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

10am on 26 June 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:	Grace Norman – Deputy Director of Public Health
	Julia Head – Senior Public Health Officer

Welcome:

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

Dr Hajioff explained that the meeting papers included an incorrect version of the draft literature review, and apologised for the error. This was an old version and should be discarded. The correct version was circulated to Islanders that morning.

The Chair also reminded the audience that Islander input into Report 2 has been postponed due to unforeseen circumstances. The meeting, which was due to be held in July will be moved to September. Dr Hajioff apologised for the delay.

Dr Hajioff reminded Islanders that queries should be send to the pfaspanel@gov.je mailbox so that the whole panel can feed into the response, rather than sending queries to individual panel members please.

Finally, he gave a reminder for offering evidence of experience around PFAS testing or treatments to lower PFAS body burden for Report 3. Please email pfaspanel@gov.je and instructions will be sent.

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.

Support staff for programme management and administration were also in attendance.

Declarations of Interest

No additional declarations.

Minutes of last meeting

There were two sets of minutes to review, from the 16 May and 6 June meetings.

16 May

The Chair requested any matters of accuracy.

Dr Fletcher requested that the minutes were changed on page 6 to reflect his opinion that he does not believe that a change in birthweight has strong evidence. This has been updated.

The action list was reviewed and considered to be all completed or in hand. The minutes were signed off as a true and accurate record subject to the above change.

6 June

The Chair commented about a matter arising which was also in the action list. In the 6 June meeting, Dr Fletcher had noted that in the Australian evidence there was a pair of locations where the results are different to the two other pairs, likely caused by the comparator area being uncharacteristic of the country in general. Dr Hajioff had said that there was a similar finding in the mental health section. Following the meeting, Dr Hajioff had confirmed that it was the same pair that were the outliers in both papers. He agreed with Dr Fletcher's assessment that the uncharacteristically healthy comparator population was likely to be resulting in the adverse effects appearing more significant, and consequently out of alignment with the other areas studied.

There were no other matters arising and the minutes were signed off as a true and accurate representation.

Additional findings since the last meeting

Dr Hajioff noted that there had been a public meeting to launch Report 3 on 6 June in which Islanders were asked to contribute evidence as Experts by Experience for Report 3. Dr Hajioff reminded the public that the deadline is the 5 July 2024, and invited people with experience of using medical intervention to reduce PFAS burden in their body, or those with experience in testing in addition to the Government testing in 2022 to email the Panel. Testimonies can be given in public or private or by written testimony.

Dr Fletcher confirmed that the request for input is for any interventions that Islanders have used to reduce PFAS levels, not just medical interventions. For example, dietary interventions. He noted that there is one paper in the literature indicating that psyllium husk would be useful to manage PFAS body burden, and there is a planned intervention trial in Denmark which has been planned to investigate psyllium husk against placebo and

cholestyramine. Although the results of this trial will be too late to include in Report 3, interventions such as these will be investigated during Report 3.

The Chair clarified that it is important to understand the patient experience has been for certain interventions, and also to indicate those which the panel are unaware of currently.

Agenda item 5 – Discussion and recommendations for Report 2

The Chair described the process the panel plan to take in forming the Discussion and Recommendation sections for the report in the meeting. Each health area on the agenda will be discussed section by section, each including evidence from Islanders affected by PFAS, evidence from Subject Matter Experts around the world including from animal and laboratory testing and also the results from literature review on various areas of PFAS and health and related issues. Following this discussion, the panel will look to see if a recommendation can be made. The final wording may not be finalised in the meeting but will be discussed offline ahead of the Islander meeting in September. There is the opportunity to change the wording On the basis of Islander input in September.

Summary of draft recommendations

Disease area	**Recommendation**
PFAS and cardiology	- Symptoms of high cholesterol should be treated in the usual manner e.g. with statins
PFAS and cancer	- Clinicians, GPs in particular, should have a higher level of suspicion of cancer for people with symptoms consistent with kidney and testicular cancer who have been PFAS exposed - Potentially recommend testicular self-examination
PFAS and the immune system	- Encourage higher rates of vaccination in childhood immunisation in affected and unaffected populations to ensure that children in the affected populations have adequate protection
PFAS and the hormonal system	No recommendation
PFAS and the nervous system	No recommendation
PFAS and the gastrointestinal system	No recommendation
PFAS and the urinary system	No recommendation
PFAS and reproductive health	- Breastfeeding is recommended because of wider benefits. If you are concerned then discuss with your healthcare professional.
PFAS and musculoskeletal effects	- Clinicians should have a higher index of suspicion of osteoporosis in PFAS exposed and who are otherwise at risk, e.g. with bowel disease, eating disorders, older women.
Environment and Mental Health	- Access to talking therapies is recommended.
Interactions between services and Islanders	- Ensure that there is a clinician available for Jersey healthcare professionals to contact for support in managing their patients who have concerns about PFAS.

