Glycans Are Modifiable Biomarkers And Functional Effectors Of Ageing And Age-Related Diseases Transcript

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Introduction and Professor Laucu2019s Background

– Well, Professor Gordan Lauc, it's such an honor to have you on the segment of Regenerative Medicine Summit. Thank you so much for joining me. – Thank you for the invitation. It's a pleasure to be here – And I'm really excited about this, the subject because I get into glycoprotein is quite a bit back in the, in the 90s actually and I know there's tremendous amount of research since then. I know there's a at that time like a segment and harpers biochemistry about lichens and glycoprotein and they're signaling and all that. So I'm excited but let's first tell the audience a little bit about who you are and and and the amount of research that you've done in this field. Professor Gordan Lauc is a professor of by chemistry and molecular biology at the University of Zagreb, director of the National Center of Scientific Excellence in Personalized healthcare.

Honorary professor at the University of Edinburgh and the King's College London and member of the john Hopkins Society of Scholars in 2017 he initiated the launch of human glycoprotein decked and is one of its two co directors.

His research team is pioneering, high throughout high through high throughput google iconic analysis and the application of blackened by markers in the field of precision medicine by combining google iconic data with extensive genetic epigenetic biochemical and physiological data and systems biology approach.

They're trying to understand the role of lichens and normal physiology and disease and professor Lauc co authored over 200 research articles that are cited over 10,000 times in 27. He founded genomes, a biotech company that is currently the global leader and high throughput glycol mix research in Gino's led to the development of the Glicken Age test of biological age.

Well this is going to be exciting. I'm really because this, this is a field that a lot of, I mean people mostly don't know about this. I mean this is so kind of out there and and it's it's just gaining momentum and it sounds like you are really driving that momentum.

– Yes. Unfortunately, many scientists still ignore black simply because they're very difficult to study. So for example, if we think about the protein, a single protein is a they created with black icons to make hundreds or even thousands of glycoprotein.

So instead of looking at single molecules, scientists would have to look at the hundreds or thousands of molecules and many of them still avoided that trouble and simply ignore likens. But the field is definitely gaining momentum actually a couple of weeks ago on overpriced and chemistry was the word in the field.

The first one to Caroline virtually for developing some of the tools to study girl icons.

Why Glycans Matter in Biology

And I think the majority of people now understand the lycans are important but still stay away from them because it's difficult to study them. The way I usually try to explain the importance of guidance is by using an example of a bird without a single feather.

So it is still a bird and you could do a lot of good research on that bird. Study physiology of the bird eyesight, eyesight of the bird walk of the bird.

But if you are studying the bird without the feather, you cannot even imagine flying because bird without its feathers cannot fly. And the same goes for proteins.

So if we look at proteins only at the level we are missing a huge element of complexity which actually enabled the life in the way we know it today. – So glad icons in itself is I mean from my understanding in the past was that it's kind of like a signaling molecule in a way. So it's kind of like antenna at the outside of cellular membrane and there's a lot of communication that takes place in regards to the lycans. – So it is a part of a protein molecule.

So the majority of proteins will have this glass icons attached, you can think about the recent antennas and occasionally indeed they serve as a receptor for something to attach to that antenna. But they're also part of the molecular structure and alternative regulation, meaning adding different likens to the same protein. It's functionally very similar to coding mutation. So the coding mutation is a change in the gene sequence which is changing them in acid sequence, which is changing the structure of a protein and we know that some mutations can be little.

So you have a mutation which can kill you or make you sick. The same goes for alternative like insulation So if we are putting the wrong, like on at the given regulation site, the function of protein is altered and the protein cannot function normally. And actually there is a series of diseases called the congenital disorders of accumulation which are very rare but kids with this type of disease are dying at very engaged because we cannot in majority of cases and we cannot live with our glider. So without argh likens we are not functional, not only us, any organism on the planet cannot live without.

– So help me understand a little bit more in regard to click in. So you're telling me that. So we're looking at the bird, you know, which is without the feathers, that is kind of like just the protein.

So it's like a, the physiology, it's like the, it's almost like dumbing the bird down in a way and then we add the feathers which is an additional complexity and all of a sudden then now we can study how the bird is flying and the patterns is flying.

