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ENVIRONMENT, NATURAL RESOURCES AND REGIONAL DEVELOPMENT COMMITTEE

Inquiry into the CFA training college at Fiskville

Melbourne — 19 November 2015

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**Necessary corrections to be notified to
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The CHAIR — Welcome to this hearing of the Environment, Natural Resources and Regional Development Committee's inquiry into the Fiskville training college. I would like to welcome our next witness, Dr Rye Senjen. Thank you for coming to talk with us today. Most of the academic and expert witnesses were at our last hearing, but I understand you were not able to attend at that time, so thank you for making the time today to come and speak to us.

We just have a few formalities to go through before I then hand over to you to make a presentation. After your presentation the committee members would like to ask you a number of questions. Again, welcome, and thank you for coming. There are a few preliminary comments before we start. As outlined to you by the secretariat, all evidence at this hearing is taken by the committee under the provisions of the Parliamentary Committees Act 2003 and other relevant legislation and attracts parliamentary privilege. Any comments you make outside the hearing will not be offered parliamentary privilege. It is an act of contempt of Parliament to provide false or misleading evidence to the inquiry, and the committee may ask for further information at a later date if there are any gaps in today's presentation.

All evidence is being recorded, and you will be provided with a copy of the proof transcript to check for accuracy. In saying that, we will now hand over to you, Dr Senjen. Perhaps just as a start if you would not mind telling us a little bit about yourself, your research and studies.

Dr SENJEN — Thank you, Madam Chair. I like to stand up when I talk because I was a lecturer in another life. Thank you very much for inviting me as a representative of the National Toxics Network. I will talk a little bit about the National Toxics Network in a few moments, but first just a few words about myself. I have a PhD in entomology — insects — and statistics. I worked for a long time in the telecommunications industry and then — it seems a little bit odd — my PhD was in artificial intelligence. I then became very interested in risk management and risk. I have been very involved in nanotechnology risk assessment, mostly on the non-governmental level, but I have also been working closely with NGOs in Europe and also with the European Commission. I work on a regular basis with an NGO called Health Care Without Harm, which works with the WHO on greening hospitals. In that capacity I have written a number of papers and reports for them on safe hospital flooring and things like that.

I have become involved because I am interested in chemical risk management and also in the whole PFOS and PFOA, issue, and I am deeply concerned.

Today, rather than boring you with again saying how it is dangerous and the low levels and la la la, I thought I would talk a little bit about influences from my other life, because I teach ethics and sustainability to MBA students and have done so for about four years now. In that context a lot of my thoughts came about and also in the context of being a bridge between science and policymakers, because I think scientists work in the lab, they make little measurements and they do not really want to say for sure what they have found because they need more money. It needs people who can really have an overview, pull it all together and perhaps summarise for policymakers the key issues.

I have been reading the transcript, and some of these issues that are surrounding science and the validity of risk assessment have not really been brought out to you, so that is my focus. I will make it quite brief and then you can ask me lots of questions.

Visual presentation.

Dr SENJEN — Just a few words about the National Toxics Network. We focus on environmental health. We are basically a peak body of concerned experts and scientists. We have people on Pacific islands, in New Zealand and around Australia who are involved with us. We are also represented on government committees like NICNAS. I personally also work with the Australian textile industry on product safety. We go to international meetings. I have just been to Geneva for a meeting for SAICM, which is the Strategic Approach to International Chemicals Management. It is a get-together — there were 800 people there — of government officials, industry and NGOs. It is a terrific meeting where we all get together and do a multi-stakeholder approach so that not just government and industry get together but all concerned citizens get together and have a voice. They come together to come up with a resolution, and then work is done on these. PFOS of course was discussed, and industry flagged that they would welcome and support a listing of PFOA on the Stockholm convention. The EU was in fact the government body that had put forward that proposition, so it is very

interesting to see that even industry is realising that PFOA is a chemical that needs to be phased out and stopped.

Unfortunately Mariann could not be here to talk with you today, but she goes every year to Rome — not to see the Vatican and the Pope but to be part of the Stockholm convention expert committee, the Rotterdam convention and the Basel convention. These are all conventions that try to deal with chemical management.

As you can see, PFCs — and I thought I would say just a few words about that — have been in the firing line since 2000 when the OECD first realised that there was concern. In 2002, already 13 years ago, DuPont actually stopped production of PFOS and has just now agreed to stop production of PFOA — so no more Teflon in your frying pans and no more Gore-Tex with PFOA in it, because they are two of the key consumer items that we know about.

Just to give you a feeling, at that meeting in Rome that Mariann attended there were 150 countries represented, and every single one agreed to have a more detailed look at PFOA and started on that journey to listing. That is quite significant because often there is not a consensus decision — one country, often Russia or India, will say, ‘Oh no, there is nothing wrong with that’ or ‘We need that chemical’ — but no, this time it was actually unanimous. That is pretty significant.

The important thing with these two chemicals, with perfluorochemicals, is that all the time new research comes out. Just — very fortuitously, I guess — this week a new article has been released in the scientific journal *Obesity*. I have sent you a copy of that because it is open access, and they rather alarmingly found that if you were a female and you drank that water that came out of the DuPont plant, you ended up with twice the amount of PFOA in your blood, and if that all happened while you were pregnant, very sadly your children were more likely to get fat — so it is not just the hamburgers in the States, it is also the PFOA that sets the body up to put on weight. I think that is fairly shocking. These women were 250 miles — so that is 300 kilometres — from this particular factory. Fiskville is only 140 kilometres away.

