Minutes of public meeting of the PFAS Scientific Advisory Panel on Teams

10:00am on 7 November 2024

Panel Members present:	Dr Steve Hajioff – Independent Chair
	Dr Tony Fletcher – PFAS and Health member
	Professor Ian Cousins – PFAS and Environment member
In attendance:	Julia Head – Senior Public Health Officer
	Grace Norman – Deputy Director of Public Health
	Programme support team from I&E

Welcome:

The Chair welcomed everyone to the Panel meeting, and reminded people the meeting was being recorded.

Introductions

The Chair and Panel members introduced themselves.

Dr Steve Hajioff, Independent Panel Chair: A background as a GP for 25 years and a retired Director of Public Health from an area of London with two major international airports and a variety of other environmental hazards and challenges. Not a PFAS expert but has done lots of work with National Institute of Care Excellence and other groups about translating science into policy. Dr Hajioff has also worked a lot in the pharmaceutical industry.

Dr Tony Fletcher, PFAS and Health Panel Member: Environmental Epidemiologist at the London School of Hygiene and Tropical Medicine, working on PFAS since 2006 and member of the panel with experience of epidemiological studies on the health effects of PFAS in contaminated communities in West Virginia in the United States, in the Veneto region, in Italy, and in Ronneby, and is the health expert on the panel.

Professor Ian Cousins, PFAS and Environment Panel Member: A Professor in Environmental Chemistry 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 exposure of PFAS.

Standing observer Grace Norman, Deputy Director of Public Health is present. Grace commissioned the panel on behalf of Government of Jersey. Support staff for programme management and administration were also in attendance.

Declarations of Interest

No additional declarations.

Minutes of last meeting and matters arising

There were no minutes from the previous meeting to discuss due to the August, September and October meetings containing inputs from Experts by Experience and Subject Matter Experts. This requires additional review by the experts prior to minutes being discussed in the meeting. Dr Hajioff apologised for the delay.

Additional findings since the last meeting

Dr Fletcher explained that Prof. Ian Cousins had organised a letter, signed by over 50 scientists including himself, which has been sent to the British Government urging them to regulate PFAS more strictly. This letter received media attention and was mentioned in the House of Commons. Dr Hajioff provided reassurance that the panel had previously discussed the ethical implications of participating in such advocacy, concluding it was appropriate for the experts to be involved and not a conflict of interest for their Jersey roles. The letter can be found at this link - PFAS letter from global academics to UK ministers_2024.pdf

Prof Cousins mentioned an interesting study where a German researcher dosed themselves with stable isotope-labelled PFAS for over a year. The study provided valuable data on human pharmacokinetics, despite being limited to one individual. It raised ethical and scientific discussions. Dr Fletcher added that the researcher did not need ethical approval for self-dosing and has since received approval to dose a dozen volunteers. Dr Hajioff noted that such self-dosing would not receive ethical approval in the UK due to different medical regulations. The study raises interesting questions and provides useful data, but more extensive research is needed for broader conclusions to be drawn.

Agenda item 5 – Dr Fletcher – Interventions literature review

Dr Fletcher has summarised the literature of interventions which reduce body burden of PFAS. There are three types of studies:

1. Observational studies
2. Interventions without control group
3. Interventions with control group comparison

Dr Hajioff reminded observers that the different types of study design have been summarised in Report 2. Dr Fletcher explained he has also briefly summarised them in the current paper.

Diet interventions

There have been several studies showing differences in PFAS levels related to diet.

- High fibre foods appear to have an impact on the elimination of some PFAS compounds, resulting in lower serum levels of these compounds.
- Probiotics to help have a healthy gut also appear to have an impact on some PFAS compounds.