So how, what functionalities are added then with the Glickman's you know that we are studying that's let's say for instance, I mean what are some normal functions in the body that would not take, I mean like you said every function but yeah, help me understand a little bit more kind of in layman's terms, – We can make one very simple example And these are antibodies.

So antibodies are the main weapon of our immune system but the protein part of an antibody it's actually defining which antigens that bind. But the moment when this protein part is defined we still do not know what type of anti genitals. It could be a virus, it could be a bacteria, it could be food, it could be something we inhale and the response of our immune system has to be very different because we activate different branches of the immune system to kill viruses to kill bacteria. Or even we have to dampen our immune system to tolerate things we eat or things we inhale. And this is being done by likens.

So by putting different likens to the globalists we decide to which receptors will these so called FC or concept crystallize, herbal or constant region of the antiballistic will bind and then activate the effect of functions.

For example we did some studies in people having pneumonia and pneumonia which is not for viral log origin and pneumonia of bacterial origin will cause completely different accumulation of antibodies because our immune system has to use different weapons. Different effective functions to kill viruses and to kill bacteria. So immune system and inflammation are important aspects which are being regulated by Greitens but this is just one of the examples for example all the main brain receptors that causality there half life is determined by like isolation and also it is known for example that one specific type of insulation is linked with a very high risk of diabetes because our glucose sensing and glucose and insulin release mechanisms are regulated by a cancelation.

How Glycans Regulate Immune Function

So really all aspects of biology have likens involved but in most of them we didn't study likens sufficiently to understand it – And it is mostly because it is such a complex science. I mean like like you're saying we have we have a limited amount of proteins, you know. And so those are fairly easy to to study and then we add then the combination of the numbers of different Billikens.

I mean are there like in proteins we have touring we have tire scene. We have all these different amino acids and a combination of these and creates a peptide if it's a smaller that has a very specific singling, you know.

And you know, peptide science is really kind of moving forward and then in Glickman's, is it the same thing that you have? Certain like manos and and you know, different kind of sugar molecules that become that's a limited amount of them?

Or is it just a huge amount of different, you know, look likens – It's a huge amount of different structures actually. It's an entire new complexity level because both D.

N. A. And RNA and proteins are linear molecules. If you write down the sequence of nucleotides in the D. N. A. You know the sequence of R. N. A. And you know the sequence of a protein glycogen. Zar branched nonlinear structures and their structure is not encoded directly in the D. N.

A. It's encoded in a network of genes. So for example, for immunoglobulin gene where we did a series of large studies, we know it's over 40 genes which have to work together in the network to decide which kind of gliding structure to put on I. G. So on the majority of proteins, the number of gliders which are being attached is not huge.

It can be from a few dozen to maybe a few 100 but they can be put on a different locations and a protein so different like insulation sites. Each protein have a multiple mutilation sites. So the entire complexity is enormous and we still don't fully understand it. And until recently it was really difficult to study because there were no reliable high throughput quantitative methods to even see how the insulation looks like. So if we think about genetics, this would be like in the eighties or early nineties.

But when it was really difficult to read the sequence of A D. N. A. That was a challenge. But with the development of tools which happened in the nineties for molecular biology, we were able to start to sequence D. N. A. And now for maybe a decade we really have tools which enable us to reliably address voting like insulation.

and this is why the field is blooming because we are doing large studies studying thousands of people to the humanlike on project. We already studied over 200,000 people and generated like and data which showed that people are different, that glass icons are predicting position to different diseases to respond to some therapists and so on because you know, everything is correlated just, we don't think it that way. For example, blood groups are lichens, chemical, E, A B and O blood groups, Argh likens majority of um cancer markers, argh likens so we know about them but people don't think about them as likens, they just think them as a blood groups or cancer antigens but they're there.

Most of them are actually likens. – So what do you see lycans, I mean what impact do you see this research having in and in people's lives, you know, directly in and battling disease and anti aging and you know, what impact do you see in people's lives?

– So unfortunately like comics is only slowly entering the diagnostics arena, so because formal diagnostics is extremely conservative, you know, at the global level, we introduced one or two biomarkers per year, but first black and biomarkers have already approved for clinical use.

So in a maybe a decade there will be a lot of black and biomarkers in diagnostics. What is happening on the side of diagnostics is that there are some tests which are being marketed as a lifestyle markers like the glycol test of biological age where of course I'm heavily conflicted because I am the inventor of that test.

