted currently. So that’s one of the areas.

There is a number of others as well. There are some studies being done for sepsis.

**DM:** How would it work in sepsis? Would it help boost the immune system or it actually have some effect on actually fighting the infection?

**DB:** Both. Those are very preliminary being done but pretty exciting results already. Some of the other areas is as I mentioned before on mechanism. There is a number of studies coming out of Germany that is actually genomic studies that are being done to look at the transcriptional level to see what genes are actually affected by ubiquinol and again in direct comparison to coenzyme Q10.

Not surprisingly, a lot of redox active genes light up when they start doing genetic mapping for this. Some of them that may or may not be all that surprising depending on what you know about coenzyme Q10 such as inflammation. Actually, lipid and cholesterol metabolism is affected by ubiquinol but not by conventional coenzyme Q10 and in a number of different areas as well. At least for me as a researcher it is becoming very exciting in terms of some of the things that they are uncovering here.

**DM:** One of your earlier areas of research and this seems to be an extension of that was on free radical pathology and antioxidant. I’m wondering if you could provide our listeners with your perspective on just antioxidants in general with respect to their specificity in relation to any potential benefits from taking a number of different antioxidants in the supplement form. Clearly, you’ve made a very compelling and powerful case for taking ubiquinol. But what about something like vitamin C and vitamin E. Do they work synergistically with ubiquinol? Do they have different purposes? Does it make sense to use that?
Another antioxidant perhaps that you may have studied or be familiar with is what I’m really excited about is astaxanthin which is a derivative of a marine algae which appears to be one of the most powerful antioxidants discovered and have a number of profound benefits.

DB: I’ll try to. Probably in terms of your question, the most important aspect is – and when I talk to, you know, I give a presentation or talk with crowds or I have done some radio interviews as well and have people call in.

Typically, I ask the audience if they are familiar with, at least from the media, the terms free radical, oxidative stress, and antioxidants and that type of thing. What I typically find is that they are very familiar with the terms but not familiar with what necessarily that means.

They know that free radicals and oxidative stress, oxidative damage is bad. Antioxidants are good. In general, that’s about right except for the free radical part. Free radicals are generated in our body and at very low levels are very beneficial for growth, development and maintenance of cellular systems.

The main idea I try to get across is that most – people at the consumer level anyways – when you talk about oxidative damage they really get the idea and then conceptually that an oxidative state is an unhealthy state. Of course that makes sense. Some of the things that we talked about, the depletion of coenzyme Q10, increased oxidative stress and mitochondrial dysfunction as I mentioned before directly associated with the aging process and age related diseases.

But when I ask the same audience then what’s a healthy state, typically I don’t get an answer. I gave a talk recently in New York and there were physicians and researchers in the audience and there wasn’t an immediate answer because I guess most of the media concentrates on the oxidative stress and that type of thing.

But if you think about it and just rationally if the opposite of the oxidative state is a reduced state and if you look at the biochemistry and it doesn’t matter what cellular system, any aerobic cellular system that you’re looking at – whether they are cellular models you are looking at, mammals ourselves, there is a redox balance but predominantly in almost every cell in our body and in our plasma etc, the reduced state predominates in a healthy cell, a young healthy cell and it becomes more and more oxidized as we age.

It makes sense that you want to replenish and you want to optimize the reduced state that you enjoyed when you were healthy and young say like in your teens and of course ubiquinol as we talked about and emphasized really helps along those lines. It really helps to replenish those same areas of energy production and antioxidant protection.

In terms of combinations of antioxidants, in terms of cellular compartments, there is a lipid compartment which ubiquinol is very effective at but also the aqueous compartment as well or the water soluble department. That’s where you’ll see the vitamin Cs and water soluble antioxidants and that type of thing.
What I look at is two things, is mainly the science behind it. What kind of research has been done to show that there is actually a metabolic effect by taking either vitamin C or vitamin E in whatever form that’s beneficial? Obviously vitamin C with scurvy was probably the turning point and the same thing with the vitamin E. A lot of studies have been done and lipoic acid as well. So you really have to look at the studies and what’s out there.

What’s often of concern at least on my side is that every plant, every botanical typically has antioxidants. That’s how they protect themselves. There are supplements out there that they are extracts from botanicals, the main question you should be asking, the listeners should be asking is, what if I ingest this? Is it assimilated and metabolized the same as it would be if I got it directly from the plant source, from the food source?

If those studies are there then it’s probably a good chance that there is going to be a beneficial effect because what we have to think about is does your body recognize it? Is your body going to do anything with it? Many of the botanical antioxidants, I have some question about whether or not they are actually effective – not just me but a lot of researchers – whether or not they are actually effective as antioxidants in our metabolic systems.

**DM:** Unlike ubiquinol which you have mentioned earlier is absorbed and metabolized identically to the way that we produce it internally.