Dr Fletcher took the Panel through his report including a table detailing the extra reductions over 3 months for PFOS, PFOA and PFHxS for diet and probiotics in addition to the reduction due to natural half life. Dr Fletcher explained the mathematical calculation used to compare excretion of PFOS using half life, and presented a graph showing that there is an additional 9% reduction of PFAS levels in people who consume a high fibre diet. This increase in PFAS excretion suggests that a high fibre diet could result in a reduction of 14 weeks over 20 years, in the time taken for PFAS levels to reach background. which is a modest difference. PFOS is the compound where the reduction appears to be most rapid.

Dr Fletcher explained the effect of medication including probenecid, bile acid sequestrants and statins on PFAS levels.

Probenecid

Evidence suggests that for Probenecid, which affects kidney uptake and reabsorption, had no effect on PFAS levels, but the bile acid sequestrant cholestyramine appears to show a dramatic effect on PFOS levels in studies in the C8 population and the general NHANES US population. Dr Fletcher displayed the effect of bile acid sequestrants on PFOS and PFOA in a graph which showed that the excretion rate is substantially faster than the effect caused by a high fibre diet. Statins had an inverse effect, meaning that people taking statins had a higher level of PFOS but it was not a statistically significant effect.

Dr Fletcher described a study which looked at probenecid in the population in Ronneby and showed no effects.

Bile acid sequestrants

Dr Fletcher described a study by Genuis *et al*. where bile acid sequestrants were used in a high PFAS exposure family and demonstrated a rapid excretion of PFAS following cholestyramine administration.

A clinical trial in Denmark was described where participants were randomised into observation groups and bile acid sequestrants treatment for 12 weeks. Participants had increased levels of PFOS, PFOA and PFHxS due to eating contaminated meat. This is a randomised study with controls in place, so this is a strong study design. There was a dramatic reduction of PFOS in particular in a 12 week intervention period.

Plasma interventions

An intervention study with control groups in Australian firefighters was conducted where participants were either given phlebotomy or plasma exchange. This study has been summarised already in Report 1. The fall in serum levels from phlebotomy varied from 2.4% for PFOS, 3.9% for PFHxS and 5.8% for PFOA, however this figure for the benefit on PFOA was very imprecisely estimated due to concentrations being low in the participants. The plasma removal procedure study showed the benefit (reduction of PFAS levels in serum) varies between 2 – 7%. An average of 4% reduction in PFAS levels was determined in Report 1 with some uncertainty.

Comparison of interventions

A table has been prepared to display the percentage reduction in PFAS serum levels over a period of 3 months, looking at all interventions which have data, including an option for doing nothing.

Option	Source of data	PFHxS	PFOS	PFOA
Do nothing	Ronneby half life study	3	4	5
Phlebotomy 1.5 procedure	Average impact of 4% per procedure	6	6	6
Plasma removal 3 procedures	"	12	12	12
Probenecid drug use	Ducatman study	0	0	0
Bile acid sequestrants drug use	Moller study	15	60	20
High fibre diet	Nhanes study	0	0.5	0.3
Probiotic supplements	Nhanes study	0	0.6	0.4

Dr Hajioff commented that haemodialysis is not included in this table, because it was considered as a theoretical intervention but no evidence was found in the literature. Dr Hajioff will present on this technique in next month's meeting. Dr Fletcher commented that there was a paper from Taiwan on haemodialysis which he will add to the discussion but that it will not change the conclusions.

The panel commented that preliminary results from ongoing studies described by Dr Andersson in September's panel meeting are consistent with these findings.

Agenda item 6 – Testing and retesting – Prof Ian Cousins

Prof Cousins presented the findings of systematic reviews (or a review of reviews approach) which is a well-established and reliable methodology in healthcare research. It is an efficient and appropriate method for summarising extensive literature within a limited timeframe. Large reviews have been conducted on PFAS testing in general and elevated exposure populations.