And So this test is used currently by I think over 500 different clinics all around the world where people are using it to navigate personalized healthy aging. Because one of the key problems we have in medicine in general is that all both pharmacological and lifestyle um therapist or approaches are developed on the basis of a standard human But there is no standard human, none of us is a standard human. Each of us is a little bit different.

And this is why we know that today 80% of the smart drugs, all those expensive sciences, smart drugs are being wasted because we give them to people who do not respond the same goes for lifestyle interventions.

So different diets, different exercise regimes, different supplements are given to people who do not benefit from them. Because we do not have tools to say whether it actually works or not because there is a rich perch saying, you know that the compound X. Is helping in a condition B but it might not be working for me. It might maybe working for you.

Glycan Complexity and Human Glycome Research

So what what the glycogen age test is doing is actually showing whether specific intervention works for me and it can give a result in a reasonable time frame of a couple of months.

So as a lycan age is a company which is on the market for, I believe slightly over two years already have I think over 15,000 customers which are using this test to see whether some lifestyle interventions they do actually benefit them or not.

And for example, one of the first things we learned where we're actually shocked is to see that the majority of people, especially the middle aged people when they start training, they actually over exercise their overtrained and we see actually damage and not to benefit from physical activity because um it was actually the food industry which created dogma that you can sweat out the bad guy, which is false.

You cannot sweat out the bad diet if your diet is bad, you cannot access that enough to fix the diet. The other thing which is wasteful, largely overlooked is the microbiome, especially in the US with so much ultra processed food with food, which has a shelf life of of a half a year or year, you know that there are chemicals there which kills microbes and if you eat that food, it is killing your own microbes.

And if you kill your own microbes, then you cannot function normally. So people do things then try to change everything. And so many people overdo it, they combine different interventions, different dietary regimes and actually do them self damage.

And we have seen it so many times that you test somebody who thinks I'm doing everything perfectly and then it turns out it's not that perfect and then you just have to kind of calm down a bit. You know don't don't do everything at the same time or the classical thing is you know somebody is not doing anything and then tries just going to the gym every day and takes a personal trainer and you know just press it out and then you say look at your you're getting too much pro inflammatory, you know all these exercises pro inflammatory, you have to relax more and then just by exercising a little bit less things get better.

So this is something where people are already benefiting from the glycol science because you can actually see that what you do either works or do not work.

– So I'm curious to see because you have these genetic tests, you know testing genetic snips and and then you get personalized medicine based upon that you have this snip so you can take this herb of these nutrients you take you take.

You know obviously the popularized one is like Mthfr and then you need you know methylated folic acid and so forth. So how how does this differ? You know learning about the Glickman's than the genetic snips in regards to how to personalize what you're eating supplement lifestyle etcetera.

– So these are two very complementary approaches because what we know today we are what we know today is that only approximately 20-30% of diseases and the longevity is actually genetic majorities of our lifestyle. And these snips which we read in the genetic testing are exactly the same since we were born until we die.

So our genes do not change. And all the genetic risk factors are predefined. So if you have a higher risk for heart attack, genetic risk, anything you do will not change that genetic risk, it will change the lifestyle and the genetic component. And this is what is being measured by likens.

So glad icons and genetics are complementary aspects. Also one part of Lycans in genetics. So approximately

between 30 and 50% of the glycol composition is predefined. This is written in our genes.

There's nothing we can do about it. But the other 50, we can change by making a decision to have a different lifestyle. So the key difference between icons and genetic testing is that you cannot see an effect of fear intervention on the genetic risk.

But you can see it on like this. On the other hand, when we see that the glide cancer not ideal, we usually do not know why. But then we can use genetics to give us part of the guidance and and interviews to see what people are doing. And the research then can tell us, you know, obesity is driving the pro inflammatory aspect.

It could be sex hormones to be other things which drive the glycol to become more pro inflammatory – And so when people do this test then, you know, what are they, what are we measuring? And how, what do we learn from it that will then give us a a reason to change our lifestyle. I mean you're told you know that you know, this individual, they may learn that they're exercising too much, but how do we, and then he turns that down and then, you know, how do we measure differences and what are we looking at?

– So this guy can age test, which we were talking about. This commercial test which is available is measuring glide cons attached to global energy. And we know which glide constructors are associated with old age with inflammatory diseases, with the risk for cardiovascular events and such things and which glass icons are actually suppressing inflammation and we all know that we are young.

