Compared to U.S. residents without a known high exposure to PFCs tested in 2011-2012, the average amount of PFOA, PFOS, and PFHxS in blood samples from the adult Pease Tradeport community is higher.

The amounts of PFOA and PFOS are, however, similar to amounts detected in the U.S. population over the last decade.
Summary for the First 98 Participants (2)

Compared with other communities exposed to environmental contamination and with chemical plant workers, the average amount of PFOA, PFOS, and PFHxS in blood samples from the adult Pease Tradeport community is **lower**.

Compared to U.S. residents without a known high exposure to PFCs tested in 2011-2012, the average amount of PFCs (other than PFOA, PFOS, and PFHxS) in blood samples from the adult Pease Tradeport community were **similar** or **lower**.
Perfluorochemical (PFC) Testing Program: Summary of the First 98 Test Results

Benjamin P. Chan, MD, MPH
NH State Epidemiologist
Department of Health & Human Services
June 17, 2015
Purpose of Tonight’s Meeting

- Review the testing program, including the results reporting process
- Review initial results from the first 98 participants (note: a detailed epidemiologic analysis will be done at the end of the testing program)
- Highlight the work DHHS & partners are doing to provide you your test results and information about PFCs
- Offer a chance for questions and feedback
Current Status of the Testing Program

- 100 people tested (Adults)
- Reporting out participant results today
- Shipped blood samples for the next 100-200 people to the CDC
- We will report individual results as testing is completed
- We are expecting approximately 500 people total will participate in the testing program
- When all results are back, we will give you a complete analysis at another community meeting
Multiagency Collaborative Response

- U.S. Air Force
- Environmental Protection Agency (EPA)
- NH Dept. of Environmental Services (DES)
- NH Department of Health & Human Services (DHHS)
- Northern New England Poison Center (NNEPC)
- Centers for Disease Control and Prevention (CDC)
- Agency for Toxic Substances and Disease Registry (ATSDR)
- Environmental Medical Group at Boston Children’s Hospital
- Portsmouth Regional Hospital
- Community Advisory Board (CAB) & community members
- Senator Shaheen & staff
- Senator Ayotte & staff
<table>
<thead>
<tr>
<th>PFC Name</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>perfluorooctane sulfonic acid</td>
<td>PFOS</td>
</tr>
<tr>
<td>perfluorooctanoic acid</td>
<td>PFOA</td>
</tr>
<tr>
<td>perfluorohexane sulfonic acid</td>
<td>PFHxS</td>
</tr>
<tr>
<td>perfluorononanoic acid</td>
<td>PFNA</td>
</tr>
<tr>
<td>perfluorodecanoic acid</td>
<td>PFDeA</td>
</tr>
<tr>
<td>perfluoroundecanoic acid</td>
<td>PFUA</td>
</tr>
<tr>
<td>Perfluorooctane sulfonamide*</td>
<td>PFOSA</td>
</tr>
<tr>
<td>2-(N-ethyl-perfluorooctane sulfonamido) acetic acid*</td>
<td>ET-PFOSA-ACOH</td>
</tr>
<tr>
<td>2-(N-methyl-perfluorooctane sulfonamido) acetic acid*</td>
<td>ME-PFOSA-ACOH</td>
</tr>
</tbody>
</table>

* PFCs tested in blood by CDC lab, but not tested in water
** PFCs not tested in blood by CDC lab, but tested in water

PFC Levels in μg/L
# PFCs Tested in Water

## PFC Levels in μg/L

<table>
<thead>
<tr>
<th>PFC Name</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>perfluorooctane sulfonic acid</td>
<td>PFOS</td>
</tr>
<tr>
<td>perfluorooctanoic acid</td>
<td>PFOA</td>
</tr>
<tr>
<td>perfluorohexane sulfonic acid</td>
<td>PFHxS</td>
</tr>
<tr>
<td>perfluorononanoic acid</td>
<td>PFNA</td>
</tr>
<tr>
<td>perfluorodecanoic acid</td>
<td>PFDeA</td>
</tr>
<tr>
<td>perfluoroundecanoic acid</td>
<td>PFUA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PFC Name</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perfluorododecanoic acid**</td>
<td>PFDoA</td>
</tr>
<tr>
<td>Perfluoropentanoic acid**</td>
<td>?</td>
</tr>
<tr>
<td>Perfluorobutane sulfonate**</td>
<td>PFBuS</td>
</tr>
<tr>
<td>Perfluorohexanoic acid**</td>
<td>PFHxA</td>
</tr>
<tr>
<td>Perfluoroheptanoic acid**</td>
<td>PFHpA</td>
</tr>
</tbody>
</table>