Reviews and studies were divided into categories based on exposure levels and types. Studies focused on populations near fluoropolymer manufacturing sites such as the Teflon factory in the US and 3M manufacturing plants. Other places of contamination include in North Carolina, Antwerp and the Veneto region in Italy. Separate studies on places experiencing AFFF contamination near airports and military bases such as in the US, Ronneby in Sweden and Australia were used. There is also an exposure in Denmark from consuming contaminated cows which is a more indirect exposure profile, but still covered. Prof Cousins has focused on PFOS, PFOA and PFHxS as these are the most relevant PFAS compounds for Jersey.

Prof Cousins explained that most studies that involved human testing aimed to understand exposure levels, how to mitigate the exposure and whether contamination levels are reducing, rather than being conducted for clinical management of patients. Most focused solely on exposure levels, however some studies included health information. Unlike Jersey, most studies have not asked participants about symptoms, and instead they include a large number of volunteers living in the area of interest and determine the levels in the population.

Prof Cousins reminded the panel that they had heard from subject matter experts in Sweden and Denmark who specifically do not recommend doing any re-testing of individuals, as there is no agreed follow up with the information. Health outcomes cannot be determined by the serum level on an individual level. Dr Hajioff agreed, and commented that this will be further discussed by the panel in the next meeting when discussing Dr Fletcher's thoughts on body burden of PFAS and disease risk.

Prof Cousins described the studies available in Australia, Sweden, Germany and the US, and concluded that the levels in the general population are remarkably similar, with the exception of Asia which has higher levels due to ongoing manufacture of PFOA and PFOS. The highest known exposures in the world are in fishermen in China consuming fish contaminated with PFOS. Dr Hajioff asked Prof Cousins to include the levels from different studies in this paper so that Islanders can compare their own levels with those from around the world.

Prof Cousins indicated that there are many occupational sources of exposure to PFAS, and that firefighting exposure has been determined to be the focus of this paper. Firefighting foam in Australia changed formulation away from long chain PFAS in 2005, so firefighters joining the service since then would have levels more similar to background levels than those who historically used the long chain PFAS AFFF.

Prof Cousins finished by summarising the evidence he had found regarding re-testing, indicating that the consensus from around the world is that retesting should not be conducted unless it is known how to interpret the data, and there are clear outcomes from the knowledge. Most testing around the world is conducted for research and epidemiological purposes, not for clinical management. Dr Hajioff agreed and reiterated that there is not clear evidence linking individual levels in blood and health effects.

Dr Hajioff thanked Prof Cousins for the paper, which will be very useful in the Panel's deliberations.

Prof Cousins added that many of the studies he has summarised had a reference population nearby in order to compare to the contaminated population. He thought that it would be useful to do this in Jersey as well. Dr Hajioff agreed and reminded the panel that one of the recommendations in Report 1 was to generate a baseline population level of PFAS. It has not yet been put in place, and the panel may recommend this study is conducted again in Report 3, as it would be very useful information for the panel.

Dr Fletcher commented that when testing, some studies informed participants of their results and some participants were not informed due to the fact the results cannot be interpreted on an individual basis.

Dr Fletcher agreed with Prof Cousins when he noted that the ATSDR gathered measurements but not health data as it was a scoping study. He informed the panel that there is a second phase underway at the moment, a new study which is gathering health data including cholesterol and immune markers and specific clinical markers to look at associations. This will be useful in the future.

Dr Fletcher also commented on the Italian study which offered everyone living in the contaminated area (100,000 people) a test which included clinical markers such as PSA (for assessing prostate health) and cholesterol, and results were given to everyone who participated. This was done because it was thought to be a public health benefit to screen the population which might pick out health conditions in which they could offer interventions. Some age groups have been offered further testing. There is a study looking at rates of decline to estimated half lives, and another to look at correlating changes in PFAS and cholesterol to see if there is a recovery to normal levels of serum cholesterol. Dr Hajioff asked Dr Fletcher to expand on this information in the next meeting in December.

Dr Hajioff thanked Prof Cousins and commented that this paper will be very useful in future discussions.