	- Make a concise knowledge-based resource available to healthcare professionals on the current state of PFAS and health.

Comparability of exposure

The places in the world where people have been exposed to a similar mixture of chemicals as Jersey has been are Ronneby in Sweden and parts of Australia, but there appear to be different levels of exposure and different time periods between peak exposure and blood testing. This means that while the levels might look higher or lower in those places, there might not be a real difference in how much PFAS people have been exposed to when those things have been taken into account. Dr Fletcher has looked into this on behalf of the panel.

Dr Fletcher notes that it looked at first sight as if the exposure levels in the Swedish studies were much higher than in the Australian studies. 100ng/ml in the blood measured in the Swedish population in 2014, after the problem had been discovered in 2013. Whereas in the Australian study the levels were for the sum of PFAS were 10ng/ml in the exposed area compared to 5ml in a background area which had general population exposure.

To compare this against the levels in Jersey, Grace provided the medians for PFOA, PFOS and PFHxS. The median for PFHxS is 9.2ng/ml, the median for PFOS is 10.0ng/ml and the median for PFOA is 2.5ng/ml. This is roughly 21ng/ml total across three analytes. To compare, it was 10ng/ml in Australia, and 100ng/ml in Ronneby. When comparing with other areas, especially Ronneby, the differential in time between when the primary exposure ended and testing happened must be accounted for. In Jersey, serum testing was 16 years after mains water was extended to the area, but only one year in Ronneby.

The non-exposed European population average in 2022 was estimated to be 3ng/ml PFOS and 1ng/ml PFOA. In round numbers, the Jersey exposure level is twice the level reported in the Australian scenario. In the Australian hotspot, residents were moved to mains water in 2015 and had their blood sampled in 2019-2020. The follow up time is relatively short in Australia, which implies the average exposure in Australia was lower than Sweden or Jersey. The PFAS mixtures in the firefighting foam changed much earlier than 2015, but this is expected to also be true in Jersey.

The Chair questioned if the comparatively lower hotspot exposure in Australia could be due to some of the population using contaminated boreholes and some using mains water which was less contaminated, whereas in Ronneby and Jersey, residents only had access to one water supply. This may be why the median serum concentrations are lower because the Australian data have people with lot lower levels included in that median.

Understanding the Australian exposure is important to establish whether their experience is similar enough to Jersey for their health results to be comparable. The affected Jersey population is too small to study epidemiologically. The Australian residents on affected boreholes may have had high levels comparable to Ronneby, but there is not data specifically on these individuals.

Dr Hajioff commented that when comparing Ronneby and Jersey, calculations can be done to estimate what the levels might have been in Jersey when mains water was extended, which would account for the longer time period between what is assumed to be peak exposure and blood testing. The outcome of this is that, had testing happened 2 years after 2006 (when mains was extended) the total PFAS in the affected Islanders is likely to be around 150ng/ml, which is a comparable figure to Ronneby. Dr Fletcher agreed with this

rough calculation. Therefore the health outcomes in the affected Ronneby population are particularly relevant to the Jersey affected population. As the Australian levels appear to be quite a lot lower, the Australian disease studies are less helpful, but still contribute to the evidence-base.

Grace commented that in Jersey, there was an eligibility criterion that islanders had to have a health condition they believed to be related to PFAS exposure. This means that there is a systematic difference between the people who were tested in Ronneby and in Jersey, because those less affected in Jersey may not have been eligible for testing.

The Chair commented that in Report 3, the Panel will review whether there should be further PFAS blood testing among other islanders, and the question of comparability with Ronneby will be considered at that point.

The Chair commented that this summary by Dr Fletcher was very useful, and concluded that the exposure scenario in Jersey does seem similar to Ronneby.