Argh, like is composed in a way that it's actually suppressing inflammation. And as we're getting older and as we accumulate low grade chronic inflammation.

Our guide cons are actually driving this chronic inflammation is the kind of a vicious circle where inflammation is driving pro inflammatory glide guns, which then drive inflammation. And this is the process which is often referred as inflammation inflammation, driving aging And what can be seen from measuring likens is how far on that scale of promoting inflammation.

Clinical Uses: Aging, Lifestyle, and Personalized Health

We already went. So somebody can be chronologically 50 and they're like could be like an 80 year old person, 80 year old person or a 20 year old person. And of course we don't like to have glass icons which are suppressing inflammation because we know that the low grade chronic inflammation is one of the key drivers of disease.

The problem is that we don't know how to do it. For example, one of the typical errors people make is there are some people who are really trying to optimize hormone levels and in men of course they give them testosterone.

And if the testosterone is not rising enough then they also gave aromatase inhibitors which is blocking the conversion of testosterone to estrogen. Well actually in both women and men it is estrogen which is promoting this anti inflammatory effects of lycans. So instead of trying to to raise the testosterone level and stopping the conversion to estrogen, we should measure what is the level of this pro inflammatory lichens which are controlled by the estrogens actually aromatase can do damage. Although the testosterone is great.

But you are still pro inflammatory. So this is where this field of light and science actually can help because contrary to both the D. N. A. Testing and epigenetic testing google icons are functional defectors. These are molecules which actually do something.

So when you measure them and you see oh gosh I have a lot of pro inflammatory likens, you know this is bad and if you have a lot of anti inflammatories likens, you know this is good while in both the snakes and and and the mutilation sites.

In the majority of cases we don't know all the functional aspects, especially for ventilation. – So seeing then, you know, talking about the the pro inflammatory, so seeing then that you have a lot of pro inflammatory likens, you know, then the intervention would be because obviously exercises you trigger inflammation in order to be able to

build muscles, you know?

But if you have a lot of pro inflammatory likens then you need to tone it down and then also you need to then say support or reduce the breakdown of estrogen.

You need to allow estrogen to be there a little bit more so are there than interventions and that you can do based upon the test in order and then do follow up test to see are my interventions, working – For example what we have done in several occasions, we would have a person doing a lot of endurance training which is highly pro inflammatory and if they switch to high intensity and terrible training which has the majority of beneficial effects of also the long term training we could see that the guidelines are becoming less pro inflammatory.

So it's still, you know, again we cannot say that this works in everybody. But our researchers have shown that in many people high intensity interval training is more beneficial than than the than the long term training simply because it gives time for muscles to to restore their normal physiology. Because you know, if you keep exercising your lactate keeps building up and this is definitely not not not beneficial. So it doesn't have to be exercising glass, it could be exercising different. Also for that, we have a very interesting study which was published a couple of months ago.

There was a large study in europe where 1000 people were first put to the very low calorie diet. I believe it was around 800 calories for two months. So they lost A lot of weight.

And I think those who were lost more than 10 kg in two months, then they were put on a maintenance diet because nobody can maintain 800 calories diet, you know, that's a torture. You don't want to do that.

So they tried five different maintenance diet different combination of proteins, carbohydrates and so on. And what we have seen in glass icons is that in each of these diets there are some people who were responding well and some people who were not responding well because we are different, especially when it comes to carbohydrates because you know, the the abundance of carbohydrates is something which is very recent.

This was revolutionary. Never present. It came together with the agricultural revolution and human started to domesticate animals far far earlier than growing a lot of carbohydrates and we still have many people who are intolerant to lactose.

the mutations which enabled us to consume milk Created much earlier than the mutations which would enable us to consume a large amount of carbohydrates.

So probably there are some people among us who can cope with a large amount of carbohydrates, but there are many people who cannot. And one of the reasons why the dietary recommendations are changing so drastically because you know, 20 years ago we were all saying, you know, it's a lot of carbohydrates don't eat fat today.

We say, Oh no, no, no, you should eat that, you should eat protein and don't eat carbohydrates. Because there are some people who can cope with carbohydrates and some people who cannot cope with a high protein diet. So each of the diets which were tested on these 1000 people, some people benefited.