Agenda item 7 – Plasma removal – Dr Hajioff

Dr Hajioff presented a short paper which provided detail about the different types of blood plasma treatments that are used in medical practice. Plasma is the part of the blood that contains white blood cells, platelets, antibodies and proteins to transport other components such as iron around the body so it could be a good option for reducing PFAS.

Different types of blood plasma treatments were explained:

- Altruistic plasma donation is conducted once a month for the benefit of others who may not be able to remake their own plasma. It requires an apheresis machine to extract the plasma from whole blood and returns the rest of the blood to the body.
- Plasmapheresis also uses the apheresis machine, but the plasma is also treated to remove a contaminant from the plasma and then the plasma and blood is put back into the body. The contaminant must be able to bind to a substrate in order for the contaminant to be removed, and PFAS does not bind to substrates, so it is not expected that plasmapheresis would be effective for lowering body burden of PFAS.
- Plasma exchange is where plasma is taken out and another substance is put back into the body, which could be other people's plasma, colloid solutions or albumin. As the plasma is discarded, this technique could be more suitable for PFAS removal. However, donor plasma could not be used to replace the plasma removed, as this is a precious and finite resource which needs to be protected for medical emergencies. As plasma contains immune function and clotting factors, if this technique is conducted too regularly then it would be unhealthy for the participant.

Dr Fletcher asked if these techniques could be conducted in a medium sized hospital or whether it is a specialised service. Dr Hajioff confirmed it is an unusual technology and is usually conducted in specialised suites in a large hospital. It is not a portable technology, and treatments are required to be carried out in hospital in a sterile environment.

Agenda item 8 – risks, benefits and costs of each intervention – Dr Hajioff

Dr Hajioff presented papers on the risks, benefits and costs of the following interventions:

- Plasma removal
- Bile acid sequestrants
- Probenecid
- Psyllium husk supplement

The papers are attached to the minutes. There is more information in the papers than included in the minutes.

A similar paper will be available about haemodialysis but it is not yet ready for discussion. It will be discussed in the next meeting for completeness, however there is no evidence that haemodialysis works to reduce PFAS body burden at present. He reminded the panel that phlebotomy is not being considered in this section as it has already been reviewed in Report 1.

Plasma removal

Dr Hajioff presented the paper on plasma removal and described the procedure, eligibility criteria, common side effects, rare but serious complications, and long term safety considerations.

Grace asked about the frequency of one of the potential complications, the reduction in immunoglobulin levels in patients. Dr Hajioff replied that it was quite rare, but that it depends on the procedure being used. If the procedure is completed at high frequency and replacing the plasma with a substitute rather than plasma is conducted, then the likelihood of a reduction in immunoglobulin levels in patients increases.

Dr Fletcher asked how long the procedure takes. Dr Hajioff estimated approximately 1 hour, although does not have recent experience with the techniques.

Dr Hajioff moved on to detail the capital and revenue requirements for establishing and running the plasma donation service, including equipment and personnel, maintenance and regulatory compliance. He reiterated that there are sizable equipment and personnel requirements and the necessity of conducting the procedure in hospital. He noted that the costs in this paper do not include on-costs and so are systematic under-estimates of the actual costs, and estimated that the first year costs would be approximately £300,000, and around £250,000 for every year beyond the first year.

Bile acid sequestrants

Dr Hajioff presented a paper on bile acid sequestrants including information on Cholestyramine, Colestipol and Colesevelam. This class of drug was regularly used to treat high cholesterol for many years, prior to newer drugs such as statins or ezetimibe being available. They work by binding bile acids in the gut which prevents cholesterol from being absorbed. The side effects were described, including a comparative analysis of side effects and tolerability of each compound.

Dr Hajioff commented that there are dual benefits from using this class of compounds, as they work to prevent PFAS from being absorbed, and also work to lower cholesterol which is one of the potential adverse health effects of PFAS. There are also potential effects on the control of blood sugar and Colesevelam has been used in patients with type 2 diabetes. However, there is also the potential to prevent absorption of compounds such as vitamin A, vitamin D, vitamin E, vitamin K, folate and others, which can lead to malnutrition disorders.