Dr Fletcher asked Prof Cousins whether the products that led to exposure are similar. If it can be assumed that the mixtures are comparable, this would be useful in evaluating the evidence. Prof Cousins noted he doesn't know whether the products are the same, but considered that it would be likely that they are similar, although the specific mixture in the blood may be different depending on the movement of water through the environment. Dr Fletcher commented that the same few big companies were marketing fire-fighting foam globally. Prof Cousins noted that other products used in addition to Lightwater AFFF products might mean they are not directly comparable, but the Lightwater AFFF was the only product discharging PFHxS and PFOS, and we have this in both Ronneby and Jersey, suggesting similarities.

The Chair commented that the panel now has a reasonable comparator in Ronneby for the exposure in Jersey. He noted that there is the potential for there to be further work on this matter in future, looking at the relative half-lives of the different PFAS types and applying that to the difference between the levels between Ronneby and Jersey. This could help assess whether the exposure was identical. The panel will consider this for Report 4 but agreed that Ronneby is a good comparator for report 2 and 3.

Prof Cousins noted that is possible that the total cumulative exposure could be different as Sweden had a longer duration of exposure, as the residents continued to drink the affected water until 2013, in comparison to 2006 in Jersey.

Dr Fletcher reminded the panel that the relevance of this discussion is that there are reports from various bodies reaching conclusions on what the health implications may be from different types of PFAS, but studies specifically of the Ronneby population are likely to be more meaningful because the exposures are thought to be similar. The Chair agreed.

<u>PFAS and cardiology</u>

Evidence source	**Summary of health effects reported**
Experts by Experience	Elevated cholesterol
Subject Matter Experts	Elevated cholesterol Other fats elevated in blood
Literature	Elevated total cholesterol and LDL (bad cholesterol)

Dr Hajioff noted that high cholesterol is only concerning from a health point of view because it is associated with an increased risk of cardiovascular diseases. He asked Dr Fletcher the evidence shows that there are more cardiovascular events (such as strokes and heart attacks) in areas of high PFAS exposure.

Dr Fletcher indicated that there is scientific agreement that PFAS exposure does cause increase in total cholesterol and LDL (bad cholesterol). There are a number of reviews which therefore suggest, given the well-established associations between cholesterol and heart disease, that PFAS causing higher cholesterol should have a negative impact on health. However, the studies examining PFAS exposure and cardiovascular disease do not find a convincing association. Studies do not show an increase in cardiovascular incidence or mortality with PFAS exposure. This seems like a paradox. This finding may be because the increase in blood cholesterol caused by PFAS is too small to result in increases in cardiovascular disease.

Dr Fletcher hypothesised that this increase in cholesterol could be due to a more complex subcategory of increases in other factors. For example, some studies show increases in HDL as well as LDL, so the impact on the ratio between HDL and LDL is not so big compared to the apparent effect on total cholesterol; i.e. physiological changes may cancel each other out. Another example is in the C8 analysis of PFOA, there is an apparent reduction in C-reactive protein (CRP), a general indicator of inflammation, and generally reduced CRP is associated with reduced cardiovascular disease.

Dr Fletcher commented that the researchers in Sweden have not yet analysed their data on cardiovascular disease. He noted that the Italian data did show an excess of cardiovascular mortality, and the Australian data was not consistent between three areas studied and this inconsistency may be due to one area having a comparator area which is unusually healthy.

Draft Recommendations

- Treat people who have raised cholesterol in the usual manner e.g. with statins.

The panel briefly discussed whether it would be appropriate to recommend screening for high cholesterol in affected Islanders, but agreed to discuss this further when preparing Report 3, which will include a section on human biomonitoring.