Some people did not respond well. And you cannot say by the change in B. M. I, you cannot see that with any kind of other markets. But gardens were showing, you know, these guys are responding well and the other ones are not.

– And so with that, because we talked about the pro inflammatory glass icons are are those the lichens that you would measure if there's more of those than you know that they're not responding well. – So now we are talking only about these immunoglobulin glass icons which are more pro inflammatory or maybe some other plasma protein likens, which we know that our link with inflammation.

So if we see that specific diet is not reducing this uh pro inflammatory capacity of a glass icon, then we could say, you know, maybe some other diet would be better for you.

And google icons can tell it reasonably well. You know, in a couple of months you can see whether something is working or not. And you know, one of the key problems we have as as individuals is that the lifestyle interventions are difficult.

It's not easy to do things which you know, exercise controlling your diet. It's not easy. And if you don't see a benefit, people don't do it. And health benefits Are manifesting only two or three decades after we start doing something and nobody is going to change their lifestyle or at least very small amount small number of people will change their lifestyle today for benefit which will come in 20 or 30 years. But if there is something quantifiable, something you can measure and then you can see that in the three months some of your difficult decisions are actually paying off, then people get motivated and this is what we see a lot with this like an age company is that people try something, they see it works or it doesn't work because they're like an agent going up or down and and then change and then they find something which works and this feedback gives them motivation to go in that direction. So I really think that I hope that, you know, in in 5 to 10 years when this test becomes routine test in a clinical laboratories, it could be used to motivate people to live healthier because, you know, the problem we have in the modern health care is that we are not trying to keep people healthy, we are trying to keep people well enough to function and then still to stay our customers and buy the drugs and therapies and everything else.

Glycans vs Genetic Testing

So I think the majority of the health care systems are now realizing that this will just bankrupt Everybody because, you know, in us, I think now it's around 20% of GDP which goes to the health care.

So how high can it go? Will it be 60% of the health care that will 60% of the money which will go to health care? And I know that in Europe we have a formal priority of the European Commission. Is that from so called in terrible health care.

When you try to fix something which is broken, we have to switch to the continuous health care by helping people to stay healthy. And it's not easy because, you know, healthy people don't bring money, but healthy people actually do bring money because they work and then they create money.

So it's complicated. – Yeah. And obviously the issue with sick people is that it's a huge burden on taxpayers to support them financially because they they're not producing work and then they're sick.

So now they need financial support to be able to be taken care of. So obviously better model would be not to have them sick, you know and be healthy and thrive. So what more I mean because like inflammatory factors, I mean we look in in blood like c reactive protein and we do another test called at our clinic where we measured like from boxing A to you know, as a inflammatory marker. So what other things are you looking other than inflammation in regards to the the glycol age or like an age?

Are there a lot of other factors that come along with it other than inflammation that you determine as well or how does that differ from other inflammatory markers that we are used to seeing. – So majority of current clinical inflammatory markers are highly acute meaning they can change a lot from day to day.

They respond to a small infections, you can have a small bacterial infection somewhere and your crp could go through the roof. Gland cans are more the chronic measure.

So in many global and lycans are measuring inflammation at the chronic level. So it's not a short term marker. It's a long term marker. It doesn't make sense to measure it more than once in a few months while clear p you measure daily. But this is just one aspect of black insulation which which can be used and this is the only one which is commercial available today.

We as the largest hydro particular comic laboratory globally do a lot of other studies. For example. We are now trying to develop a test which would be more predictive of risk of um future diabetes development. So it's measuring kind of a balance of metabolism Because you know our ourselves are constantly adapting to changing environment and as we are progressing from from a healthy state to some kind of prediabetes and diabetes which

is today a global burden will have over 10% of a population that have diabetes now in most of the countries.

This is a process which takes over a decade to develop. And glass icons as a regulatory mechanism which is uh controlling for how long will receptor B on the cell membrane the insulin receptor, the global transporters there also that and change continuously.

And when we look some other types of black on. So these are now not even a global icons, their icons and some other proteins. We see them changing up to a decade before people develop insulin resistance.

So glad cons try to compensate for this problem. And then at the moment there's a break out of the system insulin resistance and finally diabetes develops.

So also we time this test will also be available where people could actually see how far on this path of going from healthy to some kind of a diabetes or prediabetes state They already traveled and this is all before the HB one C gets altered. So HB one C.

