

{Participant Name}

{Address}

{City, CO Zip}

Dear {Participant Name},

We are writing to provide you with a summary of your remaining personal results for the health markers and perfluoroalkyl substances that we measured in your blood sample in June 2018.

As you saw in the previous letter, the study measured both health markers with clinical relevance (cholesterol and liver enzymes) and several other compounds in your body, all considered subclinical markers of health (interleukins and other cytokines). For the subclinical markers of health the underlying science on their direct clinical relevance is unclear and physicians are not able to make health recommendations based on these results.

The goal of this study was to better understand your exposure to perfluoroalkyl substances, and the potential links between exposure and the health markers we collected. The following markers were measured to help evaluate the relationship between exposure and potential health effects:

GROUPING:	MEASURED IN THIS STUDY:	BASIC INFORMATION:
PERFLUOROALKYL SUBSTANCES	47 specific fluorinated compounds	A group of thousands of man-made chemicals that are known to be long-lasting in both the environment and the body.
LIVER ENZYMES	AST, ALT, GGT	Higher levels of these proteins in the bloodstream may indicate inflammation or damage to the liver.
CHOLESTEROL	Total cholesterol, LDL Cholesterol, HDL cholesterol, Triglycerides	High cholesterol can lead to narrowing of the arteries and greater risk of cardiovascular disease.
INTERLEUKINS AND OTHER CYTOKINES	IL-1 β , IL-2, IL-6, IL-10, IFN- γ and TNF- α	These proteins are normally present in the bloodstream and higher levels may reflect inflammation and immune response in the body. These are considered subclinical markers of health.

Included with this letter:

Part 1: Perfluoroalkyl substances in your blood. For each compound you will see your personal level as well as the 50th percentile (median) and the range of levels measured in all participants in the PFAS-AWARE study. For most of the new compounds provided in this letter it is not possible to compare your results to national reference levels developed by the US Centers for Disease Control, as these compounds are not included in the set they evaluate nationally. At this time we have data for the remaining 29 compounds to share with you.

- 12 of the 29 new compounds were detected in **at least one** study participant.
- 17 of the 29 new compounds were **not** detected in any study participant.

Part 2: Health markers in your blood. We will provide your personal level for each marker as well as the study population 50th percentile and the range of levels measured in all participants in the PFAS-AWARE study. Where applicable, we will also provide health-based normal ranges. At this time we have the cytokine and interleukin blood biomarker results to share with you.

In a prior letter you received:

- The first 18 perfluoroalkyl substances that were measured
- The cholesterol and liver enzyme results

We have included these previous results in this packet for your reference.

Although we have not yet finished analyzing all of the data, we wanted to share the rest of your personal results with you now. In addition, we will be holding multiple public meetings to discuss these results and answer any questions you may have (See Flyer). We hope the enclosures are informative. Please call either of us - John Adgate at (303)724-4692 or Anne Starling at (303)724-8483 -- if you have questions or want further information.

If you have questions or concerns about your health, we suggest you share these findings with your physician.

Thank you again for your participation in our study.

Sincerely,

John Adgate, PhD
Colorado School of Public Health
(303)724-4692

Anne Starling, PhD
Colorado School of Public Health
(303)724-8483

Part 1: Levels of Perfluoroalkyl Substances found in your Blood (ng/ml)

Chemical Name	Abbreviation	Your Result	Lowest Result found in this Study	50 th percentile* for this Study	Highest Result found in this study	Number (%) of participants with detectable levels in this study	50 th Percentile* for general U.S. Population	95 th Percentile** for general U.S. Population
Perfluoroalkanoic acids								
Perfluoro-n-tridecanoic acid	PFTrDA						--	--
Perfluoroalkane Sulfonates								
Perfluoropropanesulfonate	PFPrS						--	--
Perfluoropentanesulfonate	PFPeS						--	--
Perfluorononanesulfonate	PFNS						--	--
Perfluorodecanesulfonate	PFDS						--	--
Chlorinated perfluoroalkane sulfonates								
8-chloroperfluoro-1-octanesulfonate	Cl-PFOS						--	--
Perfluoroalkane sulfonamides								
Perfluoro-1-octanesulfonamide	FOSA						^Below Limit of Detection	^Below Limit of Detection

^ Below Limit of Detection means there was not enough of the compound in the blood sample for the instrument to provide a confident answer. For these compounds the limit for detection ranged from 0.01 ng/ml to 2.00 ng/ml depending on the compound.

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Perfluoroalkane sulfonamido acetic acids								
Perfluoro-1-octanesulfonamidoacetic acid	FOSAA						--	--
Fluorotelomer Sulfonates								
4:2 fluorotelomer sulfonate	4:2 FTS						--	--
6:2 fluorotelomer sulfonate	6:2 FTS						--	--
8:2 fluorotelomer sulfonate	8:2 FTS						--	--
Miscellaneous Emerging Compounds								
Perfluoro-4-ethylcyclohexanesulfonate	PFEtCHxS						--	--

^ **Below Limit of Detection** means there was not enough of the compound in the blood sample for the instrument to provide a confident answer. For these compounds the limit for detection ranged from 0.01 ng/ml to 2.00 ng/ml depending on the compound.