If you read the paper, you will find out that there have been a number of studies, and some of them say, ‘There is nothing wrong with PFOA; they did not put on weight at all’. That was what I was wanting to focus on today — to alert you to this or to discuss with you: what this is? There is a bunch of scientists who say, ‘This is a really bad chemical’, and then there is another bunch of scientists who say, ‘Actually, we could not find anything’. In this case it was very good that the paper actually discussed this — ‘Why is it that we and two other researchers found that PFOA makes children fat when two others did not?’. Again and again when you look at science you find that you have to look at the way the experiment was set up, and in the case of the two that did not find anything they had self-reporting — and self-reporting is difficult, especially when it is about your children. If I ask you, ‘Are your children getting fatter?’, you will probably say, ‘No! No, not that fat. A little bit fat, but not that fat’. That is the problem. Self-reporting is a very bad way of doing research.

Also, as I highlight here, you need to look at things for a long time. These women were exposed 10 years ago, got pregnant. Then they followed the children and they discarded the children who fell outside the paradigm of research, and so in the end they had something like only 400 children left. They started with 600. It is that kind of very detailed serious research that is really required, and when you compare and look at papers, that is what is sometimes so hard. And of course the people who did the other two studies are not going to admit that their research was not perhaps as watertight as it could have been, because that’s all they had, probably. They could just do the self-reporting, you know; it is better than nothing. So that is one thing that I wanted to highlight with you — that sometimes what can be perceived as conflicting research really needs to be investigated further.

The other quick point I want to make is about risk. You have heard from toxicologists, and toxicologists basically say, ‘The dose makes the poison’. Of course it does. If you consume a litre of arsenic, you will probably die — even half a litre or 10 grams probably will kill you. But in the last 30 years — and that is quite significant — we have suddenly found that very, very, very small doses are just as bad, I guess you would call it, as very large doses. And this is a huge paradigm shift. It is a paradigm shift as big as saying, ‘Hmm, the earth is flat? No, actually it’s round. There’s a big, wide cosmos out there’. But when you have grown up as a toxicologist and you have done all the experiments — you have killed thousands of rats with ever-increasing doses — it is a terrible thing. Suddenly you discover that what you believed in applies most of the time, yes, but not all of the time. So that is why toxicologists, I think, are so stuck in a particular world view. I think that is important, again: when you look at evidence, you really have to look at the very latest research.

Just when we were in Geneva, the Endocrine Society was there and gave some talks — and these are eminent and serious scientists — and they have just put out a new statement on endocrine disruptors. It is like 200 scientists that signed this particular statement, really saying, ‘It’s a big issue, having tiny, tiny doses’. And the funny thing is that you can have tiny doses and you can have big doses having an effect, and everything in the middle has no effect — and so of course if you do not give tiny doses, you are in trouble.

The other aspect with PFOS is that, I guess you have heard, it takes four years to clear out of the body. Now the terrible thing is that when you have rats — and mostly rats are being experimented upon — it comes out much faster. So when you do experiments on pregnant rats, female rats clear PFOS faster, so you might not see the effects. So it is all these little details that come into play. That is why I want to say to you: risk assessment and science is actually not value neutral. Scientists have particular ideas, and risk assessors have particular ideas. They want to come in and they want to have a certain outcome: ‘I am going to measure whether PFOS is good or bad’, so my hypothesis might be that there is no effect. And then everything you do as a scientist — and I have been a scientist — you set it up that way.

That is not to say science is bad; it is just like human nature. We sort of organise our world so that we get certain outcomes. As parliamentarians you represent the people of Victoria, and it is really, I think, your job to take all the science and say, ‘Okay, what is all this about, and how do we represent the people and make sure everybody is safe?’. That is why I say at the bottom that it is a person’s moral right not to be exposed to the risk of a negative impact through the actions of others. I guess for me that is the guiding light, in my life at least and I believe in the lives of many of us and especially parliamentarians, because you are our representatives and so you represent especially the people who cannot represent themselves, which is often children and the old people. This is what we call sub-population. You often hear, ‘Oh, I’ve been smoking all my life and I’m good’, or, ‘Yes, I’ve been spraying’, whatever, you know, ‘I never wear anything’. But the fact is that yes, you might be okay — in fact, you probably are okay — but what about your wife?

There is the classic story of the wife washing the asbestos clothing and then getting the illness many years later. What about the children? Your wife is pregnant, she is exposed, and then the children, 50 years later, 40 years later, are the ones who are affected. I think that is the key issue. That is why I say that a multistakeholder approach is so important. It is not just the experts that can give you all the answers; it is actually all people that are affected, and everybody needs to be heard.

I have already talked about the toxicologists’ point of view on: what is a safe level? Maybe you have asked yourselves — I do not know if they explained this to you — ‘How do we get a safe level?’. This is voodoo, in my opinion. What they do most of the time is they perform a one-time exposure at various levels. So you have a bunch of rats and you give them a little bit, and then a little bit more and a little bit more. And then five doses — everybody dies. And then one dose — everybody survives. You maybe then kill them anyway, cut them open, see whether their livers are affected, and eventually you find a rat that is okay. That is what you call your ‘non-observable adverse effect level’.

Then you take that level and you put some uncertainty factors into it — ten times lower for the effect on humans, ten times lower for this effect and maybe ten times lower — you get some number. Good. But what if? What if rats get rid of PFOS and PFOA more quickly than humans? What if there is another dose which is much, much smaller that actually causes the effect? There are all these what-ifs. Of course you cannot experiment on humans, but sadly we do. We do experiment on humans. What we are starting to understand is it that is not only the effect of endocrine disruptors, which is a whole huge paradigm shift which I think the WHO is getting a handle on, but mixtures. So you are not just exposed to one chemical. It is not like you are a rat and you get a bit of PFOA, and that is it. There is PFOA, there is PFOS, there are various other chemicals. When they do blood samples of humans, they often find there are hundreds of chemicals in a person’s blood and they do interact. It is like when you take some aspirin or something. You are not meant to take alcohol and you are not meant to do this, you are not meant to do that — that is the mixture effect. Little is known about it, but we do know that it is very serious.

