Hydrogen Biology – The Creation Of ATP And Its Relevance For Life Transcript

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Introduction to Hydrogen Research

– Jim Wilson. It's such a pleasure to have you on the segment of regenerative Medicine summit and you are the director and founder of hydrogen Biology Research Center. Tell me a little bit what made you passionate about hydrogen? – It's been quite some years now.

We was early on in the peace. There was all the talk and the buzz about energy of course and my father in law's education and profession was in marine engineering. So we were looking at hydrogen as a supplement for fuel and burning the diesel fuel more efficiently, bigger horsepower, less costs and all those sorts of things, less emissions. But in all of that we started seeing more and more of the evidence associated with health and biological organisms.

I've had a long association with kids with cancer in the past and I've seen too many of my little mates go and I've got a bit of a bee in my bonnet if you like about trying to do something about that and and that underpinned a lot of the greater good that I could see that this hydrogen Technology Association in Biology would do. And and that's really where I started to get more passionate about it because I started to see the real practical applications and uh, it's just going on from there. – So obviously, I mean we people want to feel younger, they don't want to be dealing with things like cancer and immune and all these type of things.

Hydrogen and Cellular Energy

So hydrogen, I mean, how how how important is that In the body, how how prevalent is that in the body compared to everything else – In my understanding, it is the most important thing. It is 62% of the atoms in our body. We have to access it.

Either food substances and otherwise process it, use it and and then re consume and reuse again and again and again. It's the most abundant element in the universe. It is nature's energy source.

And let's not forget that hydrogen ultimately is an energy source. The talk about hydrogen energy in conversion into electrical energy is simply an energy conversion. So if you think of a solar panel for example, we can use solar energy converted by a device and turn it into electrical energy for use in electrical applications in the same sense, we can use electrical energy converted via a electrolysis machine and convert it into chemical energy in hydrogen.

Hydrogen then is converted by a device called the mitochondria into a biological energy called a TP to be used in biological devices or appliances or processes or functions and all biology and virtually all life on the planet uses mitochondria implants.

There's also chloroplast, but we use an energy source and if you don't have enough energy, you don't get all the jobs done that need doing. And the body is going to prioritize what needs done first of course. So then other things don't happen and things are less efficient and then they accumulate and build up.

You get stressed. The stress, if not managed leads to a dis ease of function, simply not functioning at ease and then that disease may manifest at a weak point in the body of which we can give all sorts of different names because of its application or where actually manifests. And ultimately they are consequences.

If we if we had a clean, efficient energy production source, then a lot of these jobs would get done And may not evolve into a stress which then progresses. So hydrogen is vitally important.

And again, it's the biggest part of what we are. And if we look at a recipe to make a cake or a biscuit or whatever it is you need. There's some important ingredients and hydrogen at 62% is a pretty important ingredient and that's definitely not what we should be overlooking. And there would be a difference too if you made a case of self raising flour, plain flour because again we have mitochondrial function or oxidative phosphor relation and we have

legalized again, a different form of energy production, but there is a very different consequence associated and there's different things that happened.

So again, it's important to have the right kind of flower as well. – Just so a lot of us would, I mean from my point of view if you think of a tea production and and how that is the burning of oxygen for energy.

But here oxygen now we have hydrogen as an as another gas as another. You know, how does that promote the energy production within the cells? Because obviously, like you're we're talking about if a cell is cell is energy deficient, it is not going to perform well and if it's not performing well, it's not repairing well and then you start to then get, you know, disease patterns that take place and obviously we all know, you know, trying to drive a car without, you know, with the dirty carburetor, whatever it is, where gas is not coming into the engine and it just kind of it's not you can't accelerate very fast and you know, you have breaks in when, you know, you have to do boop boop boop, you know, you're just driving very well.

So it's the same in the cell. But so how how does hydrogen then add to energy production? Since, you know, I'm thinking oxygen when I think energy and you know, in the cell, – Right, in the mitochondria where we're pumping hydrogen protons, so we would be in complex one, pumping four protons, complex three complex for another four. There's electrons passing through to the queue chamber in the mitochondria complex one. There's an iron sulfur cluster, complex one which would normally transfer electrons through that change in the chamber and its oxygen that can also pull those electrons causing the production of the super oxide radicals, which as you know, is the precursor to the hydroxide radical, 90% of the super oxide radicals are produced complex one.