Part 1: Levels of Perfluoroalkyl Substances found in your Blood (ng/ml)

Understanding the above tables:

* **The 50th Percentile** is the same thing as the median. It is the mid-point of all the measurement results, or the level at which half the measurements are higher and half the measurements are lower.

** **The 95th Percentile** is the level at which 95% of the measurements are below this value.

^ **Below Limit of Detection** means there was not enough of the compound in the blood sample for the instrument to provide a confident answer. For these compounds the limit for detection ranged from 0.01 ng/ml to 2.00 ng/ml depending on the compound.

The values for the 50th and 95th percentiles in the general U.S. Population can be found here:

https://www.cdc.gov/exposurereport/pdf/FourthReport_UpdatedTables_Volume1_Jan2019-508.pdf

Part 1: Levels of Perfluoroalkyl Substances found in your Blood (ng/ml)

Additional compounds that we tested for that were below the limit of detection in every member of the study population:

Chemical Name	Abbreviation	Number (%) of participants with detectable levels in this study
Perfluoroalkanoic acids		
Perfluoro-n-tetradecanoic acid	PFTeDA	0 (0%)
Perfluoro-n-hexadecanoic acid	PFHxDA	0 (0%)
Perfluoro-n-octadecanoic acid	PFODA	0 (0%)
Perfluoroalkane Sulfonates		
Perfluorododecanesulfonate	PFDoS	0 (0%)
Chlorinated perfluoroalkane sulfonates		
11-chloro-3-oxa-perfluoroundecane sulfonate	Cl-O-PFUdS	0 (0%)
Perfluoroalkane sulfonamides		
N-methylperfluoro-1-octanesulfonamide	MeFOSA	0 (0%)
N-ethylperfluoro-1-octanesulfonamide	EtFOSA	0 (0%)
Fluorotelomer Sulfonates		
10:2 fluorotelomer sulfonate	10:2 FTS	0 (0%)
Fluorotelomer Alkanoic Acids		
3-Perfluoropropyl propanoic acid (3:3)	3:3 FTA	0 (0%)
3-Perfluoropentyl propanoic acid (5:3)	5:3 FTA	0 (0%)
3-Perfluoroheptyl propanoic acid (7:3)	7:3 FTA	0 (0%)
2-Perfluorohexyl ethanoic acid (6:2)	6:2 FTA	0 (0%)
2-Perfluorooctyl ethanoic acid (8:2)	8:2 FTA	0 (0%)
2-Perfluorodecyl ethanoic acid (10:2)	10:2 FTA	0 (0%)
2H-Perfluoro-2-octenoic acid (6:2)	6:2 FTUA	0 (0%)
2H-Perfluoro-2-decenoic acid (8:2)	8:2 FTUA	0 (0%)
2H-Perfluoro-2-dodecenoic acid (10:2)	10:2 FTUA	0 (0%)

Part 1: Levels of Perfluoroalkyl Substances found in your Blood (ng/ml)

Additional Information about Perfluoroalkyl Substances:

How are people exposed to perfluoroalkyl substances (PFASs)?

- The most common exposure pathway for these compounds is through eating or drinking PFAS-contaminated food or water.
- PFASs have also been found to accumulate in dust.
- Some fast food and microwavable containers contain detectable levels of PFASs.
- PFASs are present in certain household items such as stain-resistant and water-resistant clothing, fabrics, carpets and furniture, as well as non-stick cookware.
- People who work in the manufacturing or installation of these household items may be at risk for higher PFAS exposure.

What does it mean if the levels of PFASs in my blood are high?

- A level of concern has not yet been established for PFASs levels measured in blood.
- Previous studies have shown possible associations between PFASs in blood and health impacts including: thyroid disease, high cholesterol, liver damage, immune system suppression, decreased fertility, and giving birth to infants with decreased birth weight. Some studies have also shown an increased risk of kidney and testicular cancer.

How can I reduce my exposure to PFAS?

- Investigate if your drinking water PFAS levels are below the USEPA health advisory levels. If you are on a private well have it checked for PFAS contamination. The Water Authorities in Security, Widefield, and Fountain have changed their water supplier and/or have added treatment systems to ensure that their systems delivers water to customers at levels below the EPA health guidance levels for PFOA and PFOS.
- Limit eating at fast food restaurants or eating microwave meals that use packaging that may be grease repellent.
- Avoid buying stain and water-resistant products (e.g., clothing and furniture) where possible.
- Wash hands before eating and keep floors and surfaces clean to reduce possible exposure from PFASs in dust.