PFAS and cancer

Evidence source	**Summary of health effects reported**
Experts by Experience	Breast, prostate, bowel, leukaemia, lymphoma, myeloma, kidney, bladder, uterus, skin and mouth cancers
Subject Matter Experts	Kidney (good evidence) Breast and testicular (some evidence but not strong) Liver and thyroid cancer (animal models)
Literature	IARC – Strongest evidence for PFOA, inadequate for PFOS Ronneby - Small excess for kidney, testicular and bladder. Australia - kidney

Dr Fletcher explained the literature evidence. He indicated that there are two main sources of evidence. One is a very recent review by the International Agency for Research on Cancer (IARC) on PFOS and PFOA. The evidence is strongest for PFOA which has been classified on balance of probabilities by IARC as carcinogenic to humans (Class 1) with limited evidence in humans of renal cell carcinoma and testicular cancer. For PFOS there is no epidemiological data with IARC considering the available human evidence to be

inadequate. The overall conclusion is that PFOS is "possibly" carcinogenic to humans (Group 2B). PFHxS was not investigated, although there is a good paper on PFHxS in the Ronneby study. In Ronneby, researchers found that there was a greater increase in kidney, testicular and bladder cancers, although the differences were small. Prostate cancer incidence was significantly lower than expected. There is evidence that suggests that there's a lower incidence of prostate, colon and lung cancers in Ronneby.

Extrapolating from the Ronneby data, the two cancers which have been highlighted with mixed evidence are kidney and testicular cancer. The researchers concluded there is a 20% increased risk of developing kidney and testicular cancers. Bladder cancer showed a similar increase, but there was less corroboration from other studies. In Sweden, there is an efficient health record keeping and data linkage system which means that it is expected that the research is a reliable indicator of the actual rates of cancer in that population. Dr Fletcher noted that kidney cancer was higher in one area in Australia, and when averaged across the whole area, it also has a 20% excess.

Dr Hajioff noted that these are fairly rare cancers, and therefore a 20% increase in risk for a rare cancer does not mean that there would be an increase in risk at an individual level, although it does mean that among large populations, more cases would expect to be detectable. He noted that of course, it will be important for those who are affected, but across the whole population the numbers are not large, because the cancers are relatively rare.

Dr Hajioff noted that it is mechanistically plausible that other cancers could be associated with PFAS exposure, particularly as PFOA is a known carcinogen, but there is little evidence of this in the real world currently. Dr Hajioff noted that the IARC review for both PFOA and PFOS found the mechanistic evidence is strong. There are various epigenetic, cell proliferation, and immunological routes which point to a plausible mechanism of cancer and provides some support for the hypothesis that other cancers could be caused by PFOA and PFOS. The panel will discuss screening for cancers in Report 3 including whether ultrasound would be an effective mechanism.

<u>Draft Recommendations</u>

- Clinicians, GPs in particular, should have a higher level of suspicion of cancer for people with symptoms consistent with kidney, bladder and testicular cancer who have been PFAS exposed
- Testicular self examination is a possible recommendation, although would require further review of the literature. This is often recommended in a lot of places anyway.

<u>PFAS and the immune system</u>

Evidence source	**Summary of health effects reported**
Experts by Experience	Autoimmune disease such as rheumatoid disease, lupus
Subject Matter Experts	Antibody responses to vaccination Increase in susceptibility to infections
Literature	Decrease in antibody levels following childhood immunisation in relation to maternal, perinatal exposure indicating the early immune system seems damaged no strong evidence for autoimmune disease equivocal data on COVID-19

Dr Fletcher noted that several reviews have concluded that the strongest evidence of harm, and the basis for setting limits in water, is due to childhood vaccination efficacy reduction. This is because that is an indicator of immunomodulation. Any evidence that this correlates with an increase in vaccine-preventable or common childhood infections is weak; some studies find an association, but others do not. The evidence does not link to childhood asthma, and for common respiratory infections evidence is mixed.

There are several studies showing a decrease in antibody levels following immunisation in infants who have had maternal, perinatal exposure to PFAS. Very early programming of the immune system seems to be damaged. There are some preliminary results from Ronneby which do not find an association with reduced antibody levels in children, however this is not yet published. Because this is not perinatal or in utero data, it does not necessarily contradict the other findings. Jamie DeWitt gave evidence to the PFAS Panel for this report and showed that PFAS is associated with lower immunity in animal studies also. Overall, the evidence suggests that there is a real association between PFAS and immune function, and PFAS does damage the developing immune system.

Dr Fletcher explained that there is some data on adult vaccine response in the Ronneby study, where antibody levels were tested before and after people received the COVID vaccination, which did not show an effect. This study was conducted in a different age group (adults) with a different type of vaccine so this finding doesn't contradict the finding that some childhood vaccines result in a lower immune response among people in PFAS hotspots. The data suggests that PFAS doesn't affect the adult immune system but there is convincing evidence that PFAS does affect the childhood immune system especially in relation to some immunisations.