So, again, if if we eliminated by donating electrons at that point we negate necessarily that iron cluster loss or leakage of electrons and the creation of the super oxide. So by donating hydrogen at that point we can increase production by 50%. The hydrogen protons accumulating at the top of the TPc face is what then turns that face, turning a D.

P into a teepee in complex for we receive the electron with an oxygen molecule. So in the production of a teepee or that cycle in the mitochondria, it's actually 12 parts hydrogen, one part oxygen.

It's the it's the driver is the ph differential from membranes, membrane through the eighties. So there's a lot going on there. And if we don't, if we lose electrons in that path, it inhibits the production capability.

So you can't move through the a big one on and a big via that process.

Mitochondria, Oxidative Stress, and ATP Production

If we're losing electrons along the way and therefore the complex 11 pump the amount of hydrogen ions. So both the electrons and the protons are very important and if you lose one it's sort of bottlenecks and and hinders the production of the other.

So when it comes to mitochondrial function there's a lot less emphasis really on oxygen. It's only the receiving of the electron there that that is the major aspect.

And again, very much biased on the hydrogen proton as the energy force pushing through to create that a D. P. Into a. T. At the end of that chain. – So it's if I'm hearing right then what I'm what I'm hearing is that the hydrogen, I mean it's by bringing that the extra proton that allows them for a a stronger there's less than oxidative stress that's produced you know, Sue proximate days uh saw that that's produced you know, so it's less of that oxidative stress that is produced at the complex one.

So you know for for listeners in the electron chain transport, you have different complexes. So it's kind of like different stations that the substances move move through in order to be able to produce energy and complex one through complex five. And then hydrogen is an increasing than the amount of electrons that's able to move through and to be able to produce more energy without as much of oxidative substances that are produced that can then be harmful to the cell. So it becomes like a cleaner energy With less oxidative stress. And you are then able to

produce, like you said, 50% more energy by introducing hydrogen into the mitochondria. – Yes. So as you say there there's a couple of things going on. Not only are you then able to produce more hydrogen availability and electron availability but the reduction of those oxidative radicals makes a massive difference. It's another job that doesn't need to be done.

Therefore creates greater efficiency that also leads to inflammation and such as well. So there's a there's a bit of a cycle that can be addressed their it's there's a lot of things that the hydrogen is being associated with in biological functions such as inflammation for example, or selectively anti oxidizing.

I don't subscribe to the selective antioxidant literature as much. I think we think that it is simply not being produced in the first place. That's why it's not there, that's why you can't find it.

And hydrogen associated with reducing inflammation for example. Well it's the hydrogen that's producing a teepee, the teepee that operates the calcium, the calcium pump is managing the information. So again there's another couple of steps in amongst it all and by efficiently producing in one space and negating consequential production of another Byproduct along the way you get somewhat of a multiplication effect. And the result obviously over 37 plus trillion cells in the body is significant and that's why it affects all of the body in all sorts of different ways. – And because you're making a real I mean obviously making a lot of points there but one of the points is that, you know, one we're increasing energy by increasing the efficiency within the Mitochondria set secondly, then we are not producing damaging substances that the body would have to or the cell would have to use other energy in order to be able to battle.

So now we're conserving energy there as well and then also we are then supporting the different ion channels, you know, like the calcium calcium pump which have a huge impact on the the effect or the efficient of the cell and how it functions. And it translates into so many health conditions like like insulin for instance, I mean that, you know, diabetes, you know, that that that plays a major role in controlling blood sugar levels, you know, by being able to make that pump more efficient using than hydrogen.

– Yes, very much so. And that allows that pump to work properly, allowing the insulin to be released, doing its job. Those with type one that are taking insulin then of course need to be careful about taking too much insulin because the body is starting to do what it needs to do.

And you could be in abundance as opposed to not enough. So again, you've got to drop off some of the things as others rectify. So there's there's a balance and some care obviously that needs to be associated with what's going on, depending on the condition. – So, one of the things that I'm very passionate about, I do a lot of integrative oncology at my center.

And one of the components that you look at in regards to oncology is that you look upon it as a metabolic disorder where, you know, there's a mitochondrial dysfunction or how we produce energy in this cell is dysfunctional.