For more information on Perfluoroalkyl Substances:

- https://www.atsdr.cdc.gov/pfc/docs/pfas_clinician_fact_sheet_508.pdf
- <https://www.colorado.gov/pacific/cdphe/pfcs>
- http://securitywsd.com/wp-content/uploads/2017/05/Security-fact-sheet-updated-2_11_16.pdf
- <http://www.c8sciencepanel.org/index.html>
- <http://www.pfashealth.info/index.html>

Part 2: Health Marker Results

Interleukin Results:

	IL-1 β (pg/ml):	IL-2 (pg/ml):	IL-6 (pg/ml):	IL-10 (pg/ml):
Your IL-1β, IL-2, IL-6, IL-10 levels:				
Study IL-1β, IL-2, IL-6, IL-10 50 th percentile levels:				
Study Range for Interleukins:				
Detected in what Percent of Study participants?				
Expected Range for Interleukins:	Not Established			
Please note: If your results are significantly different than the average found in this study, it does not necessarily mean you have a health problem. If you have any concerns, you should consult your physician.				

Below Limit of Detection (<LOD) means there was not enough of the compound in the blood sample for the instrument to provide a confident answer.

Basics of interleukins:

Interleukins are proteins in the bloodstream that belong to a larger molecular group called cytokines. A cytokine is a type of molecule that assists in communication between cells during immune responses and helps to direct cells towards areas of inflammation, infection and trauma. Interleukins are released in short bursts in response to events that the body may view as a threat. There are 15 different interleukins, each with a slightly different function.

Interleukins play an important role in the immune system, and in particular, inflammation. Inflammation is part of the body's natural response to injury or infection and often is displayed as redness, heat, pain and/or swelling. There are both pro-inflammatory and anti-inflammatory interleukins and there must be a balance between the two for proper functioning of this process. The body can exhibit signs of chronic inflammation for many reasons including but not limited to: chronic stress, poor diet, exposure to certain air pollutants and certain chronic diseases.

Pro-inflammatory: Pro-inflammatory cytokines are sent to sites of injury or infection to help heal the body or fight the infectious agents.

Anti-inflammatory: Anti-inflammatory cytokines help to regulate and control the pro-inflammatory cytokine response.

- **IL-1 β :** This interleukin is a pro-inflammatory cytokine.
- **IL-2:** This interleukin is a pro-inflammatory cytokine.
- **IL-6:** This interleukin is a pro-inflammatory cytokine.
- **IL-10:** This interleukin is an anti-inflammatory cytokine.

Part 2: Health Marker Results

Other Cytokine Results:

	IFN- γ (pg/ml):	TNF- α (pg/ml):
Your IFN-γ and TNF-α levels:		
Study average IFN-γ and TNF-α 50 th percentile levels:		
Study Range for IFN-γ and TNF-α :		
Detected in what Percent of Study participants?		
Expected Range for IFN-γ and TNF-α :	Not Established	
Please note: If your results are significantly different than the average found in this study, it does not necessarily mean you have a health problem. If you have any concerns, you should consult your physician.		

Below Limit of Detection (<LOD) means there was not enough of the compound in the blood sample for the instrument to provide a confident answer.

Basics of interferon gamma (IFN- γ):

Interferon gamma is a signaling protein. It is a type of cytokine that plays an important role in the body's adaptive immune response, particularly against viral and bacterial infections and has been shown to relate to the fighting off of allergic diseases (like asthma).

- **IFN- γ :** This cytokine has both pro- and anti-inflammatory properties.

Basics of tumor necrosis factor (TNF- α):

Tumor necrosis factors are a family of proteins that are also within the cytokine group. The proteins in this family are part of the body's immune response system and can cause cell death. As the name suggests, tumor necrosis factors also play a role in defending the body against tumor growth.

- **TNF- α :** This is a pro-inflammatory cytokine.

Part 2: Health Marker Results

If I have a high level (or a low level) of the cytokines (markers of immune function and inflammation) does that mean I'm sick?

- **No.**
 - *All of the cytokine measures (including the interleukins)* evaluated in this study are considered “subclinical” and at this time have no clear diagnostic meaning. This means that although there is research about associations between levels of these compounds and specific health effects, nothing conclusive has been determined by the medical community.
 - There is no defined “healthy range” for any of the cytokine compounds.
 - Because there is no “healthy range” for the levels of these compounds, you can only compare yourself to the PFAS-AWARE study population. The study population is a small group of people and may not be representative of the general population.
 - There are many things that can affect the levels of the cytokines including but not limited to:
 - Exercise level
 - Medications
 - Age
 - Diet
 - Stress

Part 2: Health Marker Results

For more information about blood biomarker levels:

Basics of Interleukins: <https://www.britannica.com/science/interleukin>

Tumor Necrosis Factor: https://www.hss.edu/professional-conditions_the-history-basic-science-biology-tnf.asp

Chronic Inflammation:

- <http://health.usnews.com/health-news/family-health/articles/2009/11/02/chronic-inflammation-reduce-it-to-protect-your-health>
- <https://healthletter.mayoclinic.com/editorial/editorial.cfm/i/163/t/Buzzed%20on%20inflammation/>

Note: We have links to all these sites on the www.PFAS-AWARE.org website.