Minutes of public meeting of the PFAS Scientific Advisory Panel on Teams
10.00 – 11.30 am on Friday 7th July 2023

Panel Members present:	Dr Steve Hajioff – Independent Chair Dr Tony Fletcher – PFAS and Health member Prof Ian Cousins – PFAS and Environment member
Subject Matter Experts present:	Dr Roger Klein, PFAS Expert, Chemist and Medic Professor Kristina Jakobson, University of Gothenburg Professor Jon Martin, Stockholm University
In attendance:	Grace Norman – Deputy Director Public Health Plus support staff

Welcome:

The Chair welcomed everyone to the Panel meeting in public, and reminded people the meeting is being recorded. A recording of the meeting is available upon request via the publichealth@gov.je mailbox. There is a slight delay in the recording being available as appropriate checks are made to ensure anonymity of the observers attending.

The Chair recapped in the meeting that the Panel would be producing a series of five reports:

- The first report is interim report on feasibility of therapeutic phlebotomy as a way of lowering PFAS levels in the body
- 2nd report – more detailed, on health effects of PFAS
- 3rd report – more detailed, and will look at all potential treatments for PFAS, as well as looking at other interventions and testing
- 4th report – environmental interventions, how to help manage PFAS in environment
- 5th report – update to first 4 reports, and any further information and evidence available and any changes locally.

Introductions:

The Chair and Panel members introduced themselves and, being mindful that not all of the meeting observers would necessarily have been at the first meeting, gave a summary of their experience and expertise:

Steve Hajioff, Panel Chair – background as a physician and a retired Director of Public Health in an area of London with two major international airports and a variety of other environmental challenges.

Tony Fletcher, Panel Member - Epidemiologist and member of the panel with experience of studies on the health effects of PFAS in West Virginia in the United States, in the Veneto region, in Italy, and in Ronneby, Sweden.

Ian Cousins, Panel Member - Professor at Stockholm University, an expert on PFAS, appointed as the environmental expert on this Panel and whose expertise on PFAS is on the sources, transport, fate, and human exposure of PFAS.

Grace Norman, Deputy Director of Public Health for the Government of Jersey, the Commissioner for this work, and a standing observer at these meetings. The Chair confirmed he was happy for Grace to participate in the Q&A as it will give sufficient breadth of answers to support writing of the report, but this will not compromise the independence of the report.

Support staff, for administration and minute taking, were also in attendance.

The Chair also welcomed subject matter experts to today's meeting, and asked them to introduce themselves:

Professor Kristina Jakobsson, University of Gothenburg:
Physician Specialist in Occupational and Environmental Medicine and got involved in the Ronneby case almost 10 years ago as a clinician, as a health adviser to the Municipality from the healthcare system, exploring health effects of PFAS, and became a PFAS researcher exploring the health effects for the Municipality.

Professor Jonathan Martin, Stockholm University:
Professor at Stockholm University, working on PFAS since 2000, focuses on environmental analytical chemistry, and is a content matter expert in terms of environmental sources, the fate, and effects of PFAS.

Dr Roger A Klein, PFAS expert, Chemist and Medic:
Physical Chemist and Medic, working on PFAS for many years. Worked for over 50 years with the fire service and since 2000 in transitioning from fluorine containing firefighting foams to fluorine free firefighting foams and the environmental consequences and has been involved in a number of large legal cases.

Declarations of Interest:
None.

Minutes of last meeting:
The minutes of the last meeting were taken as read and agreed, with no matters arising.

Actions from the last meeting were agreed at a private meeting after the public meeting, as follows:

- Literature review on phlebotomy led by Tony and Ian
- Descriptive writing on the structure and components of a clinical study by the Chair
- Review of risks to individual of phlebotomy – informational piece by the Chair

All three actions are currently in progress, and it is important not to finalise the first and third actions until after this meeting, as additional issues might be identified. However further information regarding this will be available at the next public meeting on 4th August.

Discussion
The Chair invited subject matter expert guests to present to the meeting, to inform the interim report 1 on therapeutic phlebotomy.

Professor Jakobsson shared a presentation titled “Ronneby PFAS Research Program – Lessons learnt from clinical experience and research in Occupational & Environmental Medicine.”

Summary notes from the presentation:

- No information on phlebotomy as this was not considered as an intervention;
- Ronneby is a small municipality in the very South of Sweden, with a military airport that used PFOS since the mid-1980s;
- The pollution of PFAS was discovered during the autumn of 2013 in the area of one of the two Water Works in the municipality, which was highly contaminated by PFAS;
- The municipality immediately switched to the other water works, and everyone was provided with clean drinking water;
- About a third of the households had been highly exposed to contaminated water for decades;
- The airport was in the middle of a large ground water reservoir, just a couple of kilometres from the main airport, the levels of PFAS in outgoing drinking water from the contaminated water works was high, with more than 10,000 nanograms per litre at that time;
- The other municipality was minimally contaminated, with around 59 nanograms per litre at that time.