Inflammation, Insulin, and Metabolic Health

And then it then shifts an alternative way of producing energy. That is not very I mean it's it promotes cancer and it's not very efficient because the byproducts from that type of production of energy and produce signaling mechanisms that promote metastases and promotes, you know, and you're genesis or blood supply than to where tumors are.

So, you know, the mitochondria becomes so important. So then bringing in hydrogen into the equation to be able to support mitochondrial function becomes really important. – Absolutely, Absolutely.

Is that energy conversion into the appropriate energy form that that everything needs. And that goes right into a whole range of different things. And as we've mentioned before, there's there's protein folding associations and all sorts of things. As you say, with cancer, there's a backup system with google ISIS that produces also some 80 P short instant access but again inefficient and the production of lactate and down regulation or suppression of immune systems and old range of consequences that can come from that imbalance as opposed to the

mitochondrial function as opposed to the backup function.

So again, the body has got a lot of backup functions but they are less efficient and less desirable in the long term. – And in regards to the protein folding, I mean, you have something called, you know, the unfolded protein response and and I know that that is is tied highly into the production a lot of inflammatory substances that can then lead to autoimmune diseases. So by minimizing that effect, you're then able to reduce the the process that takes place in autoimmune diseases. And am I correct in that?

– Yes, if we fold proteins incorrectly which require as an energy source to fold it correctly. Again, it's a three dimensional piece of spaghetti at some stage that gets folded into the right shape to do the right function.

If that's incorrectly folded, then the immune system recognizes it as something foreign. So again, that's where the autoimmune aspect comes in. We were not getting rid of it and of course cleaning that up requires a T.

P. So in dimensions and such things, we have an accumulation of amyloid for example, um and incorrectly folded proteins accumulating. And if you haven't got enough a teepee in the first place to fold it correctly, you probably don't have enough available to clear the situation.

So we get a cumulative effect over a period of time that that results in something unfavorable of course. So there's that that autoimmune aspect and things that don't work properly simply because there's not enough energy to do the job correctly. That may also be an association with a genetic disposition. So if you have a weakness and you need 120% of an effort to fold that particular protein correctly.

If you are only operating at 100% that particular one doesn't get done correctly and therefore you're going to have a manifestation and exposure of the con consequence for that particular thing. So we can we can start to narrow down to all sorts of different things. Getting right back to whether or not it's an environmental challenge that's caused a weakness or genetic such as a breast cancer or something like that. Perhaps where there may be a weakness in that line that enables such a thing. Not quite to happen correctly, but again, often it comes back to http and from a teepee comes back again to hydrogen and that comes back again to good food and clean healthy non toxic substances that we ingest. Otherwise things are going to work properly.

Good health comes from the gut. Absolutely. But go back another couple of steps go back to good healthy clean food without toxins providing the D A. To provide the hydrogen protons and electrons available to do all these jobs – Because I mean when a person is eating unhealthy food and were exposed to toxins, then we need more energy to be able to clear all of that out and then to protect the body.

Cancer, Protein Folding, and Autoimmune Disease

So obviously by not doing that, we conserve energy and in regards to the what I think is fascinating with the folding of proteins that that people may not understand.

I mean all our enzymes, all our, you know, tissue hormones, all of these different things to require very specific type of proteins. And it's not only that they are, you know, these components are in line, you know, like we have so much many of these amino acids, so many of the other and they come together in a string.

But it's also like you mentioned, it's a three dimensional form of it that has to be perfect and and that requires a huge amount of energy to be able to create that three dimensional form. And if it's not appropriately done in that structure, in that form it becomes dysfunctional and then that that agitates immune system, you know, saying that this is not the right type of protein.

And now the immune system will start to attack that protein, even if it may be then incorporated in some tissue, you know, then the immune system will start to go after that.

So if we would increase the energy and then we would be able to fold those proteins appropriately and then we would not have an immune system to go after that misfolded or you know, the wrong kind of structure of the

protein, even though it may contain the right components, – The greedy, the trace elements and as you say, the amino acids and all the bits and pieces may all be there.

But again, if you don't have the energy to squeeze it together and pack it correctly, you're going to have an incorrect associations and it's not going to do what it needs to do and the body is going to require energy to try and make good on it.

And that's where backup energy sources come in and they in turn have their own inefficiency. So it can be a bit of a snowball effect of one thing leading to another.