I think I am just about finished. I have more slides, but I will not go through them all because you already know some of this information. I just highlight the fact that in the States litigation is happening. The first woman has won \$1.6 million US dollars. There are another 3500 people hoping to get some money because they are all ill. I leave you with this thought: in the US they checked all the water and found there was not much PFOA there. Then some other people checked the water, and they found that the measurement device they used was not

sensitive enough. It is a bit like if you use a sieve with very big holes; everything falls through. What you need to use is the right-sized sieve, and you suddenly find stuff is there. If you then combine that knowledge with the fact that small doses are potentially very harmful — in fact some people say there is no safe dose — then you are in trouble.

That is why — I am just going to rush through this — we need to do certain things in Australia. We need to, obviously, destroy all the compounds. We need to permanently close Fiskville. We need to, most of all, probably institute long-term health monitoring of people affected — the firefighters and other people. I have a friend, and I said, ‘I’m going to this Fiskville inquiry’, and she goes, ‘I used to go there; I was with the Red Cross’. I said, ‘When was that?’. She said, ‘That was in the 90s’, and I said, ‘Have you been tested? Are you worried?’. She said, ‘No-one has contacted me’. So there is potentially a whole other bunch of people. She is in her 60s, so she is not going to get pregnant, hopefully, but it is a big issue. So long-term health monitoring is very important and nationally, obviously, we have to act as well, but you can see that for yourself. That is it. Any questions?

The CHAIR — Thank you for that. Just on your last point there, about long-term health monitoring, in terms of the terms of reference and as policymakers, as you say, as I understand it most of the long-term health monitoring is very expensive. They go for a long time. When do you actually get anything out of it in terms of those people who are affected and so on, and what can you actually do? Are there other ways as well in terms of monitoring people? There is a cancer register, for example. I am not saying excluding health monitoring, but if we want to look at something ongoing, it is about data collection. Do you see any other ways to collect information? For example, the person who you said mentioned that they were with the Red Cross — having a register that allows for anybody that had some sort of association or experience at Fiskville. Would that be a valuable thing to do? Then perhaps start crosschecking in terms of illnesses? Because of course it is not just cancer; it is also about other illnesses, and not just PFOS but also the chemicals previously used there that people were exposed to.

Dr SENJEN — I certainly think as a first step everybody who has been there needs to be registered, but I also acknowledge that you have a big problem because Fiskville is not the only place. I think monitoring is important. How you actually organise it, I am not really an expert in that and I understand it could be potentially difficult, expensive, fraught. So, yes, sadly I do not have any suggestions there.

The CHAIR — I am not sure if you are aware of the situation in New South Wales with that Williamstown contamination — the air base. In one of the articles I was reading, I think the health department issued a notice that people should not eat the fish or eggs or drink milk in quite an extensive area around that air force base because of PFOS contamination and PFOA. Would you know why perhaps meat is not included in that? Is there a difference between eating an egg as opposed to eating the meat of an animal that is there?

Dr SENJEN — I guess it accumulates very seriously in fish, and fish being a smallish creature, it would accumulate more. I am not sure why the meat was not included, but I suspect it is because apart from ‘the dose makes the poison’, the other mantra that toxicologists have is ‘dilution is the solution’. Of course if you have a few cattle and they get all chopped up into little chops and whatnot, you have basically done a dilution. When you have just a fish, you probably eat the whole fish. Of course there have been a lot of studies, especially on fish in northern Europe, because PFOS gets into the waterways, fish eat it and then people who do not even have any PFOS near them — children in the Faroe Islands and other faraway places — end up with really quite alarming levels of these chemicals.

The CHAIR — I guess a lot of people would say, ‘There’s chemicals all around us. We’re exposed to things all of the time. It’s impossible to live in a world that has nothing that’s not good for you in it’. In terms of PFOS, PFOA, would you rank that in a particular category in comparison to other things or other toxins?

Dr SENJEN — This is where the whole POPs — persistent organic pollutants — comes in. I think there are 40 or 50 now. The big issue is that they accumulate — bioaccumulate — they do not just go away, and many of them take a very long time to leave your body. So you drink a glass of water one day, you get a little bit. You drink it again, more and more. It does not leave you. So the longer you are exposed to something the more chances are, depending on your background — and that is an important thing to consider always, the subpopulations — the more chances are you eventually will end up with something terrible. Yes, we live in a world full of chemicals, but I think after a few hundred years of chemical exposure now, we are smart enough to actually think, ‘Well, some of them we don’t actually need. We don’t need people to ingest lead, for instance’. I

was in Geneva and was horrified to find that there is still lead in paint in some countries in the world. I mean, we got rid of this long ago. I think we are smart enough to pick off the worst of the chemicals and just say no. Of course, that is what the manufacturers have done. They have realised that PFOS, PFOA, it is like asbestos. They sound fantastic, and no doubt PFOA is fantastic in Gore-Tex or a beautiful frying pan, but in the end the costs are too high, and we are talking about the human costs. You know, it is great to have a wonderful raincoat, but if it means that your children have a shorter life span or get kidney cancers, you think, 'Well, is that really worth it?'