This initiated a lot of local actions from all areas of the municipality, including the healthcare system, it raised national interest, and a Commission of Enquiry was set up.

At the regional clinic, a pilot investigation of PFAS levels in serum in school children found high levels, so it was decided that there was a need for open serum samplings in the community free of charge, in order to have a better monitoring of the exposure situation. The sampling included 3,500 people over 2 years. During this time, there was a lot of communication with the inhabitants in the municipality, and health and public health were kept informed.

While the background levels outside this municipality were about the same as background levels elsewhere in Sweden, it was found that those with high exposure and especially those living in the municipality during that time had very high levels with medians around 250, but outliers about 1800 nanograms per litre. Quite a lot of people had PFAS levels of 600 nanograms per litre and about similar for the hexane sulphonate, but much lower for PFOA. It was noted that those who had left the area with contaminated water had lower levels. No exact information was available from the general population, as water is drunk in many different places, such as work, visiting friends and relatives in other areas.

Health effects:
There have been lots of epidemiological studies, mostly in background exposure ranges, looking at diseases, functional changes that are risk factors for disease, or functional changes happening in the body. There is a wealth of different health outcomes that have been studied.

Strengthening evidence has been found for PFAS and causal effects regarding kidney cancer, testicular cancer, cholesterol, but weakening evidence for PFAS and causal effects regarding breast cancer, prostate cancer, pregnancy complication or thyroid disease.

Summary of risk at group level:
Large scale group evaluations and 10 years of research clearly shows that on the individual level it is not likely that specific disease could be attributed to exposure. Their work also did not show a linear dose-response at higher PFAS levels.
Working within clinical contexts, there is surety that the specific levels of PFOS in the body of the person cannot predict the risk of disease for that individual. There are no clear links. Research focus is now on early life effects, and whether pregnant women can pass on PFAS to future generations. There are no restrictive recommendations on breastfeeding, and there is an argument that the benefits of breastfeeding might be even more beneficial for a child with prenatal PFOS exposure.

The Chair thanked Professor Jakobsson for her presentation.

Professor Martin shared a presentation with the meeting titled “Phlebotomy Treatment for Elimination of Perfluoroalkyl Acids in a Highly Exposed Family: A Retrospective Case-Series.” He invited anyone who wished to contact him for further information to e-mail him at jon.martin@aces.su.se

Professor Martin explained this was a case study of a highly exposed family in Canada that was discovered by a colleague of his Stephen Genuis, an environmental health clinician, who has been really interested in environmental exposures. He routinely asked his patients about their work history or their life history and would send plasma samples out for testing for environmental contaminants. He discovered a family of six with high exposure to PFOA, PFOS and PFHxS, and began an intervention study, the results communicated in this paper have been collated using the data from the study.

Background:
This was a family of six people, the father who is 52, the mother who is 48, a son who is 23, a son who is 21, a daughter who is 18, a son who is 17 and a son who is 15.

The mother and father had their first son in 1985, a second son in 1987, and then they moved into a new house in 1989 and had three more children in that house. Because the house had a lot of carpeting, they thought it was a good idea to treat those carpets with 3M Scotchgard formulations, which was a stain repellent you could hire companies to come in and treat the carpet in your home. They did that five years in a row when the house was quite new. They paused for about five years and then did more applications, the last ones in 2007 and in 2008. This is when the biological sampling was first done, and it was discovered they had quite high levels. The youngest children, had the highest levels of exposure, and the reason that they have the higher level of exposure is that when they were born, they were crawling around on the carpet in their home, when it had been treated with Scotchgard and they probably ingested more dust or had more hand to mouth activity and got more of it in their body.

They stopped treating their carpets with Scotchgard, replacing carpets with hardwood, and renovating to increase ventilation in their home, to make the air cleaner. They started phlebotomy in 2009.

Summary of results/conclusions:

- There was a 4-year intervention period.
- Intermittent phlebotomy at rate similar to blood donation services appears safe and effective to facilitate removal of PFHxS, PFOS, and possibly PFOA.
- None of the participants described any ill effects of the phlebotomy.
- Weaker effect for PFOA may be real, or because levels were closer to background levels.
- Clinical judgement in conjunction with informed patient consent should be used when considering interventions to facilitate removal of PFAAs.
- They did not completely eliminate the exposure.
- In 2008 a vacuum dust sample taken from the house showed really high levels of PFAS PHOA and PHFxS.
- In 2012, the vacuum dust sample was taken again and showed the PFAS's were still there, but they were nine to tenfold lower.
- PFHxS, PFOS and PFAS all had relatively long biological half-lives. If you remove the exposure entirely, you would expect half of PFHxS to be eliminated in 8 to 9 years, PFOS to be 5 years and 3.8 years for PFOA.
- The body burden of PFAS was mostly in the blood, so the volume of distribution was such that if you did remove blood, you would actually remove a significant fraction of the body burden.
- To balance some of the risks of phlebotomy a mineral supplement was taken.
- The Canadian Blood services prescribed no more than 500 millilitres of blood be withdrawn every 56 days, and the family were under that, so this is a schedule that is quite a reasonable schedule if you are a regular blood donor.