* PFCs tested in blood by CDC lab, but not tested in water
** PFCs not tested in blood by CDC lab, but tested in water
# PFC levels in Water

<table>
<thead>
<tr>
<th>PFC Name</th>
<th>Abbreviation</th>
<th>Haven Well</th>
<th>Harrison Well</th>
<th>Smith Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>perfluorooctane sulfonic acid</td>
<td>PFOS</td>
<td>2.50</td>
<td>0.05</td>
<td>0.02</td>
</tr>
<tr>
<td>perfluoroctanoic acid</td>
<td>PFOA</td>
<td>0.35</td>
<td>0.009</td>
<td>0.004</td>
</tr>
<tr>
<td>perfluorohexane sulfonic acid</td>
<td>PFHxS</td>
<td>0.83</td>
<td>0.04</td>
<td>0.01</td>
</tr>
<tr>
<td>perfluorononanoic acid</td>
<td>PFNA</td>
<td>0.02</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>perfluorodecanoic acid</td>
<td>PFDeA</td>
<td>0.005</td>
<td>ND</td>
<td>0.004</td>
</tr>
<tr>
<td>perfluoroundecanoic acid</td>
<td>PFUA</td>
<td>ND</td>
<td>ND</td>
<td>0.02</td>
</tr>
<tr>
<td>Perfluorooctane sulfonamide*</td>
<td>PFOSA</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>2-(N-ethyl-perfluorooctane sulfonamido) acetic acid*</td>
<td>ET-PFOSA-ACOH</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>2-(N-methyl-perfluorooctane sulfonamido) acetic acid*</td>
<td>ME-PFOSA-ACOH</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Perfluorododecanoic acid**</td>
<td>PFDoA</td>
<td>ND</td>
<td>ND</td>
<td>0.01</td>
</tr>
<tr>
<td>Perfluoropentanoic acid**</td>
<td>?</td>
<td>0.27</td>
<td>0.008</td>
<td>0.004</td>
</tr>
<tr>
<td>Perfluorobutane sulfonate**</td>
<td>PFBuS</td>
<td>0.05</td>
<td>0.002</td>
<td>0.0009</td>
</tr>
<tr>
<td>Perfluorohexanoic acid**</td>
<td>PFHXA</td>
<td>0.33</td>
<td>0.009</td>
<td>0.004</td>
</tr>
<tr>
<td>Perfluoroheptanoic acid**</td>
<td>PFHpA</td>
<td>0.12</td>
<td>0.005</td>
<td>0.003</td>
</tr>
</tbody>
</table>

* PFCs tested in blood by CDC lab, but not tested in water
** PFCs not tested in blood by CDC lab, but tested in water

ND = Not Detected
Statistics Overview

Range: The lowest and highest levels found in the U.S. population sample

Geometric Mean: A special type of average
- Most people will not have a blood level of a PFC that exactly matches the average number; it will be above or below.

95th percentile: Describes the spread of a set of numbers
- In a group of numbers, 95% will be at or below the 95th percentile.
- The remaining 5% will be above it.
- If a person has a PFC level close to the 95th percentile it means they have a PFC level at the higher end of what is normally found in the U.S. population.
Statistics Overview

The mean (average) and 95\textsuperscript{th} percentile do not tell us anything about possible health impacts.

The numbers are simply a way for you to compare your results with others.