Is a marker which is changing after the glucose regulation has already been at least part the loss. So higher glucose levels result in higher HB one C guidelines change before that happened.

Early Disease Detection and New Biomarkers

Another very important aspect where lycans will prove to be very beneficial is the the perimenopause issue because transition from the regular cycle to menopause is a period which takes a number of years and it's heavily under research and the majority of women in that period get misdiagnosed with different problems.

They get treat with different diagnosis. They got treated for different issues which have which are not real problem. The real problem is hormone deficiency.

And It's very hard to determine it by measuring hormone levels because hormone levels can vary within a day from day to day. So one of the tests today would say you have to collect 28 samples every day in a month, measure it and then see what is your hormone level. This estrogen has a very strong effect on the regulation of I. G. Like regulation by measuring a glide and sample at the single time point, we see the the average concentration of I.

G. In the last few weeks. So actually, probably within a couple of years or maybe a little bit more. I. G. G. Lycan composition will be equivalent for HBO one C. So what is HB A one C.

For glucose will B I. G. Lycan composition for estrogen levels. So there are more and more of this type of test being developed also for for different types of liver diseases, for different types of cancers, there will be like on biomarkers which will be available to predict what is going on or to help diagnose the disease.

– So it's and this is exactly what we're missing in healthcare is that, you know, blood levels, you know, the body tries to compensate for such a long period of time before anything starts to show up in the blood.

So then measuring. So it's a very kind of late stage type of diagnostic to see what's going on in the bloodstream. So then measuring the Glickman's will give us the opportunity to start to see when the process is moving towards a disease state, you know, way earlier so that you can do an intervention and recognizing that something is going on, you know, before way before it becomes a disease.

– So I think something which is extremely important for for the entire health care system to acknowledges that we still know very little about the biology and immunology and all physiological processes. And I think this became so clear in this pandemic, you know that we don't understand anything.

We don't know how things work and we have to learn. We have to try and we have to develop better ways how to quantify An individual. For example, there is a paper now being under review in which we participated which is called the molecular human.

They measured over 6000 different molecular phenotype, metabolic, comic, platonic glide comic to try to understand an individual person because we are all different. This is what keeps us a suspicious alive because we lived through the ice age. We live through the much warmer climate than today. People can survive in in a tropical climate in the desert or at uh frozen uh completely frozen land.

People can survive and this is because we are different and we have to acknowledge that we are different and then approach every patient individually.

We still don't have this knowledge. So if if you are seeing a patient, you have no ideas how different he is from a previous or the next patient at molecular level gene sequencing of course will give a part of information.

So finding mutations, pharmacogenomics is now really moral, is becoming a standard. So you know that some mutations and some drugs should not mix not to genomics is making a progression in the field of oncology. Yes, genetic analysis can help a lot.

But in the majority of chronic diseases it's it's a lifestyle, it's not genes which make you obese and it's not genes which make you give you metabolic syndrome or insulin resistance. It's your lifestyle and gliding tests can really hear be helpful. So they're still not the formal diagnostic test because the key problem for gliders to become a diagnostic test is that the methods to analyze the glass icons have to be certified. And as a human like on project we talked to the all the instrument providers and just a couple of weeks ago we had a meeting of the human gliding project. I spoke to one of the big companies and ask them, okay so what do you need to make an I. V. D.

Certification of this specific machine? And they said you know I have to sell at least a couple 100 of these machines in Europe and to sell a couple 100 of machines then you have to have pests which people will do on these machines.

So it's a kind of we should circulate cannot get out until there are no tests. You cannot certify machines when there are no certified machines, you cannot develop tests. So this is what human blackened project is trying to to help so have the the instruments and the re agent providers to create tools for black and tests to become available – And in the process and you're you're needing to have it on the research level to make sure that these tests can be then commercially beneficial to the public. And you know obviously that that becomes the first step and then you can then roll out the test. Yeah – So first step is to have as many healthcare providers as possible.

Use indeed the research on the test to actually help their patients because the healthcare provider the certified decisions or even nutritionists or or whoever is working with the people. They can use all the information available even if it's not a diagnostic test. So test which can help a physician help their patient can be useful even before it becomes diagnostic test.

Of course it has to be used by people with more experience with more training uh has to be with all the all the restrictions there but people can use it.