But on the flip side of that, if you do have enough energy in the first place, it means you can also gain more energy because other jobs don't need to be done as a consequence. – Yeah, exactly.

Because if the unfolded misfolded proteins, what happens then is that now you use the energy to try to do the job that you've done but it was done incorrectly.

Now you require other energies to be able to clean that up, which will then reduce the amount of energy to try to do that job again, you know, So it just becomes a perpetual issue that and and that's why things like autoimmune and cancer is such a, it's kind of a downward spiral and you try to just use medication to control inflammatory response instead of looking at the core component of it, which is then to drive the energy and increase the level of energy so that the physiological functions can happen appropriately.

– The involvement of other what I would refer to as a synthetic application or I refer to them as alternatives. Once we get to the basics and the natural function of things. If that doesn't work correctly, then we need to look towards an alternative.

But a lot of those drugs and applications and therapies that are on the market now massively benefit in association with getting the core aspect of things done right in the first place, then that little bit of a tweak here and a little bit of a tweak there allows for clearing or repair or whatever it may be. So there's there's more than just one thing going on and we need Be mindful that yes, we need to pay attention to that 62% size piece of the Jigsaw puzzle. But there's all those trace elements obviously will need to be there and little tweets as in trace elements are exactly that they're trace elements. Let's look at them as a secondary.

And we focus on the primary first, which is enough energy creation to do the jobs that needs to do. – So, do you feel that we as humans now are hydrogen deficient? Definitely one way to think of it.

– Yes. If we look at food and the definition of food, we can look up the definition of food anywhere and it would be defined as a substance ingested by one's cells to provide energy, create maintenance and replication.

That's exactly what hydrogen is. And once you break an apple down into its chemical elements, probably 49% of that apple is hydrogen, carbon and oxygen and all those things are in there as well of course.

But we have to ingest it and had its raw elements, the natural energy source for biology. – And so what are some ways for people that are wanting them to increase the level of energy? They may be dealing with cancer may be dealing with, you know, autoimmune conditions or they just want a higher level of function and they want to maximize their their their cell cellular function, you know, for regeneration and in every possible way, what are some ways that hydrogen can be introduced or so we can receive these benefits that that you're talking about?

– There's a lot of things that we can do so far as machines and things. The technology, is there one of the most important things we need to do is eliminate toxins and chemicals and challenges that are going to hinder correct operation in the first place. But the hydrogen ultimately is contained in water. It's the ingredients of water.

Everyone says, you know, the ingredients of life is water, but I say the ingredients of life are the ingredients of water. So, you've got the hydrogen two parts oxygen, one part and hydrogen ultimately it's very light and it would sit in the upper atmosphere, oxygen very heavy would sit in the lower atmosphere. So for water for them to be bonded

that then makes it Accessible for us on at ground level. So that is what brings it together and then we process it. We use energy, we split it, we access the gasses so we can also make machines, electrolysis machines again, invented some 200 years ago, ultimately.

And there's a lot of variation since uh the splitting of the water molecule two parts hydrogen, one part oxygen can then be applied in appropriate volumes in appropriate ways. Everyone's talking at the moment about inhalation. It's a it's a great method is probably only any good for the human. The lung is a very good gas infusion device.

It works very well and it diffuses into the blood system, transporting it around the body, fantastic Over long periods of time. We're always breathing small amounts. Make a big difference, metabolism is 24 7. So think of it in time so far as a percentage of supplementation of this kind of food, it's all part of it, but we're also the biggest organ is the skin. So we're also a bit of a tea bag, if you like. So we could we could drop ourselves in a pool or a bath of hydrogen and oxygen infused water it would absorb through the skin.

And that would be great benefits for psoriasis. And all sorts of burns. We've seen massive benefit with burns will like to do more studies into melanomas and other things like there's ivy bags are being used, drinking of water. It's just another ingest Method and again, ultimately, it's a food, ultimately, we are 62% hydrogen, 24% oxygen as a species.

So, again, there's nothing foreign about it. It is exactly what we are already made of and the way we get it in instead of being in an apple, we can just put a lot of those ingredients directly into re infused into water and drink it.

And again making it very easily accessible to the body without having the body needing to break it down and chemically adjusted along the way. So there's a lot of ways that we can do all these sorts of things.