Mr YOUNG — I guess my first question is going to be fairly blunt. What is the safe level of exposure to PFOS and PFOA?

Dr SENJEN — As I alluded, the level is dropping all the time. Just as I was coming here I looked at another paper where the level of PFOA, the EPA had a provisional health advisory of 0.4, then the trigger level in the Ohio Valley settlement was set at 0.05, then in 2014 the level was set even lower at 0.0412 parts per billion, and then there is research which actually says — and this is the Grandjean research — 'Well, actually, it should probably be at 0.001 parts per billion'. That is very small for PFOA. Then you have the problem that people are then saying, 'Oh, there's nothing wrong with our water'. That is what the EPA has done, because they did not use a sensitive enough measurement.

Toxicologists at the moment are still very much stuck on a level that is much higher, because they usually rely on ancient research from 2009. Latest research indicates that at population levels we have now, for instance, for PFOS, there are harmful effects. A safe level has to be lower, but obviously you cannot go out and say everybody in Australia is at risk, but the reality is they probably are. It just depends on how big is the risk. How many people will get sick? How many people are you willing to sacrifice? I mean, the good news is that the levels are very much lower because they have shut the factories down. The levels have actually halved in the States — they were twice as high. So that is good news. And eventually, perhaps, they will be lower and lower, but we have to be very active in stopping further use and contamination of people, and we also have to face up to the fact that I think the levels are a lot lower than we think.

Mr YOUNG — As something that may come in in the near future, and possibly sparked by this inquiry, legislators may have to determine standards and safe levels that are expected to be adhered to. I suppose statements like what you just said, 'How many people are you going to sacrifice?', do not really help in that aspect, so how would you guide legislators into making those decisions and reaching that conclusion?

Dr SENJEN — I think I would guide them by saying look at the very latest research. Do not get stuck on just the toxicologists view — actually get people from the Endocrine Society in to talk to you. There is probably no-one in Australia, I imagine; that is always the problem. There are very few toxicologists in Australia, and of course they have to protect themselves. You know, they cannot just say things that might be difficult for people. So it is probably safest to get some of the overseas experts that are true experts and cutting-edge experts and make sure that they are not compromised. So much of science nowadays is compromised, sadly, because if you want to do research, you have to get money from somewhere. That is very difficult. I know you might find it inflammatory to think about sacrificing people, but that is in the end what it boils down to — how many people will have a negative outcome because of some decision that was not quite brave enough.

It is brave to say, 'Actually, the levels are a lot lower', because there will be lots of little voices going, 'No, no, no, the evidence is not there'. There is lots of that going on, and I know when I talk with regulators they all talk amongst each other, and they have a lot of groupthink. They are wonderful people, and they are honest people, but it can be so hard to make the brave decisions. In the end I think it is up to the parliamentarians, because you are a whole step away from all that influence, to really say, 'Okay, look at the international situation'. The Stockholm convention, factories shut down, it all points in the direction of that as a big risk. When DuPont says, 'I don't think we're going to manufacture this anymore', it is like you going to a tobacco company and the tobacco company saying, 'We've decided not to do cigarettes anymore. We won't be selling them from next year on anymore'. It is like a massive admission of guilt.

Mr YOUNG — If we step back and say we are going to look at the latest scientific reports and data, and as you said that number is getting lower and lower, what happens when we get to the point where those numbers become too low to be practical, where those numbers become lower than we would find in the environment in a lot of different places? I do not know the science behind it, but I would assume it may even turn up in rainwater given just the cycle.

Dr SENJEN — They are definitely in rainwater.

Mr YOUNG — When that number gets so low that our rainwater is contaminated, and given your statement at the end of that presentation saying Fiskville should be closed forever or at least until it is remediated, how do we determine that, given that rainwater is all over the state? Your statement suggests that any place contaminated should be closed forever. Do we just close the state?

Dr SENJEN — No. What I am saying is you work on the things you can influence always, and that is why I say in my last slide: priority phase-out of all PFOS and PFOA on a national scale; label everything so that waste managers are alerted; destroy all PFOS-containing foams, do not use them anymore; and permanently close Fiskville and perhaps any other places that are there. Then you do have the evidence that over time — like in the US, once they closed the factories the levels actually fell. While you cannot ever guarantee that all PFOS will disappear from the world, if you do not add more, at least you are not enlarging the problem. You do the things you can do and over time that will help. We have not even talked about all the other chemicals, so you can imagine the problem.

Mr YOUNG — We will be here forever.

Dr SENJEN — But in the end it is not about that you are going to be here forever and then that means it is best to do nothing. It means you always do what you can to the best of your ability, and then at least at night you can go to sleep and think, ‘I have done something that made a difference’.

Ms WARD — Thank you for your presentation. It was really interesting. A number of things I have read and some of the presentations we have had at our hearings have given me a different understanding or a confused understanding, if you like, of how long it takes for PFOS or PFOA to remove itself from a human system. Do we really know how long it takes for it to leave our bodies, and can you explain to me what a half-life is — what that means?

Dr SENJEN — If I drink a glass of water with PFOA in it and I have never drunk any before, it will stay in the human body for I think it was 5.4 years. Now of course if you drink some more, the first lot goes but the next lot stays. This is what the term bioaccumulative means. Because you keep on living, the longer you live the more you get. The term half-life is basically what it says: how long does it take for half of it to disappear. That is what is so disturbing about PFOA and PFOS — that they stay in the body for such a long time. When you look at things like bisphenol A, which is another big dangerous chemical, they stay in the body for 10 days or something. I cannot quite remember, but it is relatively short — but five years.