The tolerability of cholestyramine is poor as it is unpalatable to consume and consequently adherence to treatment is often poor, however bile acid sequestrants in capsule form are better tolerated, particularly colesevelam, and are expected to result in improved adherence to treatment.

Dr Fletcher commented that the amount taken per day is very different for each of the bile acid sequestrants and asked why. Dr Hajioff replied that they are three different molecules and so act in slightly different ways.

The capital and revenue requirements were covered for each compound. Colesevelam in tablet form is the most expensive option at £730.20 annual cost and Cholestyramine is the cheapest at £350.40 per person per annum.

Probenecid

Dr Hajioff commented that as Dr Fletcher had already demonstrated that probenecid is not effective in PFAS removal, the panel should not spend a large amount of time on this option. Dr Hajioff presented the side effects and capital costs, explaining that as probenecid is an unlicenced medicine, it no longer has a list price in the UK. It was estimated to cost £800 per patient per year.

Psyllium husk supplement

Psyllium husk is a soluble fibre commonly used as a dietary supplement, used for laxative purposes in various gastrointestinal conditions. Dietary fibre has been associated with beneficial effects on cholesterol levels and glycaemic control. Dr Hajioff commented that the evidence presented for dietary fibre is from the diet, and the panel do not have evidence of the effectiveness of fibre supplements at reducing PFAS levels.

Dr Hajioff spoke regarding the side effects and capital and revenue requirements for psyllium husk supplementation intervention to reduce PFAS body burden. There are three options for administering this intervention, generic powder, branded powder and capsules, with costs ranging from £30.66 to £434.13 per patient per year.

Dr Fletcher commented that there is no literature directly on the impact of psyllium fibre gel on PFAS levels. He commented that in one study he reviewed, the researchers investigated a fibrous plant product and found no effect. This may have been because this population had previously used cholestyramine to reduce their PFAS levels, and so it was not a fair test of the effectiveness in populations with high levels of PFAS. There is no other literature on psyllium husk interventions, however the panel are aware that a study on psyllium husk in Denmark has received funding but has not yet commenced.

Dr Fletcher proposed that the panel consider including a recommendation about increasing the amount of fibre in the diet rather than using fibre supplements in a medical manner. Dr Hajioff agreed, and indicated that recommendations will be discussed further in the meeting in January. Dr Fletcher proposed that the panel could hear evidence from a researcher from Zoe with experience in dietary advice and dietary fibres. Dr Hajioff cautioned that speaking with more experts will delay the progress of the report and that due to his own expertise in this area, it may be that the panel has the required amount of knowledge in this area already.

Comparative costs for interventions

Estimated costs per 50 patients in the first year

Intervention	**Costs per annum**
Plasma removal	£150,000 – £200,000
Bile acid sequestrants	£8,760 - £18,000
Probenecid	£45,000
Psyllium husk supplements	£1,533 – £26,206.50

Grace commented that understanding the relative costs of each intervention is very important, however these estimates are likely to under-estimate the cost to Government as they do not include on costs, some implementation costs and the costs of evaluation and monitoring for any programme or intervention implemented. Dr Hajioff agreed, and indicated that Islanders and other stakeholders must be aware that there may be additional burden on the Government of Jersey and Islanders via taxes, as there are for delivering any new services.

Any other business

No other business was raised by the panel.

Date of next meeting

Wednesday 11 December 2024. It will be held 10am-1pm online.

The Chair thanked everyone for their contributions, those watching the meeting and Julia for her support throughout the whole process. A reminder to the public that this meeting has been recorded and the video will be available online on request by emailing the PFAS mailbox. This will take a couple of days to make sure the observers are anonymised.

There being no further business, the meeting was closed.

To note that the Panel can be emailed via PFASpanel@gov.je.

Details of meeting dates and times can be found at PFAS in Jersey (gov.je)