For autoimmune diseases, the Ronneby data does not show an increased incidence of autoimmune diseases. The Ronneby research group looked at lupus and ulcerative colitis, both of which were also investigated by the C8 group, with an increase found in ulcerative colitis. This has not, however, been replicated in other studies and may be a chance association. Overall, there is no convincing evidence of an effect for any autoimmune diseases.

The Chair commented that is physiologically consistent because the lower effectiveness of vaccinations is due to the body's immune response being under-active, while autoimmune conditions occur because the body's immune response is over-active.

Prof Cousins commented that there have been a number of studies on COVID-19 comparing more vs less severe disease. An early one by Prof Grandjean suggested that PFAS exposure may have some effect on the severity of disease. Prof Cousins also noted that there is also a study in the literature about 3M retirees which did not show an effect of PFAS on risk of COVID diagnosis.

Dr Fletcher noted that these studies compared severe cases of COVID-19 against less severe cases. The authors compared blood levels of PFAS, comparing levels of PFBA grouped as either below the limit of detection (LOD) or above the LOD. This is a crude way of assessing exposure which is not very robust. The study found that there was an association between exposure of PFBA and more severe cases of COVID-19, but there was no association between for the more common types of PFAS (PFOA, PFOS, PFHxS) and severity of COVID-19 infection. Dr Fletcher considers that the authors may have overstated their conclusion, and the finding that COVID-19 infection is increased by PFAS is likely to be a chance finding. Some data from Italy appeared to show an increase in COVID-19 mortality in those exposed to PFOA, but the analysis was potentially confounded.

Draft Recommendations

Encourage high uptake of childhood immunisation in exposed areas and also in whole population to protect those who don't have high protection themselves. A universal recommendation will increase herd immunity by reducing circulating pathogens in the population.

Grace commented that the overall childhood immunisation level is quite high in Jersey, and that there is no downside to encouraging uptake of childhood immunisation.

PFAS and the hormonal system

Dr Hajioff reminded the panel that when considering changes in blood hormones and other blood tests, the concern is for people getting sick, rather than a difference in results of blood tests.

Evidence source	Summary of health effects reported
Experts by Experience	None reported
Subject Matter Experts	Thyroid dysfunction Metabolic dysfunction – obesity, glucose intolerance, type 2 diabetes, insulin resistance
Literature	Studies investigating circulating hormones, thyroid, oestrogen, testosterone. Not strong evidence Thyroid identified in C8 studies as probable link, however may be false positive as not replicated in Ronneby Type 2 diabetes – association in Ronneby data but not C8 data. May be a chance finding Obesity – mixed data in relation to childhood exposure. No positive association found in C8 data, in fact a significant inverse relationship with PFOS discovered instead

Dr Fletcher summarised the literature. There are a number of cross-sectional studies looking at circulating hormones thyroid, oestrogen, and testosterone. Some of these have found associations with circulating PFAS. However, with cross sectional studies, it is difficult to determine causality so these are not strong evidence. It was also noted that a change in a hormonal level does not necessarily mean hormone-related disease.

Dr Fletcher explained that metabolic issues sometimes are all related to these cross-sectional hormonal measures. He noted that thyroid hormone disruption came up as one of the original things listed in C8 as having a probable link to PFAS exposure, but this effect was not replicated in Ronneby, which is considered to be a more thorough and better quality study and so this is considered to be a false positive result.

For Type 2 diabetes, there was no evidence of an association in the C8 studies, but there was an association found in Ronneby data. As this is a stronger study than the C8 work, this may result in being a robust association. However, as there is not enough evidence on the subject at present, it is not currently considered robust. Further work is required to determine if this is a real or chance association.

For obesity, there are some studies that provide strong positive results, and others that find negative results in relation to childhood exposure of PFAS and subsequent development of obesity, so there is not convincing evidence in either direction. In the C8 studies, the researchers found no evidence of effect for adult obesity, and that PFOS exposure was

associated with decreased body weight, rather than increased body weight for children (significant inverse relationship).