As always, the problem is that we unfortunately live in a world where we are being drip-fed. It is not just that you take this once and that is it. It is like you are on a permanent drip — drip, drip, drip. It comes into your body. It comes from the furniture. In the case of the firefighters obviously they have more exposure, and that is why they have more in the body. That is the problem, and that is why a lot of the research is, in my eyes, not misleading but it does not model the real world, because they do not have rats there where they continuously feed them PFOS. They give them a dose and that is it, but that is not how it works in the real world.

Ms WARD — So, it would be your recommendation then for anybody living near an area like Williamsburg, like Fiskville, like Oakey, to remove themselves from it, because they will be able to eradicate a majority of PFOS from their body in time if they are not continually ingesting PFOA or PFOS?

Dr SENJEN — Yes, definitely. I would be very concerned about any residents that still have a chance of exposure through water. Look, you know, children always eat earth, unfortunately. I do not know why they do it; it is just sort of an experiment. It could be in the ground, in the soil, so children are probably our biggest worry.

I have a friend who works as a confined space sentry. She is 66. She is in the mines. And do you know why they employ her? Because she is 66, she is not going to get pregnant. They prefer older women in these jobs because even if she gets lead poisoning, she is probably going to die before that takes effect. That is sort of an interesting thought. So it is the children, I think, and the pregnant women we have to worry about the most.

Ms WARD — You alluded to this a little bit in your presentation, but I would like to stretch it out a little bit more or explore it a bit more. With the wide range of people that were used in the C8 study in West Virginia —

and you alluded to it with your conversation around toxicologists, but as I said, I would like to draw it out a bit more around what PFOS and PFOA cause — one of the things I would like to know is what were the qualifications of the scientists who conducted the study? Were they toxicologists? Did they have other experience? What was the breadth of their background that gave them the feeling that they could have a conclusive study or a conclusive result from their study?

Dr SENJEN — Do you mean the obesity study or the old one?

Ms WARD — The older one.

Dr SENJEN — From 2009?

Ms WARD — Yes.

Dr SENJEN — I think for many years our biggest problem with that study has been that basically DuPont paid for it. Unfortunately, if you get paid by a client to do something for them, you will want to at least somehow please them, even unconsciously. I am not in any way saying these were bad scientists, but there is doubt always if it is not completely free of any influence. That is why of course nowadays people have to declare a conflict of interest. There will always be doubt.

The other thing is that there were I think irregularities with the experimental design, so anybody who was retired, I believe, was not taken into the study. So these people might have been exposed but did not get sick. And there is always the question that, okay, you have 3000 people and the expected rate of cancer might be 1 in 100 000, and suddenly it is 2 in 100 000. You do not actually have 100 000 people and find that 2 of them have cancer, you only have 3000 people. So there is a lot of statistical manipulation going on.

Having trained in statistics myself, one of the things we did at university was — because I was an entomologist — look at the international journal of entomology, and we analysed every single paper for a year. Guess what? Fifty per cent of the papers were complete crap — I know it is not a technical term — because they misused statistics. So it is like, can you really trust the study?

That was 2009; it is six years later. Measurements have become refined, the whole understanding of how things work has been refined — mixture effects, EDCs. You know, did they get the cancer because they smoked or because they were exposed to PFOS or because they smoked and were exposed to PFOS? These chemicals are difficult because it is not like you drink it and you get sick; it is because you drink it and then you smoke, and maybe you have a couple of beers, you eat too much fatty food, you come from a subpopulation — maybe you are African American, or maybe you are Greek, or maybe you are Asian — and all these sorts of other factors. So it is very hard to say this is the cause, but I think, especially with PFOA, it is very clear, it has become shockingly clear, that it is cancer causing, and I think PFOS as well. Perhaps the evidence is not so strong because it is a bit Donald Rumsfeld-like: what you do not know, you do not have to worry about. If you do not look, you will never know. It is the factor that sort of tips over everything. And if we can remove these tipping point factors, suddenly it is not just about saving lives. Well, obesity, you know. How much money can we save if we have less fatter kids? How much money can we save if we have less people at the Peter MacCallum? It is about public health in the end.

Ms WARD — So how do you know conclusively that PFOA is linked to cancer?

Dr SENJEN — So how do I know?

Ms WARD — Conclusively that PFOA is linked to cancer?

Dr SENJEN — Well, the latest research, I think in animal studies, has clearly found that there is a strong connection. That is of course why the woman who got kidney cancer got \$1.6 million.

Ms WARD — Are you able to let us know what that study is?

Dr SENJEN — Yes. I have got a whole pile of extra papers on the topic, so I will send you some extra papers.

Ms WARD — Finally, one of the things I am interested in, which you have also alluded to, is this connection between PFOS and PFOA and other chemicals that you are exposed to. We know that there is a cocktail of chemicals that are found at the Fiskville site, in particular around the training PAD. How do you think this cocktail works in people?

Dr SENJEN — Sadly, cocktails are not additive, they are often synergistic, because when you, say, take a chemical, it works on a particular aspect of your body. It might work on DNA reproduction or it might work on cells or whatever. Then, when you have a synergistic effect, you might have them both working on the same thing and weakening the whole thing much faster. That would be kind of additive. But then it might work on the RNA reproduction but another aspect of the genetic activity, and then suddenly you get failures at several points. If you have a cell reproduction and you get one thing weakened, it might not lead to cancer, but if you get another thing of it weakened, then suddenly the cell goes, 'I'm going crazy, and I'm going to grow because' — whatever. so I think that is the issue. The WHO has made a statement on mixtures, and I will send that to you. It is a very difficult and new field, and as you can imagine, it is very difficult to even design the experiments to fish out what could be happening, but people are definitely waking up to it. The more we know the worse it gets.