Um mitochondria is also producing energy in plants. So we can start to infuse the water with the hydrogen and oxygen and irrigate and massively benefiting the microbes in the ground as well as the plants coming from the ground and our food sources. It's stronger, it's growing faster, it's healthier. More energy has been produced from the hydrogen less from the N. A. D. H. We then getting better sugars, flavonoids in the plant because it's not needing to use those resources to create energy.

So again consequences are favoring the available supplementation of hydrogen to be used as energy creation. You don't need to chase the sugars and such and then those sugars can be used to further benefit the plant and the nutritional content.

So disease resistance and resistance. Again, he stresses and all sorts of things. Less herbicides, less pesticides, higher quality food better for us to consume it.

Obviously we then start to become more efficient operating as an organism as well. So when we start talking about ways to ingest it. There are many, many diff ways and ultimately, I think the trick will be to fit it into one's lifestyle seamlessly. So we can still be busy and do all the jobs we need to do without plugging ourselves into something for an extended period of time, like a, like a dialysis machine, for example, it's very inconvenient.

Hydrogen Delivery Methods and Practical Applications

And again, seamlessly, like food, we fit it into our livestock. – So, and, you know, the point is if I'm hearing your rights and like, like you're saying from an apple, when, when you're eating that you're you're using energy in order to be able to harness the the hydrogen. If we can then use a a kind of an external source in a way where you just get clean hydrogen, you know, whichever way that you're administering that, then you're conserving the energy, you know, that would have been used for the digestion part and you're just getting the benefit of the hydrogen for for the energy.

So what of all these sorts of, I heard some fascinating things that you said, so you can actually then infuse hydrogen into the bloodstream in some way, is has that been done? Or it's ultimately what your lungs are doing?

– So your your lungs are infusing oxygen's and things into the bloodstream all the time. Anyway, so, again, it's another, the bloodstream as a transport system throughout the body flushing and cleaning and providing nutritional content and value throughout the body. So again, it's a it's a pretty good method from, from an internal point of view – Fascinating. And what are you So you you talk a little bit about melanomas and you've seen kind of an effect.

They're using hydrogen. What are some of the in your research and studies, what are some of the other things that you you have looked at and that you have seen in regards to, you know, physically how that has changed an individual.

– There's a long list, there's a very, very long list of things that again, we're talking each and every cell throughout the entire body. So it's vast. The melanoma is, so far as application is concerned Is conceptual to an extent at this point.

But we see a lot of association, we're doing a paper on scleroderma at the moment. We've seen a lot associated with sepsis. There's, I think motor neuron, there's a lot of brain things. Again, high consumption of 80 p out of the body, high blood concentrations usually associated in those spaces. We talk livers, heart brain for example, they're more notable changes that can be made there because there's there's a lot more going on. There's a lot more mitochondria in a cell as opposed to say, a brown fat cells maybe to mitochondria not doing much work there.

But the point is that there's there's a broad spectrum of what's going on. And the research papers are long and varied. That's part of what we want to do with the hydrogen Biology research center is to start putting practical applications with more of a focus on the A. T. P. Aspect and oxidative phosphor relation.

Now we know what the hydrogen is doing by availing itself to create more A. T. P. We can then start to divert our research from the hydrogen and what people have done in the past more towards the A.

T. P. And what A. T. P. Does. I think there's there's a whole big list of things. There's heart diseases, there's a whole world of auto immune challenges that we can deal with.

There's um inflammatory challenges, cytokine storms that can be dealt with. There's there's a whole long long long list that that we would like to be able to focus on. And again it's gonna be more bodies and more money and everything else that goes with it. But I very much believe that there are some very natural ingestion of supplementation potentials that can be done very easily in a short period of time by addressing these few core elements of biological function itself. – Yeah, obviously addressing a teepee becomes the biggest. I mean that that's just core and foundational, you mentioned scleroderma that you're you're doing a paper doing research on that which which is an autoimmune condition. So what what have you seen?

You know and I know people that have died from scleroderma which you know because it's a very yes it's not a fun disease in any shape or form. What what have you seen I mean, so you have an individual with scleroderma and then you brought in hydrogen technology and what kind of outcome have you have you seen? I mean, what kind of change in an individual have you seen? And I know that this is just research or this is not, this is not – Yeah, we haven't we haven't got to that application stage yet.

We're doing the research. We're putting all the pieces together and we we have some people in some connections. My my cousin passed from scleroderma. It's one of those soft spots I suppose it was a beautiful man and and it was a real tragedy to lose lose such a person to our world.

