Interview of Dr Francois-Xavier Pellay by Rachel Aram

A New Generation of Anti-Aging

Q: If you were to explain your career in two or three sentences, how would you do that?

I can start from my passion. I have had an interest in aging for as long as I can remember, from childhood, it was almost like some strange obsession. I basically oriented my career towards that. I started as a biologist to understand biology at every scale, I then went from the large scale biology to the small scale, I went into biochemistry and then even smaller to organic chemistry. I then changed my interests to a wider view of biology through bioinformatics. Only after all of that did I really start aging biology. Because aging is a very complex phenomenon that concerns cells and organisms at every scale, the broader your understanding of biology and the more susceptible you are to it and actually understanding aging, then you can hopefully do something about it.

Q: How long have you been in this industry?

I've been a researcher on the biology of aging for the past twelve years after my PhD. My PhD was focused on systems biology and then for the following twelve years I was focusing on trying to find a solution against aging, like understanding how it works, so I had a whole part of my work on the fundamental aspect of aging, what are the main causes, the fundamental causes of aging. A big part of my work was also trying to find a solution for it, so I addressed that as broadly as possible.

Q: What are the key components of how people age?

It depends on the scale you're looking at it. But let's say that overall aging is the degradation of a system from being fully functional, to being less functional.

Q: What are the things that make that happen? What are the things that degrade that functionality?

That's the point, it's a whole system. You have aging that occurs at the molecular level, usually called oxidation. That's one of the main things that can happen. But overall, degradation of molecules. You can picture these small molecules being fully functional, and if something happens to them, then they're obviously not anymore. It's particularly true for what we call macromolecules. The two most famous macromolecules are DNA and proteins. Proteins are little machines all over the cells that do everything in the cells, including synthesizing DNA, expressing it. If anything happens to the machine, mistakes are made, and that's how the DNA ends up being wrong. That's one possibility. And like I said, another very big macromolecule are proteins themselves, and proteins are like DNA, composed of smaller units, and they are complex molecules, they have to be folded in a very specific way to do their job. They are rather big molecules and they can get oxidized. They can lose their structure, their flexibility, and then they will lose their function, and because they play roles for everything inside the cell, if this is damaged, then everything is damaged. Free radicals are also produced by mitochondria. This damage to the proteins of mitochondria will end up with a higher production of these free radicals, and the free radicals are what then damage proteins themselves. So, it's a vicious cycle. They will also damage DNA and the DNA code for the proteins. So, you understand now a little bit better how this whole complexity is very much linked. Pinpointing a single cause of aging is not that simple. But acting on proteins and protecting proteins against these free radicals, this misfolding and everything, kind of covers a big, big part of what happens during aging.

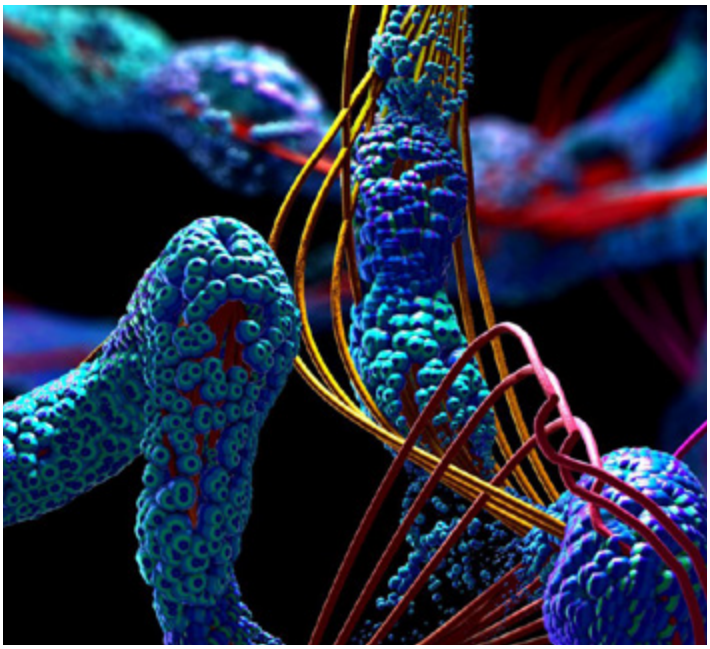
Q: Can you walk through the most common symptoms of aging that we all experience?