Mr TILLEY — There are probably more questions than answers for me.

Dr SENJEN — That is good!

Mr TILLEY — As an academic with certain disciplines in your field — we always need to continue to challenge ourselves — but for the committee, on the particular subjects of PFOS and PFOA, when did your specific and particular interest start getting involved in that, and how did it come about?

Dr SENJEN — How did I get involved? We have been involved with PFOS and PFOA for a long time, and then we saw the report that you put out earlier in the year, and it described PFOS as an emergent contaminant. We were little bit upset about that because — —

Mr TILLEY — Who is 'we' Who is 'we' in, 'We became upset'?

Dr SENJEN — I became upset. Personally I thought, 'We should have got involved with that committee after all, because to describe it as emergent implies that we do not know much about it, but it is already on the Stockholm convention, and that is why NTN then wrote a letter to the committee to alert it to the fact that the term 'emergent', while it was used by the EPA, is possibly not the ideal term to use, because it really falsely characterises PFOS and PFOA as something we do not know a lot about when in fact international action has happened on this. There is nothing emergent about it. What they do at the EPA is that they use the term 'emergent' when they have not made up their mind about it, but many people have. The international community has made up their mind about it. That is how we decided to write to you and say, 'Look, there is a bit more to this, and it is a little bit not quite on the money'.

Mr TILLEY — Specifically, with the interim report from this committee, that is when you expressed your first real interest in the issue. But the committee is not only looking at PFOS and PFOA — and my colleague to the left here mentioned other chemicals at the site. Can you expand on what you may know about that side of it.

Dr SENJEN — Personally I have been involved in the whole concept of and ideas around risk management and chemicals management for about 10 years. I have a special interest in nanotechnology and nanotechnology risk management, because these are new chemicals and it is the pointy end of chemicals management. But we have also done work on other chemicals, and NTN has done a lot of work on other chemicals. It is really from that idea of risk management and how risks should and could be managed that we come to this committee. That is why I have structured the presentation in the way I have. I wanted you to get a better feeling for what world views are out there, because obviously when you are in a world view you do not talk about it. You do not talk as a toxicologist about the fact that you believe that the dose makes the poison, because it is like, that is how it is. I wanted to raise that awareness and alert you to the fact that there are different points of view and also think about, I guess, your role in that, which is really to take the expert's view and make it into something that is good policy for the state and for the people of Victoria, which is your job as representatives.

Mr TILLEY — I just want to keep our conversation going a little bit, if I may, Doctor. During your contribution you said that little is known about it, specifically PFOS and PFOA, but it is serious. I just want to

expand on that a little bit more if I may. Then you went on to speak about banning PFOS and PFOA from all consumer products. There is the issue of the subjective nature of the views of certain experts, which leads me onto the issue of litigation and the standard of proof. In a civil matter have these studies significantly reached that level on a balance of probabilities or, further, a higher standard that human consumption may cause certain things? Would a court of appropriate jurisdiction be able to have enough evidence before them to prove one way or the other, on a balance of probabilities at the lowest end?

Dr SENJEN — I think the court, which was a jury, in Ohio certainly did. This person had twice the amount that the average population has, and they clearly saw a link between her level of PFOA and her kidney cancer. Sorry if I left the impression that little is known. Actually quite a lot is known. I should correct this. A lot is known, and that is course why PFOS is listed on Stockholm and PFOA is going through the process of listing. For me personally, when the manufacturers says, ‘We’re not going to make this stuff anymore’, that is actually more powerful than scientists saying, ‘Oh, there might be a problem. We don’t know what the problem is. We have conflicting studies’. When the manufacturers says, ‘We’re out of here’, that is all I need to know or I would need to know as a policymaker, because industry does not like to let go of things.

Mr YOUNG — Would that be more because of a fear of legal repercussions rather than the actual science-based evidence?

Dr SENJEN — It is a very good question. I do not know if you have been before the Federal Court or something. I work with a patent attorney at home, and when she goes before the Federal Court and there are experts involved, experts come and they give evidence — a little bit like here — and yes, of course there is fear of litigation. But they must have thought, ‘We’re going to lose this litigation’, so at least they can go to the court with, ‘We had a feeling this was not good and we got out of there’. Once industry is pulling back from something, I think you just have to think, ‘Well’.

I know the precautionary principle has a bad name in some quarters, but I think it is important to be careful. It is as simple as that. You always have to think about the most vulnerable parts of a population, and you have to look out for them. If they are already withdrawing from production, you just have to think, ‘We’ll just do the same. We’ll just issue a thing’. That is obviously a national issue; Victoria cannot do that. We hope nationally to move away from that. Canada has done that. I cannot remember when that was, but they have already prohibited the sale and production of PFOS. It is not a hard thing to do if they are not producing any more anyway.

You will find that people like the Australian textile council would probably be on your side. I work with them, and they struggle terribly because Australia being such a small market, we have no market power to buy stuff and so they get rejects from Europe. A lot of them are chemically contaminated. You might remember the azo dye drama, which we had a couple of months ago or half a year ago, where 200 000 jeans were withdrawn from the market. Guess what? It was the textile council which made that happen, because they were very worried about what was coming into the country. Industry is actually on your side here.

Mr TILLEY — We are not at the standard where we are beyond reasonable doubt. Would it be possible to prove beyond any reasonable doubt at this stage or is it still a subjective — —

Dr SENJEN — Do you know asbestos? They have never, ever, ever proved in the lab that asbestos causes mesothelioma; never, it could not be proven. Possibly it is because they did not run the tests for long enough. In humans it takes, what, 40 years. They did not run the rat tests — how long does a rat live? — 10 years — so it could never be proven.