So once we have research, once we have positions using this research only test an actual majority of genetic tests today for researchers only they're not diagnostic tests and then this will create a potential market which then can be converted to a gnostic market diagnostic market. So it it takes time.

Research to Clinical Adoption and Future Applications

But this is for each test, it goes the same way. – And one thing because I do a lot of integrative oncology in regards to cancer than what what do you how do you see that they liken?

I mean obviously inflammation drives any kind of cancer process but inflammation drives a lot of things. So what are some of the things in regards to google icons that can then enable a person to do more preventative medicine and recognize that they are moving in the right direction or that they therapy they're using is beneficial to them. – So actually there is first approved laboratory developed tests from for ovarian cancer is being marketed by the intervention in in san Francisco. So it's looking at the black opap ties and helping the diagnosis of ovarian cancer.

And there's a lot of research showing for example that looking at the black population of P. S.

A. Is way more predictive than just the P. S. A. Level which is not too helpful. And there is a lot of research in this direction trying to help people use it markets in ecology. Then many people are trying to identify early cancer markers, which I'm not too optimistic because you know, we have a couple of cells in the trillions of cells and you cannot really expect these few cells to produce something which you can measure in plasma.

So what we can measure. We can probably measure response of the immune system two early stage cancer which will probably not not be too specific. So I would guess majority of solid cancers would have a similar response which we could then measure.

But we are attempting for example to predict um the period of before the tumor will come back or we are trying we have some paper now in the review predicting the response of different biological therapist.

Because for example, we know that uh the one special feature of antibodies called called the constellation of the core of yukos is has a hundredfold effect on antibody dependent sellers that existed.

So the final companies are now developing Gleicher engineered molecular antibodies where glide can still are altered and make them more efficient. And but this also comes in the context of isolation of patients.

You have to look at the patient to see how your drug will help. So there is progress but it it will take it will take years before it's actually really useful. – So the measuring the glycol isolation of P.

S. A. Is that test available for people or no? – Now there's just few few research papers showing that if you look at the glass icons and P. S. A. It is more predictive than just a P. S. A.

Level. I don't know any lab which is offering this as a as a commercial testing. – Okay. Yeah so this and that's what's exciting with the science is that I mean what you're doing, we're looking ahead into the future.

You know seeing you know what what is the possibility of of kind of the next step and by exploring this type of science and just like the genomic pro you know project that that you know the initiated and all the advances that we've come.

You know that we've done just based upon that – And this is actually extremely frustrating because you know we know from science that some things could be helpful could be much more informative but we cannot actually use it because there are so many steps before science become diagnostics. And this is why we try to develop these called the lifestyle test measuring the lycan age, the metabolic age because then people can already use it.

It's not diagnostics but it's giving information which then well educated physicians can use to also help to make a better diagnosis. So it's a kind of a middle step between not being available at all like the P. S. A.

At the moment and being developed as a full diagnostic test which takes time. – So are there things that we can do to kind of improve argh likens? I mean obviously we can, you know we can kind of measure the Glicken age and then you know we create a change and now we can see if it gets better but kind of as a whole, you know like if the person is deficient in certain amino acid then you eat that amino acid.

I mean can you do something similar with publicans to improve your Glickman's? – So there's a lot of research in that direction. But since there is no standard human, there is no standardized recommendation and and like an age as the company also offers the personalized consulting.

So if you buy a test you also get the first consultation as a part of the package where people with experience about changing your icons can help an individual patient and there are also some clinics A couple of them in us which we already did hundreds of patients and they have experienced what works and what doesn't work.

For example, there's one clinic in New York in which more or less everybody becomes 15-20 years younger after

half a year in the program. So there are things which work, but they are individualized and it has to be done under the provision of a certified health care provider. – Well, Professor Lauc it's been such a pleasure, such an honor. And it's amazing this science that you are driving forward. And I'm so excited to kind of to see what will evolve, you know, the next decade or so. And with the tools, it sounds like, you know, being able then to measure a kind of a high output uh that you you're able then to, I mean, the science is able to move forward and in a much more rapid pace. So thank you so much for for sharing all of this. And then also then offering things to the public so they can get familiar with lichens.

And then also we will be able to start to incorporate that into our lifestyle changes to improve our life. So thank you – And thank you for the invitation and for your interest to learn about blackens and teach other people about the importance of blackness – Thank you