While there is not strong evidence of an association, it is biologically plausible that PFAS could affect the gut microbiome, which could have a range of health-related impacts. The gut microbiome has a lot of health benefits if it is in good order with the right balance of bacteria in the gut. This is crucial for good digestion of food, but also effects on immune system and metabolic outcomes, including obesity. It also plausibly also affects excretion rates of PFAS through the gut, which means it would be a strong confounding factor (which masks a true causal relationship) because it affects excretion through the gut. This is a hypothesis and there is not strong evidence yet.

Overall, the Panel concluded that there is not strong evidence that there is a causal association between PFAS and obesity.

Draft Recommendations

For obesity, the Chair commented that if obesity was related to PFAS exposure, it would still be managed in the same way between exposed and non-exposed populations. Therefore, there is no recommendation.

No strong evidence found around thyroid disease therefore no recommendation is required.

For Type 2 diabetes, Dr Hajioff feels there is not enough strong evidence to make a recommendation to clinicians to have a higher level of suspicion in a PFAS exposed person. Dr Fletcher agreed and noted that the type 2 diabetes finding in the Ronneby study may be a chance finding, and he would not recommend an extra effort for screening in this population on this basis. He considers normal screening to be appropriate and therefore there is no recommendation.

PFAS and the nervous system

Evidence source	**Summary of health effects reported**
Experts by Experience	None submitted
Subject Matter Experts	Developmental language disorder in girls Neurodevelopmental disorders – not demonstrated causality
Literature	ADHD – found in C8 study Sweden – apparent association with language learning – requires replication

Dr Fletcher commented that ADHD was investigated in the C8 data which did not find any results. The Swedish group (Ronneby) has found an apparent association with language learning in girls which requires replication. Any mechanism here is not clear, it may be related to the involvement of hormones in neurodevelopment, but that is hypothetical.

Dr Fletcher commented that he has not looked at neurodevelopmental effects thoroughly because he was prioritising those which have been highlighted by experts by experience, subject matter experts and findings from the Ronneby studies. It was agreed that ADHD would be investigated more thoroughly in the draft report.

Draft Recommendations

No recommendation to be made.

PFAS and the gastrointestinal system

Evidence source	Summary of health effects reported
Experts by Experience	Indigestion, reflux symptoms (high in gut) Change of bowel habit (low in gut)
Subject Matter Experts	Alterations in liver enzymes Suggestive link with ulcerative colitis – already discussed and not replicated elsewhere
Literature	Several strong studies showing effect on liver enzymes, ALT in particular Non alcoholic fatty alcoholic disease – some evidence but not strong

Dr Fletcher noted that in the literature there are several studies with strong study designs which suggest PFAS could affect liver enzymes, in particular Alanine transaminase (ALT) which suggests that PFAS could be impacting on normal liver function. There is strong evidence for small changes within the normal clinical range in ALT which seem to be associated with PFAS levels in blood tests. There is no strong evidence for symptoms related to this elevation in ALT. It is unclear whether or not the incidence of non-alcoholic fatty alcoholic disease has increased.

He explained that ulcerative colitis was found to be associated with PFAS in the C8 studies, but there have been two studies since which have not replicated that finding, one of which was in Ronneby. Therefore, it was felt that it was unlikely that ulcerative colitis is caused by PFAS.

Dr Hajioff commented that for ulcerative colitis, there is a particular cell antigen which is genetic which is associated with these types of disease which might be a confounding factor. This genetic variation may be present at a high prevalence in the C8 population.

Recommendations

The panel does not consider it appropriate to make a recommendation. If a treating physician finds elevated ALT, it is good for clinicians to be aware that increase in ALT is related to PFAS exposure but there is no formal recommendation.

PFAS and the urinary system

This section excludes urinary cancers they are discussed with other cancers.

Evidence source	Summary of health effects reported
Experts by Experience	None reported
Subject Matter Experts	Increased risk of reduced kidney function
Literature	Reduced kidney function in some studies may be due to reverse causality

Dr Fletcher explained that the literature shows that the association between kidney function and PFAS is different to other conditions. People who have reduced kidney function do not reabsorb it as quickly as people with functioning kidneys, which would mean that their PFAS blood levels would be lower than someone with the same exposure to PFAS. With most substances, reduced kidney function leads to higher levels.

If people in high and low exposure water districts are compared, there is no difference in kidney function, but within them there is a strong association which is driven by the kidney function affecting excretion.