It varies from person to person. There's really differences, but there are some common things, so one of the most obvious is, slowing down. Your muscles just don't work as well as they used to, you have to train extra if you want to be as fit as you were when you were 20, for example. This is one obvious one. You can have loss in cognition so that the brain is also slowing down to some degree. This actually happens later than muscle. Muscle loss between 20 and 30, you can already see that you are not as strong at 30, that you were at 20 (for equal training). But the brain still stays active for a very, very long time before the degradation occurs much later. You're actually getting smarter after you're 20. That's actually good news. But still, after a certain point, the system will also go down. Then you have the aging of the immune system. The immune system is your defense mechanism against infection and this will also go old and lose its ability to protect you so well, you can see, for example, in the case of infection that we saw with COVID for example. Stem viruses hits young people and old people and all people will die of it, eventually. The young not necessarily, because their immune system is more efficient, that's part of the explanation at least. One thing that happens also with the immune system is this constant inflammation called inflammaging. That's a term that has been coined to describe this low level inflammation that keeps going further and further, higher and higher with age. And inflammation is also a source of oxidative stress. Inflammation acts on all the cells, so you can imagine that once again in a vicious circle kind of way, it damages everything inside the body.

How is it the case that something as straightforward as a supplement, can address all of these broad and different things that impact aging and that we all experience in such a broad and different way?

All the different degradations of all these complex systems, like the immune system, brain, muscle, they all basically have a lot of things in common, and particularly they are all made of cells, and these cells themselves age. This aging is contributing a big part to this loss of function, oxidation, degradation, of all the tools inside of them, that are called proteins. And of course, if you phrase it like that, it seems obvious that if we manage to protect these proteins, we should at least, at the very least, slow down this process. Because the proteins are not only doing everything in the cells, but they also protect the cells. They also recycle all the things that have been going wrong. They are fixing the problems actually inside the cells. So, if you could basically protect them, fix them, then you should be able to really impact aging very much, so that is what we were looking for.

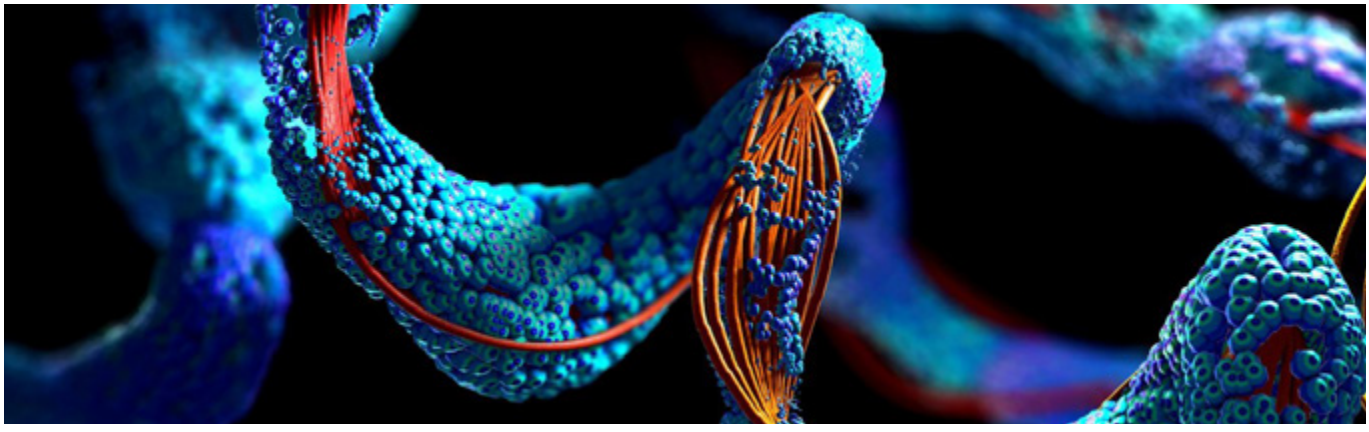
Q: So it acts as a literal shield??