And we've since had some some other contact with people that would, you know, basically it's a death sentence. There's nothing that can be done at this stage.

And I don't subscribe to that belief. So we're putting a lot of things together and now that we understand what we're looking for now. We understand the mechanisms and the the movement of protons and electrons and oxidative radicals and inflammatory aspects and protein folding and all these things.

We start to see common links right across a range of different things that people would otherwise think are very

different. You know, you could you could have something going on so far as a wound not healing on a leg because of a compound fracture that messed up circulatory aspects and then try and understand.

How is that also associated with neuro degeneration or Alzheimer's as opposed to scleroderma as opposed to diabetes. You know, these are not things that people normally connect.

So once we get right down to that biological function and the cellular aspect, we start seeing common threads of performance in certain things and 80 pre production complex one of the mitochondria oxidative phosphor relation, common threads that come up again and again and again and again.

So once we start to see some things that we can join the dots on, that's why we want this room research center to get some support at the end of the day because I think there's a whole world of things that we're going to be able to do by joining these common threats – Frequently with research. I mean, you you go with there are lots of anecdotal evidence pointing in a direction and it's enough anecdotal to then warrant that. You will then start to study something, you know, what are some of the anecdotal evidence that you have heard of or seen, where people with a specific disease bringing in hydrogen.

And this was a result. – This again by asking more of a specific disease states that have been helped. Yeah, cancer is one that comes up often. There's a lot we think that we can do with cancer. The backup system of local ISIS producing lactate lactate suppressing NK cell or immune function in case cells cd four cd eight T cells then suppresses the immune system ability to fight and attack the cancer.

Research Directions and Closing Remarks

But the lactate also is is surrounding the mass of the tumor. So you also have a down regulation of the immune system and a protection around the cancer cell.

And and things like car T cell therapy for example, is way less effective because it's not exposing the cancer to the attack. And and by turning around your energy production back to oxidative phosphor relation, you negate the global ISIS production of a T.

P. You negate and shut down, then the production of lactate that then allows the replenishment of the immune system, the NK cells, the T cells and such and then expose the cancer to the attack. So we end up with a situation where I think that there's a lot of cancer therapies out there that can be way more effective if we turn around and adjust the metabolic function associated with the energy because we negate part of the consequences or the inefficiencies that have been established as a result.

And and as we all know, if the first thing you do, if you were diagnosed with cancer is get off the sugar. Um and again, that's part of all of this scenario of how energy is created and the consequences associated with how that energy is.

So that's that's a big one as well. And again, the autoimmune, the protein folding, there's a whole list of autoimmune is that can hopefully be addressed. And there's there's lots of so called incurable. And for me, I don't like the word cure.

I would prefer to say that we negate the stress. And if we negate the stress and the miss function in the first place, then obviously we negate the progression towards the consequence.

So, again, regenerative medicine as as you say, we want to get away from the progression. We want to stop the reason why it is manifesting in this way, because of how it's working in the first place.

So we've got to get right back to those basics. We've got to get right back to the biological ingredients of life without the synthetic interventions, try and clean the system up working properly. Hopefully we can start to turn things around.

– I love that. And all of that requires energy. You know? And so all of it requires energy. Well, it it's it is a breath of fresh air, you know, the hydrogen.

And I'm really, really excited to see what direction the research is going. I know, you know, a number of people that I that I've heard from and that's used hydrogen in their treatment protocols have had tremendous results and some So I'm really excited to see the type of research that that will be coming out of your research center.

And uh and I know that any time you do research, you always look for funding. So, you know, I hope hopefully maybe there's some listeners out there that I feel that this is something that they can throw money at to drive.

Something that can solve, you know, some of these horrific condition, horrific diseases that we're dealing with, like scleroderma, like cancer, other autoimmune conditions, you know, I know also with autism and you know, there's a lot of implications there, diabetes, you know, so it's, you know, the list is so tremendous like your say, because you're working on the fundamental component, which at the end of the day requires energy and that's where hydrogen comes in.

Thank you so much. Jim Wilson, I really appreciate you taking the time and to share, share the extensive knowledge that you have in regards to hydrogen.

– Thanks very much. Hopefully we can make some real differences for for a lot of people over a long period of time watch this space.