Dr Hajioff commented that this is an effect which has come up in cross-sectional studies and animal models, but is not replicable epidemiologically because of the reverse causality Dr Fletcher highlighted.

Draft Recommendations

No recommendation to be made.

PFAS and reproductive health

This section includes foetal growth, infant growth, first year of life and also breastfeeding and lactation.

Evidence source	Summary of health effects reported
Experts by Experience	Fertility issues
Subject Matter Experts	Reduced intrauterine growth Increased risk of pregnancy induced hypertension possibility Reduction in birth weight (small and sex specific) Delayed or shortening of lactation Issues around puberty Duration of breastfeeding and establishment of breastfeeding Some impairment of breastfeeding SME experts highlighted benefits of breastfeeding and recommended healthcare professionals continue to promote breastfeeding in exposed populations due to benefits on the infant
Literature	

Exposure

Dr Fletcher commented that at birth, the serum levels in the infant will reflect serum levels from the mother. If the mother has a raised body burden, then lactation will result in increased PFAS take up in the child, approximately doubling every 6 months. There are significant health benefits to the infant and mother through breastfeeding. On balance, the benefits of breastfeeding greatly outweigh the additional exposure. This position was put forward by several of the subject matter experts that presented to the Panel. Additionally, the American Centre of Disease Control (CDC) also report that the benefits outweigh the potential risk of PFAS through breastmilk exposure.

The Chair commented that to make any recommendation other than to continue breastfeeding would require evidence to suggest extreme harm from PFAS.

Dr Hajioff commented that not breastfeeding greatly increases risk of death in the first year of life. He considers it unlikely that all the potential risks across all systems with PFAS exposure would come close to outweighing that risk. Breastfeeding also decreases risk for many health conditions, such as diabetes, heart disease, and cancer, later in life too.

The panel are comfortable to reflect the position of the CDC with recommending breastfeeding in all cases, and to encourage discussion with healthcare providers if the mother is concerned.

Breastfeeding duration

Dr Fletcher commented that there have been several studies suggesting mothers with high PFAS exposure tend to breastfeed for less time. The mechanisms for this effect are not clear, but the effect has been replicated. He notes that the effect is an observation, and is an average reduction.

Dr Hajioff asked if anyone has looked at pituitary hormone levels in PFAS exposure, as breastfeeding is largely governed by pituitary hormones such as prolactin. He proposed that if pituitary hormones are affected in PFAS exposure then they could be the reason for reduced duration of lactation. He noted that other pituitary hormones affect type 2 diabetes, indicating some sort of endocrine disruption. Dr Fletcher will consult with one of the panel's SME to follow up this question.

Birthweight

Dr Fletcher commented that there are some studies suggesting a change in birthweight and others that do not. Overall, he is not persuaded that the evidence indicates an impact on birthweight.

Pregnancy induced hypertension

Dr Fletcher commented that for hypertension in pregnancy, there is no evidence of effect in Ronneby. The C8 data did suggest the risk, but it has not been replicated in other studies including in higher exposed populations.

Polycystic Ovarian Syndrome (PCOS)

Dr Fletcher commented that PCOS is a new finding from Ronneby and needs replication. For this reason, he does not believe that it should be recommended by the panel to be screened for in this population.

Draft Recommendations

Breastfeeding is recommended because of wider benefits. If a mother is concerned then she should discuss with her healthcare professional.

PFAS and musculoskeletal effects

Rheumatoid conditions and lupus which EBE highlighted were discussed along with the other immunity-related issues.

Evidence source	**Summary of health effects reported**
Experts by Experience	Rheumatoid, lupus
Subject Matter Experts	None reported
Literature	Dose related increase in osteoporosis linked fractures

Dr Fletcher commented that a study linking serum PFAS levels with medical records in the literature found that there was a dose related increase in osteoporosis linked fractures. He noted that this effect has not yet been replicated by other studies. However, there are bone density reduction studies indicating potential biological plausibly of a real effect.

Dr Hajioff commented that he considers this finding interesting as there is a dose response in both the bone density (found by radiology) and also fractures due to weaker or thinner bones. A dose response increases the likelihood that these findings are real.

Draft Recommendations

Clinicians should have a higher index of suspicion of osteoporosis in people who are PFAS exposed and who are otherwise at risk, e.g. those with bowel disease, eating disorders, and postmenopausal women.