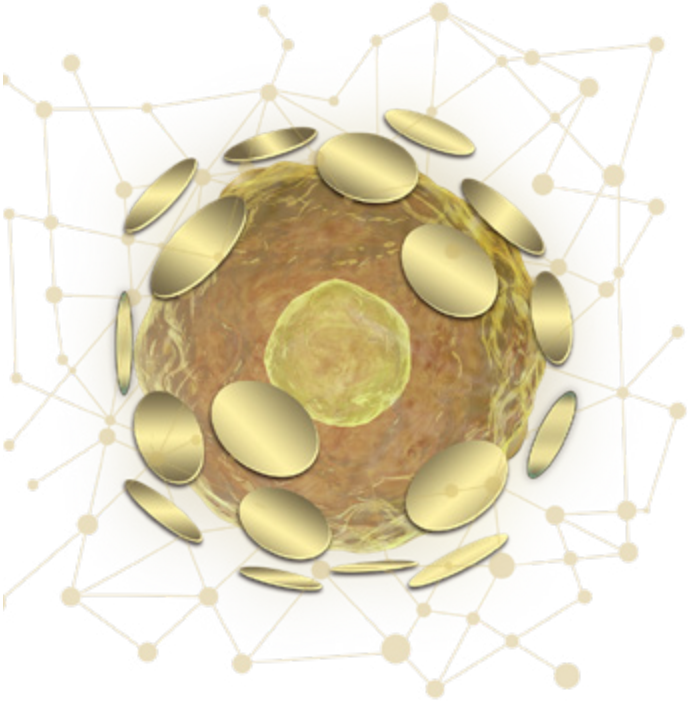
Exactly. We have these molecules in that supplement which are binding to proteins to protect them, to make things as simple as possible. In a slightly more complicated version of that, this binding allows both for avoiding the misfolding, avoiding the loss of shape and loss of function of this protein. That's one thing. The other is that they contain antioxidant properties. So you have an antioxidant that is fixed on the protein. Any free radical that will arrive will be caught by this antioxidant, so it's better than a normal antioxidant because antioxidants are normally just floating around. This one already binds to the proteins, and proteins are among the most sensitive molecules inside the cells to these free radicals.

Q: Are each of the types of proteins protected in the same manner?

Right. To our knowledge, to everything we've tested so far, that's the case. And that's actually the big leap forward compared to everything that was done before. The kind of molecule I'm talking about, they are called chemical Chaperones. The Chaperone is a molecule that binds to a protein to make it stable and avoid it from getting oxidized. And they are, to our knowledge, the best in that category that have ever been described. Because the other chemical Chaperone described so far either requires extremely high concentration, and then you have other chemical chaperones that are actually a large pan of research on this kind, which are called pharmaceutical chaperone, which target a specific protein. This one will protect one and one only protein, sometimes just one form of a protein just to make sure to stabilize that one. So it's very useful in the case of a specific disease. That's why the research is done in that way, and that's also why it's called pharmaceutical, because that's what the pharmaceutical industry is interested in, targeting a single disease. Our molecule basically does the two of those. It's working at a small concentration like pharmaceutical molecules do, and it also has a broad action. As far as we have tested so far, all proteins are protected. We're expecting that there are still some variation in the level of protection. Some proteins actually require more protection than others. You probably don't know that, but not all proteins are oxible the same way. Some are almost completely inox. No matter what you throw at them, they will remain intact. And some are more sensitive. Usually the ones that have complex activity, they require some wobbling around. They have to be able to move around and this puts them at risk of oxidation.



Q: Who do you see this supplement benefiting the most? If there are ten normal people in front of you, who is going to get the most benefit and why?



That's a very good question. I would say that if I had to choose, I would actually give it to people who are more needing it. People who have already incurred heavy damage due to aging, so usually people a little bit older, because I mean, this molecule has an extremely effective preventive role, but it also really slows down and stops, and to some degree, reverses the action of aging that has already occurred. So some people suffer with high level problems, for example, this inflammation, and there's a lot of people with inflammation issues, who would benefit greatly from taking this supplement.

Q: Can you give me some examples? What would I actually be feeling if I was that person?

Well, people with high inflammation often have, for example, arthritis (an inflammatory disease). You can have a lot of skin diseases that are linked to inflammation. You can have some recurrent muscle pain that also can be due to some degree of uncontrolled inflammation. It's something that is very general, but that will affect almost everything. So from the moment you wake up in the morning, basically moving is painful, when you are at that level, this kind of supplement would definitely alleviate the pressure off you.