**DB:** There are studies that show that. What’s also important in terms of contrast is ubiquinol and coenzyme Q10 is something that’s normally generated in our bodies. Our body is very familiar with it. It knows what it is. Some of these other antioxidants that are produced and sold in supplements, again I question it (indiscernible 54:50)

**DM:** Do you think that’s the same for vitamin C and vitamin E?

**DB:** I think there are so many studies on vitamin C and vitamin E with shown beneficial effect that it’s almost unquestionable that yes they are beneficial. The catch all here is that in terms of safety, in terms of the type of doses that most people would take, they are very safe. The only thing you could hope for is that you will get a significant benefit from them.

**DM:** Do you think there is some synergism between that and ubiquinol? Is there any concern from a safety perspective of overdosing because as you mentioned earlier, there is virtually no chance of overdosing with ubiquinol.

**DB:** The reason I say that studies were done and again these were done for the FDA here in the U.S. up to doses of like 3000 to 5000 milligrams a day which no one would do on a normal basis and with no adverse side effects.

In terms of synergy, the answer is yes. As I mentioned before, ubiquinol usually helps to regenerate vitamin C and vitamin E in our bodies. The redox chemistry and biochemistry in our bodies and a lot of it is just being elucidated now. Harmon came out in 1957 and talked about free radical biochemistry and aging and that type of thing. It’s really coming around now in
terms of what’s happening metabolically and in different cellular compartments. So absolutely there is synergy.

One of the things I do when I give presentation, I show basically a metabolic map which a lot of people have probably seen again in high school biochemistry or college biochemistry. It’s about the size of the screen. It’s very daunting. It’s very complex.

But when you look at it you realize that everything is connected. So when you affect one, you know, you could just take any section of what’s up on the screen and if there is a deficit or a dysfunction in any area you can get primary or secondary or tertiary effects way over on the other side of the screen. So in terms of synergy, you know, absolutely.

What’s the best balance? That I’m not sure but that’s what our body tries to do on a regular basis.

**DM:** It would seem in response to your earlier question to your audience, the physician, the researcher as to what’s the beneficial healthy state that an abundance of electrons or availability of an abundance of electrons within your body would be close to ideal. Would that be fair?

**DB:** Again, there is a redox balance. If you were to look in every tissue in every organ in our body, the predominant form of CoQ10 is ubiquinol but it varies depending on the organs. Such as in your plasma right now if you’re young and healthy; of all the CoQ10 in your plasma over 90% of it will be ubiquinol.

**DM:** One of the reasons it’s so beneficial is it provides a source of electrons?

**DB:** Yes. Right.

**DM:** But it would seem to be potentially at least theoretically beneficial, if we could have a source of electrons into our system through some mechanism like that available.

**DB:** I haven’t thought in those terms before. You also have to remember that in terms of all the metabolites and everything that’s going on at the cellular level is the electrons are contained and typically paired as well. That’s where you get free radicals. It’s when you have a lone electron out there. Because as I mentioned before free radicals are very beneficial and are produced on a regular basis in our mitochondria and throughout our bodies for cellular health maintenance development but too many get in. Imbalance could very damaging.

**DM:** The counter to that and the potential concern would be if you take too many supplemental antioxidants that you would suppress this level of free radical production to the point where actually it maybe counterproductive because as you just stated we do require free radicals for optimal health. They are an important part of biochemistry. Is it possible to take too many of the supplements?

**DB:** I don’t think you should too many of anything. I always said, in moderation. It’s literally the same thing. And your body works that way as well. As I mentioned, it’s a redox balance.
It’s not one extreme or the other. This is generally whatever the question is to do too much is probably not good. Is there evidence of that? I think it’s important again to look at the science and what’s been done such as with coenzyme Q10 and ubiquinol. There was always a concern along those lines that maybe you’re quenching a little too much.

One aspect about ubiquinol is the way it is assimilated and metabolized, your body helps to maintain that balance.

Look at it this way, you produce more ATP the more active you are. If you were on a hundred yard dash, at the end of that hundred yard dash your muscles are producing more ATP than when you are sedentary.

DM: Sure. It makes sense. If you are going to accelerate your car to 60 miles an hour real quickly you’re going to use a lot of gas.

DB: Right. It’s the same thing. It really is. That’s what I meant by metabolic demand. All these metabolites are there but they are not going 90 miles an hour all the time. So there is a balance that has to be maintained.

DM: Are there any other comments that you would like to make on ubiquinol or any other aspect of the antioxidants?

DB: I think we have hit most of those that we had about cover. Why don’t we cover it? I think we could actually talk about this or at least I could but I think it would be kind of boring after awhile for hours and I have before with other scientists and it’s an exciting area. Mainly the reason it’s exciting because the beneficial effects are so tangible.

DM: It seems to be one of the most promising supplements that have been uncovered to date from my perspective.