Environment and Mental Health

Evidence source	Summary of health effects reported
Experts by Experience	Mental health consequences of their illness journeys as well as how they feel about having been exposed to PFAS. Anxiety and worry, as well as moral injury at having exposed their children to PFAS and their children watching them being ill. Financial concerns. Mistrust in the light of what had gone before.
Subject Matter Experts	
Literature	Psychological distress – reasonable evidence Anxiety around environmental concerns like PFAS Depression, post-natal depression – weaker findings Post traumatic stress disorder (PTSD) Worry about long and short term physical health Mistrust Uncertainty around evidence and interpretation of evidence

Dr Hajioff commented that he has looked at literature on mental health and environmental concerns and was surprised at how few studies there were. He explained about a qualitative study in Australia which found the affected population felt:

- worry about long and short term physical health
- mistrust
- uncertainty around evidence and people's interpretation of it

Prof Cousins noted the financial implications of PFAS exposure in Australia was large, there was loss of property prices and business such as farmers and fisheries were significantly impacted. He questioned whether this was the case in Jersey as well.

Grace commented that overall, the property market is generally buoyant in Jersey but that she was not aware of more localised differences. It could not be ruled out as something which is affecting the affected Islanders.

Draft Recommendations

Access to talking therapies is recommended.

Grace noted that there are psychological support services available to all Islanders free at the point of use.

Interactions between services and Islanders

Evidence source	Summary of health effects reported
Experts by Experience	Health professionals do not understand PFAS Islanders are putting less weight on the reassurance they are being given, because their medical professionals do not understand PFAS Hearing different things from different medical professionals which is making people feel uncomfortable
Subject Matter Experts	
Literature	

Dr Hajioff commented that in a recent meeting he held with GPs, they commented that they did not have access to the latest information on PFAS and health. They requested a clinical resource with experience in PFAS with whom they could discuss patients where PFAS might be a factor in their health.

Dr Fletcher agreed that it is crucial to have a network of engaged GPs and Prof Cousins noted that GPs need information to help patients who consult them with regard to breastfeeding concerns and queries as the panel previously recommended.

The panel proposed that an evidence summary is provided to help GPs, based on Report 2. The panel discussed how the Government could produce a short summary of the key content from Report 2 and make it available to the GPs and the public. It would then be updated when Report 3 is made available. Dr Fletcher noted that the Executive Summary from the reports could be used as a starting point, and there are also are already resources online that can be drawn on.

<u>Draft Recommendations</u>

- Have a clinical resource available to help GPs around the issues the patients have raised.
- Make a concise knowledge-based resource available to healthcare professionals on the current state of PFAS and health.

Agenda item 6 – Additional recommendations

The panel had no additional recommendations to add.

Dr Fletcher commented that there could be fewer recommendations from this report alone, as it would be more relevant to combine recommendations with Report 3. The Chair agreed, and reminded the panel that this is largely an informational report, and recommendations are less important. Report 3 will be an action orientated report.

Next steps for Report 2

Dr Hajioff noted that the panel will collate the recommendations from the minutes, construct draft recommendations and then incorporate into the draft report. The report will then be shared as a courtesy with Public Health team once the process is done.

There will be a public event on September 12 where the panel will hear input from Islanders on the draft report and the recommendations, and launch a period of input for interested islanders. All of the input will be considered, and will be presented as an appendix at the back of the report with a response indicating what changes have been made and why, or

why changes have not been made. The report and changes will be made public before the final draft goes to Ministers for publication and launch. Publication of Report 2 is likely to be in November.

He explained that Report 3 will be running in parallel. The panel start their work on Report 3 in a public meeting on 11 July. Report 3 is hoped to be published in Q1 2025.

Dr Hajioff reminded the audience that the panel are still calling for Experts by Experience for Report 3 on their experiences on measures to reduce PFAS in their body and testing for PFAS in their body. This evidence can either be in a public or private panel meeting or in writing. All testimonies will be anonymous regardless of method of testimony.

Dr Hajioff sent further apologies that the wrong draft of the literature review was circulated yesterday, and the correct draft was circulated this morning. He asked the audience to discard the previous version.

Any other business

Grace noted that Islanders requested an event with the Ministers at the last Islander event and confirmed that this has been arranged for 31 July at 5.30pm at Les Ormes.

Date of next meeting

11 July 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)