The idea of science is you have a hypothesis and you want to disprove it. Science can never prove anything because you come up with a new paradigm and you chuck out the old one. Science will never give you that proof, even I imagine with smoking. There is a pretty good indication that smoking causes lung cancer. Yes, we accept that. But is it proven 100 per cent? There are plenty of people who smoke until they are 90 and they never die of lung cancer. I am sorry, there is no ultimate proof.

Mr TILLEY — You certainly do not help my quest. I recall as a learning crime scene examiner going to my first post-mortem where two deceased females were on the bench. One had smoked all her life, the other had not but resided in the inner city; the other was a country girl. It still remains unanswered.

It goes to the debate on consumer products. Though you cannot compare this with the withdrawal of the product by 3M and PFOS and PFOA, but the challenge is often that there is not significant research. For example, Australia once produced and still does produce the best tallow for the purposes of glycerine and there was the palm oil debate. In consumer products there was a large debate about glycerine animal products versus palm oil from trees. Still to this day it is more of a marketing thing than it is the health implications that it has for humans. Is this far worse? The thing is probably having to get toxicologists, endocrinologists, a whole range of disciplines, being able to find a benchmark. You earlier said that the measuring devices were not sensitive enough. How do we achieve that to probably get a better benchmark? With statistics — damn statistics — you can make them sing, dance and do whatever you like, as you said earlier. In your view the statistics were misused. How do we find that balance?

Dr SENJEN — I think you look at the evidence. In my eyes, the evidence is pretty clear. The toxicologists will always say it is not enough evidence, we need more indications, because they use the wrong method to get the answer. As I explained to you, they use a method that probably will not show up a causal relationship because when biology is involved, it can be very, very difficult. I am just trying to think of an analogy — the old idea of apples and oranges. Apples are not oranges, but they are only using apples, and they do not really think that something else is going on.

I guess your difficulty is that you want a solution. You want to say, ‘At this level it is okay’. That would be wonderful if we could say that, but the health implications of persistent bioaccumulating chemicals are much more serious than glycerine versus palm oil, which is partly perhaps marketing. Maybe there is a little bit of a health impact — who knows? With a chemical like that, there are serious implications of harm to humans. We cannot prove exactly what the harm is because we cannot conduct experiments — well, we are conducting those experiments on 100 000, 2 million or 20 million people — but at the same time we cannot, so we have to just take that knowledge we have. Personally I think the evidence is overwhelming. Ultimately I do not know what the cost might be to close it down and clean it up, and people are unhappy and whatnot, but the long-term costs if you have got a health economist in to calculate your long-term costs, you actually would probably find that they are much bigger. The mixture effect is something we know little about, but again the more you can remove from the mixtures, the better it will be.

Mr TILLEY — Just one last one if I may. Putting it back in the direct context of Fiskville, the sins of the past, PFOA or PFOS, in comparison to other things that have been found, such as your benzenes, your toluenes, your other solvents and those things, we are beyond any reasonable doubt specifically when it comes to benzene that it is a serious carcinogen. In the context of Fiskville is there a higher or lower issue that you may have in relation to what has been used on the site there, from reading the report that you have picked up, that one or the other is worse? I suppose that is the best way to put it.

Dr SENJEN — I do not think I am in a position to say, but I would say that you could say that PFOS and PFOA are like the canaries in the mine. They are sort of the headlines that you can easily poke a stick at. Internationally I do not think people have stopped producing benzene, have they? It is still produced for whatever purposes, but it is clear industry has withdrawn from those chemicals because it is such a canary. Sorry I cannot give you more certainty. I would love to.

The CHAIR — I have just a couple of quick questions. I know we have kept you a bit longer than we said. First of all, just in terms of Fiskville and what Bill was saying, your knowledge of the nature of PFOS and PFOA and I guess the other chemicals like benzenes or whatever, one of the reasons in a public statement by the CFA that determined the closure, that there was a report done, and there were new areas identified where PFOS or PFOA were found to be. It was previously not realised it was going to be there, and it was also connected to some sort of water mains areas. In terms of the nature of these chemicals, can they move around, or do you not know? Do you know where they are going to go to next? In terms of that site, could we at any time from one month to another know where the chemical will be or where it is likely to go to?

Dr SENJEN — Good question. There may be research on how it moves through the ecosystem, but it is clear it does move through the ecosystem. That is of course why once it gets in the groundwater it could go. It goes anywhere. How did it get to the Faroe Islands? I do not think the people up there had any PFOA. It came through the fish. That is the big problem, the bioaccumulation and the persistence in the ecosystem. What that means is, say you have a spillage, a lot of things that spill then settle and bind to things. They just sit there for 50 years or 100 years; they never go anywhere. PFOS and PFOA do not really attach themselves to things

readily. Obviously there are methods of cleaning them up that they have developed for that to happen, but in the normal thing they just get washed out. Eventually they travel. It might take 10 years or 20 years — we do not know. I should actually have a look into that research whether there is some modelling that people have done. The biggest problem is obviously groundwater. It gets into the groundwater and eventually into the drinking water.

The CHAIR — I think in this case there is not any groundwater, but it still seems to be travelling, I suppose that is one of the questions.

Dr SENJEN — But it must travel either through the soil, lift it up somewhere else, or it must still travel through groundwater.

Ms WARD — Surface water appears to be the conduit, and the interesting thing that I have learnt is that the way that rainwater, for example, forms rivulets, they are teeny little streams of water, and they just seem to carry it across the terrain in a whole variety of directions.