I'm a woman who is turning 40 in two weeks and I'm not aware of my proteins becoming unfolded. I am aware of what's occurring on my skin, what's occurring when I wake up in the morning, how my memory is working, and how easy it is for me to learn new things. What is actually happening in my body that is causing those changes? Can you give it to me as a list?

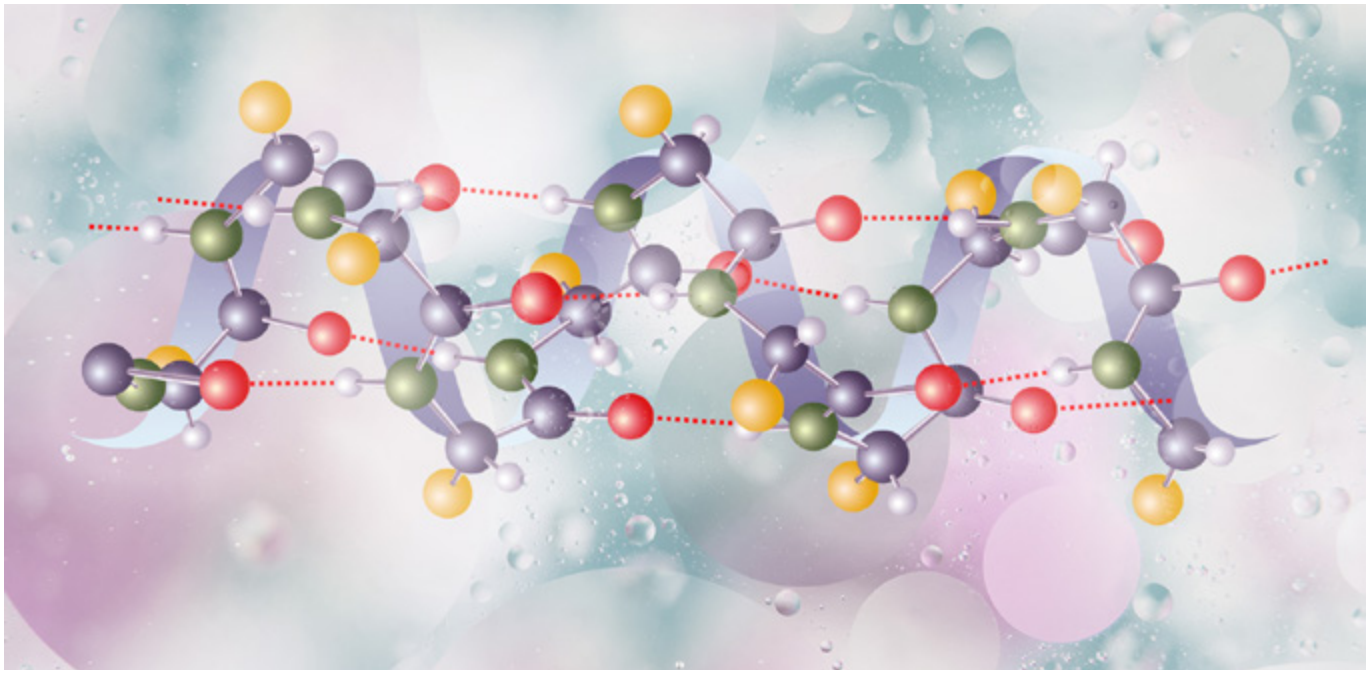
That's a long list of things that are happening. It really depends, once again, on the scale. Everything that happened to your skin is due to both cells within your skin aging, all at a different rate. That's also important to look at. And the sun. The effect of the sun, that's why you have more skin damage on all the sun exposed parts of your skin. Then for the other part, we are talking about overall decreased efficiency of your muscle, decreased efficiency of your brain, which is all linked to, well, all this accumulation of problems towards aging. Both muscle cells and neurons don't divide, which means they only can accumulate problems over the years. They don't have the possibility of diluting it through division. It's an interesting concept, but that's exactly what's happening. These cells, especially muscle and brain, tend to accumulate problems more than the others. And these problems are an accumulation of damaged proteins aggregating together and making the whole cells older and less efficient. If you look at that at a whole level, there's constant compensation mechanisms, it's not visible right away, but in the long term, it will be harder to deal with. The way to deal with that is either slowing down the problem by, for example, the molecule that protects proteins, or, activating the way to degrade the things that have been accumulated so far. These are two big path's that science are taking right now to answer this problem of aging. If you can address both at the same time, then we should be able not only to slow down the aging, but to reverse it at the cellular level and at the whole organism level.