DB: Sure. As I mentioned before, even for Kaneka that produces it initially we thought it would be, again, just like the next generation and it would be okay to have out there. Aside from being on the supplement shelf its health benefits are just light years beyond what we anticipated 10 years ago.

DM: I think if I can just reemphasize because anyone listening to this who feels compelled and motivated to start consuming this that we can maybe talk a little about dosing and again reemphasize the fact that it is fat soluble so you want to take it with meals with a little bit of fat. But ideally, it doesn’t last forever so if you can, is it better to take it every 12 hours, at least twice a day, or taking two doses. I personally take one of the capsules twice a day.

DB: The pharmacokinetics have been done on it and published. Yes, you should take it chronically. In other words, if you take it once a week it’s probably not going to do a lot. So at least a couple of times a day. There are studies out in terms of dosaging. Some of the initial
studies show that if you don’t take any coenzyme Q10 at all, if you were to take ubiquinol at 200 to 300 milligrams a day after about two to three weeks…

**DM:** The typical capsule is 100 mg?

**DB:** Right about 100 mg. Your plasma levels will plateau out at that time about two to three weeks. A hundred milligrams a day is a good maintenance dose. But again in terms of safety, everybody is different in terms of their metabolism, their health state etc. So 100 to 200 milligrams a day is probably a good dose for someone who is fairly healthy and that type of thing. If you’re under chronic or acute disease or older you may want to do more.

**DM:** So acute metabolic stressors could increase your requirements in the short term.

**DB:** Sure. The real test for this is to be able to monitor your plasma levels on a regular basis. Unfortunately, that’s not practical.

**DM:** Or commercially available.

**DB:** Right. But maybe not too far in the future. There is a number of major medical centers now that include not just total CoQ10 but also the cholesterol-CoQ10 ratio and the ubiquinol levels in the lipid profiles that they do when you go to different regular heart exam on a yearly basis. So it’s becoming more visible.

As I mentioned before, there is a lot being done on mechanism. There is a study that was literally just published that showed they are looking at ubiquinol ratios to total coenzyme Q10 and total coenzyme Q10 from a finger prick. Maybe in the near future there will be a personalized version of how you can monitor your CoQ10 levels.

**DM:** In my experience ratios of biochemistry in the body seem to be far more powerful predictors than the actual levels.

**DB:** Sure.

**DM:** You agree with that of course. I’m wondering if you can comment on the ratios and what they mean to ubiquinone to ubiquinol and what the optimum levels are compared to average?

**DB:** Just simply as what we talked about earlier, as we grow older we become more and more oxidized. You see that when you monitor your plasma levels of coenzyme Q10 and in an aging population. In fact, there are studies that were published that going from the 20s up to the 60s or 80s. It’s an increased oxidative state. In other words, they find higher and higher levels of oxidized coenzyme Q10 as opposed to what should be predominantly the ubiquinol levels.

As I mentioned before it’s fairly well defined if you were a healthy individual, a fairly narrow window. Ubiquinol should be formally between 93% and 95% of your CoQ10 in your plasma if you are a healthy individual. Of course that varies…
DM: Almost 20 to 1 though.

DB: Right. But I typically say over 90%. But over 90% is a pretty significant number. And that varies from organ to organ. The balance seems to tip the other way in terms of the redox (indiscernible 1:05:32)

DM: How low does it go down to in typical stages that you have measured? Is it 5 to 1, 2 to 1, 1 to 1?

DB: Its interesting in some of the studies that have been published, there are some studies that have been published showing the ubiquinol ratio say for diabetes and shows a normal glucose fasting level which is around 93% what I mentioned before. For an impaired glucose fasting level, it’s around 43. You got a very dramatic difference. For full blown diabetes it’s down to the 20 percentile.

But what’s interesting is there are other published studies that look at hepatic disease, various forms of hepatic disease. That ratio is only off by a few percent but there is still a very significant clinical effect. In some cases, it may be a very dramatic change but in some cases it could be just off by a few percent that makes a significant difference.

DM: Do you think this is due to increased metabolic demand or decrease in production?

DB: I think both. Just like with the car that we have used as an analogy before. Let’s say it’s a six cylinder and one of the spark plugs go. Let’s say that’s ubiquinol and one of it goes. It will keep running but how well. How well in time if it keeps running like that will it contribute to damaging other components of the engine and then the machinery? We work pretty much the same way.

DM: You provided us with loads of great solid information that is backed by the science. We certainly appreciate that. It really is profound pieces of information to really compel and motivate people to start taking this if they aren’t are already and start sharing the message with others.

Thank you for all the work you have done. Hopefully, you’ll continue to elucidate even more of the mysteries of how we can improve our health and stay healthy.

DB: Thanks for having me. It was a lot of fun. Thanks.

DM: Great.