Dr SENJEN — That is right.

Ms WARD — So actually pinpointing where it is and then where it is going to next is quite difficult.

Dr SENJEN — Yes. It is serious. If I might just add, the other thing that would be interesting is to actually measure some of the water with the latest measuring technologies. Because the EPA, while I am sure it is a wonderful organisation, may not have the latest fancy equipment. They might have said, ‘Yes, everything is good’, but if they have not had the latest technology that can measure to very small quantities, you do not actually know what is there.

The CHAIR — Is that what you referred to earlier in terms of the American experience?

Dr SENJEN — Yes.

The CHAIR — Do you know what that technology is?

Dr SENJEN — Yes, I think I have highlighted it in this little report I have from an NGO in the States.

The CHAIR — Do we have that report?

Dr SENJEN — Yes.

The CHAIR — Do you mind just saying what it is for Hansard?

Dr SENJEN — The EWG, the Environmental Working Group, put out a report called *Teflon Chemical Harmful at Smallest Doses*, which basically summarised a whole lot of research on PFOA and water. One of the things they mention in here is that New Jersey used a different testing method — I do not see what the testing method is, but I can find out — which then measured PFOS to much lower — it was much more sensitive, so much lower levels. Of course if you are a toxicologist, you go, ‘We don’t care if it’s that low because it doesn’t matter’. If you are an endocrinologist, you say, ‘Oh my God, it’s so low; that is at a level that is really going to bind to hormone receptors and throw out your hormones’. It very much depends on your view. But I will look up for you the different technologies and then you can ask the EPA which one they have used. That will be interesting.

The CHAIR — You were saying that you work with regulators sometimes. Did I hear you correctly — that you do some work with regulators?

Dr SENJEN — The NICNAS and various technical groups, and because I worked a lot in the nanotechnology area I was invited numerous times to speak at EU regulator conferences where various views were put forward. In the EU it is very common for regulators to get industry, NGOs and experts together to discuss how things should be done and multistakeholder approaches. I was in very close contact with the regulators then, as are my colleagues in Brussels. They go and visit them almost on a weekly basis, as everyone does in Brussels — it is a huge industry of people visiting regulators.

The CHAIR — Have you ever had any contact with the Victorian EPA?

Dr SENJEN — No.

The CHAIR — Have they ever been in attendance at any of the conferences you have gone to — to find out more?

Dr SENJEN — No. I am unblemished.

Ms WARD — Following on from Bronwyn's comments about the Victorian EPA, on their fact sheet for perfluorinated chemicals they say:

There is limited evidence about the health effects on humans from PFOS and other PFCs. There have been numerous studies on animals. However, the link between the effects of PFCs on animals and how that relates to human health is not yet clear.

Do you have any comments to make on that?

Dr SENJEN — It is clearly written by a toxicologist, because if you have a toxicologist's point of view of course you do not find any effects; that is the whole point I am trying to make. It is like you have a piece of fruit and you peel it, and you peel it as if it was an apple and you find an apple. But if you think it is an orange, you have a different way of peeling it and you get an orange. That is what is happening with PFOS and PFOA. I apologise for making such a silly example, but a lot of the time, as I said earlier, if you have pregnant rats and you give them PFOA or PFOS, rats clear the stuff much faster, so you do not see any effects. But if you give it to a human pregnant person, then you would see effects.

I think that is our biggest problem — that we are experiencing a huge paradigm shift in the way chemicals are assessed and thought about. On an international level people have caught up with it. So the WHO goes, 'EDC is a big problem; mixture effects are a big problem'. Stockholm says, 'PFOS bad; PFOA bad', and so forth, and industry says, 'We're out of here'. But on a national level, or even a regional level like Victoria, people simply have not caught up with it. It is too scary.

Ms WARD — One of the things I am finding challenging to reconcile is that we have statements around, 'There's limited evidence; we don't quite know what it can do. We think it's okay but we're not sure'. You have people who are saying, 'Anywhere up to 10 000 micrograms is okay' or, 'Anywhere up to 2000 micrograms is okay'. Yet we are regulating it to say that you can only have 0.2 per cent of a microgram in water — that that is safe. I cannot reconcile such low levels in drinking water yet say that such high levels in the human system are okay.

Dr SENJEN — I cannot reconcile it either. It is puzzling, isn't it? I think what has happened is that you are a toxicologist and somebody says, 'I want you to write a report on this', and so you look at the literature. And you look at the literature from 2009 or 2006 because you want to see what happens to the workers, and you think, 'Oh well, everything is okay. The dose makes the poison and these guys ingested all this stuff and they were fine', and so you write your report. The challenge is to take on the new paradigm and actually go, 'Hmm, that was then. What is the latest research? Can we trust that old stuff?'. I think a lot of people just do not do that. It is too challenging, I think, to actually revise your opinion on something.

The CHAIR — Thanks for being here for so much longer than we asked. There may be some other questions that we have. Is it okay if we send them to you and perhaps follow up on any of the issues we spoke about today?

Dr SENJEN — Yes, absolutely.

The CHAIR — Just one thing for the record that Bill reminded me of. I think, Vicki, you quoted out of a document. We should just make mention of that for Hansard.

Ms WARD — I did — the EPA fact sheet on perfluorinated chemicals.

The CHAIR — Is that the one you were talking about, Bill?

Mr TILLEY — Just the author, yes.

Ms WARD — It is the EPA.

The CHAIR — It is a health sheet, sorry. We are confusing ourselves. Thank you very much.

Dr SENJEN — Thank you for your time.

Witness withdrew.