Q: So, if we were to take those separately, in terms of shielding the proteins using your specific molecule, can you describe how once that begins to occur, it's sort of like we're zooming down to the molecular level, and we're looking at it there, but now let's zoom all the way back out to a normal person and the way they feel or look at themselves or interact with the world in a day. So, after we start to protect the cells using the molecule, and the cell is therefore able to do its own job of fixing itself, how am I going to feel that, or how am I going to notice that, as I go about my daily life?

What we've seen so far, is people telling us that they feel less pain in their joints, for example, that they just wake up more easily. I know that sounds strange, but that's true. They can get out of bed more easily. That's partly linked to it, both muscle and brain, so they can recover from exercise more easily. There is a broad range of these kind of things that can happen. We've even had cases of people who feel that they could see better.

Q: What aesthetic things have been reported?

We haven't looked so much at that. But that's also a very good question. When you think about wrinkles, when you think about the thing that you see, which is mostly your skin, it's been broken and then it creates that canyon inside your skin, right? If you want to look at that, at this scale. So you can imagine that just protecting proteins won't be able to reverse that, it's not going to be working like that, but it might and it will actually, prevent some more of that happening. So we have other ways to fix that problem, but it will require you to also lose some cells, for example, with age, so if you could replace these cells, that would be one way, to resynthesize the matrix of the skin and make the wrinkles go away. But this molecule, this protein protector molecule, will slow down the process of more wrinkles appearing. That's basically what we're talking about. There might be some effect on the shininess of the skin, but we don't have a clear measurement for that yet to tell you how it's going to be impacted, and it's not our priority anyway. Everything that we do is more about trying to prevent problems from happening and being healthy. That's really our main focus. It's basically you have to see this supplement as health insurance. It's like you are investing in the next 10 years, 20 years and making sure that this future self is going to be healthy. And that's how it's supposed to be seen. It's as anti-aging as it's supposed to be. It's anti-aging as it's supposed to be, so even the word supplement is complicated in that concept.



Q: At the very beginning, we talked a little bit about your professional background and then we talked about how the supplement actually works at the molecular level, and then we talked about how a person may look and feel and how that's impacted by taking a supplement.

Well, it's very interesting. We were asking ourselves how we can protect proteins? That was really the start of this project. We were focused on the fact that if we protect proteins, we should be able to protect everything. We asked ourselves, where in nature we can find the most resistant organism that can be, and how did they manage to become so resistant to all stress, and especially stress that will target proteins, that will damage proteins. These organisms, they adapt to very extreme environments, it can be, for example, very high temperatures, very low temperatures, desiccation, irradiation to UV, high salt amount and all these things that I just named, they all will damage proteins and most of them will end up, if you put a normal organism in this environment, their proteins will become completely destroyed because all of them end up being oxidative stress. They will act on the folding of the protein and they will make them very much damaged. It's normal to think that if we find this organism, we should basically find out how they became resistant to this environment. In some cases, part of it can be exploited. Sometimes they change all of their proteins and all of their proteins are super resistant. We cannot use them. But in some cases, some of these organisms manage to just produce small molecules that will protect their proteins, and that's what we're talking about. We searched for that, we found it. We found some organism that managed to produce small molecules that bind to their proteins and protect them, and then we learned from that, trying to figure out what was the mechanism of these molecules, and then we could use that to create our supplement. This is the path that we took.

Q: How did you take what you observed in that organism and replicate it in a supplement that is safe, that can be produced, and that people can take every day?

Right. We learn from these organisms. We found the molecules that were acting on them and protecting the proteins, and then we used what is called biomimetism. We copied from nature and used molecules that are well described, well defined. We look for the synergy of these molecules that will copy this mechanism, and because this molecular is well defined and well described, they are also completely safe, and that's how we ended up making this supplement.