Limitations to this study

- It is a small study.
- The participants are all from one family, so it is difficult to generalise or compare to broader populations or other populations.
- There were no experimental controls because it wasn't an experiment.
  There was a comparator group from another study who were older people with historical occupation exposure, but there was concern that they were not an ideal comparator.
- The results may look quite different with a different comparator group.

The Chair thanked Professor Martin for his presentation.

Dr Klein gave a presentation titled "Effect of Plasma and Blood Donations on levels of Perfluoroalkyl and Polyfluoroalkyl Substances in Firefighters in Australia."

This was a randomised clinical trial of firefighters in Victoria, Australia, with complete ethical approval. It was a fairly limited study, but it does align with what would you have just seen from the Canadian family study. The point of the study was to look at whether blood donations or plasma donations were effective as a means of reducing PFAS levels in the blood.

The background to this was a population of about 600 firefighters that had been tested for PFAS and two-thirds of those firefighters were over 29 nanograms per millilitre. The significance of this is that 29 nanograms per millilitre PFOS is the so called HBM 2 level established by the Human Biomonitoring Commission of the German Federal Environment Agency as the level at which some form of intervention is deemed necessary. Some of the firefighters had blood levels of PFOS of 1400 nanograms per millilitre, and two-thirds of the entire cohort were above HBM 2.

It is important to note the difference between PFOS and PFHxS is not as simple as it sounds.
Commercial PFOS, as was present in Scotchgard treatments or in firefighting foams, always had about 5 to 8% in purity of PFHxS, so if you were exposed to what you thought was PFOS, you were also being exposed to be PFHXs, and possibly others.

With water drinking levels, PFOA is defined as less toxic than PFOS, but the reverse is true. If there are higher levels, there is a noticeable risk. PFHxS and PFOS decay at different times, so over a 30-year period some levels will remain higher.

If you are looking at interventions for reducing blood levels, it's a question of triage. Realistically, it should be done if it is between HBM1 and HBM 2 levels.
They need to look at the mode of exposure and reduce exposure as much as possible.

The publications from the German Federal Environment Agency are available in English for information.

Within the last three or four years, just before the pandemic, the UN Stockholm Convention, Persistent Organic Pollutants Review Committee classified PFAS, PFOS and PFOA as persistent organic pollutants. The general conclusions were that PFHxS were considerably more toxic than PFOS.
The problem is that if you have been exposed to PFOS, let's say from firefighting foam or the use of Scotchgard, you will also have been exposed to PFHxS.

Phlebotomy does have a role to play, however, plasma donation is potentially more effective. One of the issues is how often you can take blood and who from. Guidelines for blood donation say over 50 kg in weight, and aged 17-65 which will exclude teenagers, children, and many women.

The chair noted plasma donation will form part of report 3, but for the purposes of this report, we are only looking at therapeutic phlebotomy.

The clinical randomised study involved the regular taking of blood by phlebotomy and the taking of plasma at regular intervals, and then the 3 groups were sampled at the end of the first year. The data is fairly limited as was this was a fairly small study with financial constraints. Each group, 1) the control group, 2) the Blood Donation group, and 3) the Plasma Donation Group had just under 100 participants.
What we see is with PFOS there is a fairly small drop in the blood donation group and the same is true of PFHxS, which is barely significant. However, plasma donation is more effective.
One question addressed in the study - what happens when you stopped blood donation or plasma donation? What we saw was a small uptake in the blood levels.

The Chair thanked Dr Klein for his presentation.

Question and Answer summary

A question-and-answer session then followed, summary points to note:

- Different studies show different elimination levels;
- There can be a huge difference in removal rates for individuals;
- Difficult to statistically prove the success of phlebotomy;
- Cannot explain the majority of differences in individuals, for example, women lose blood through menstruation and childbirth, and there are other unknown elements;
- No issues raised with phlebotomy generally;
- A question of contaminated bore hole water, dilution and trigger levels globally was raised. In Jersey, there has been confirmation from Jersey Water that bore holes in the effect area are not currently feeding the mains water supply.

Summary of actions

- To pull together the content of the discussion and presentations and use it to develop the report and to feedback at next meeting on 4 August.
- To feedback on the 3 reviews at the next meeting: 1) literature review on phlebotomy, 2) a written piece on the structure of a clinical study and 3) a review of risks to individuals to giving blood.

The next meeting is scheduled for 4 August.

The Chair thanked everyone for attending the meeting and reminded anyone with any comments or queries to e-mail the Public Health mailbox publichealth@gov.je and they will be brought to the chairs attention.

There being no further business, the meeting was closed.