Specific health effects cannot currently be linked to PFC blood levels.
# ADULT LABORATORY REPORT

**Participant Name:** Benjamin Chan  
**Participant Identification Number:** PT9999

## Your Perfluorochemical (PFC) Blood Test Results Compared with National Averages*

<table>
<thead>
<tr>
<th>PFC Tested</th>
<th>Your Level (µg/L)</th>
<th>Levels in the U.S. Population (µg/L)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Range</td>
<td>Geometric Mean</td>
</tr>
<tr>
<td>PFOA, perfluorooctanoic acid</td>
<td>4.97</td>
<td>0.07-43</td>
</tr>
<tr>
<td>PFOS, perfluorooctane sulfonic acid</td>
<td>5.2</td>
<td>0.14-235</td>
</tr>
<tr>
<td>PFHxS, perfluorohexyl sulfonate</td>
<td>2.15</td>
<td>0.07-47.8</td>
</tr>
<tr>
<td>PFUA, perfluoronondecanoic acid</td>
<td>&lt;LOD</td>
<td>0.07-6.96</td>
</tr>
<tr>
<td>PFOSA, perfluoroctane sulfonamide</td>
<td>&lt;LOD</td>
<td>0.07-0.62</td>
</tr>
<tr>
<td>PFNA, perfluorononanoic acid</td>
<td>0.627</td>
<td>0.06-80.77</td>
</tr>
<tr>
<td>PFDeA, perfluorodecanoic acid</td>
<td>0.631</td>
<td>0.07-17.8</td>
</tr>
<tr>
<td>Me-PFOSA-AcOH2, 2-(N-methyl-perfluoroctane sulfonylamido) acetic acid</td>
<td>0.372</td>
<td>0.06-4.25</td>
</tr>
<tr>
<td>Et-PFOSA-AcOH, 2-(N-ethyl-perfluoroctane sulfonylamido) acetic acid</td>
<td>&lt;LOD</td>
<td>0.07-0.72</td>
</tr>
</tbody>
</table>

(µg/L) = micrograms per liter  
LOD = limit of detection (0.01 µg/L)

Samples were analyzed at the National Center for Environmental Health, US Centers for Disease Control and Prevention, Chamblee, GA.


**The national average was not calculated for this PFC, as the proportion of results below limit of detection was too great to provide a valid result.

A health level concern has not been established for perfluorochemicals in blood.
Your perfluorochemical levels compared with the national average


**The national average was not calculated for this PFC, as the proportion of results below limit of detection was too great to provide a valid result.

A health level concern has not been established for perfluorochemicals in blood.
## Summary of first 98 results compared to U.S. Population

<table>
<thead>
<tr>
<th>PFC Tested</th>
<th>Geometric Mean, first 98 samples (µg/L)</th>
<th>Range</th>
<th>Geometric Mean</th>
<th>95th Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PFOA</strong> perfluorooctanoic acid</td>
<td>3.20</td>
<td>0.07-43</td>
<td>2.08</td>
<td>5.68</td>
</tr>
<tr>
<td><strong>PFOS</strong> perfluorooctane sulfonic acid</td>
<td>8.08</td>
<td>0.14-235</td>
<td>6.31</td>
<td>21.7</td>
</tr>
<tr>
<td><strong>PFHxS</strong> perfluorohexyl sulfonate</td>
<td>4.79</td>
<td>0.07-47.8</td>
<td>1.28</td>
<td>5.44</td>
</tr>
<tr>
<td><strong>PFUA</strong> perfluoroundecanoic acid</td>
<td>0.20</td>
<td>0.07-6.96</td>
<td>**</td>
<td>0.620</td>
</tr>
<tr>
<td><strong>PFOSA</strong> perfluoroctane sulfonamide</td>
<td>0.10</td>
<td>0.07-0.62</td>
<td>**</td>
<td>&lt;LOD</td>
</tr>
<tr>
<td><strong>PFNA</strong> perfluorononanoic acid</td>
<td>0.69</td>
<td>0.06-80.77</td>
<td>0.881</td>
<td>2.54</td>
</tr>
<tr>
<td><strong>PFDeA</strong> perfluorodecanoic acid</td>
<td>0.21</td>
<td>0.07-17.8</td>
<td>0.199</td>
<td>0.690</td>
</tr>
<tr>
<td><strong>Me-PFOSA-AcOH2</strong> 2-(N-methyl-perfluorooctane sulfonamido) acetic acid</td>
<td>0.15</td>
<td>0.06-4.25</td>
<td>**</td>
<td>0.690</td>
</tr>
<tr>
<td><strong>Et-PFOSA-AcOH</strong> 2-(N-ethyl-perfluorooctane sulfonamido) acetic acid</td>
<td>0.14</td>
<td>0.07-0.72</td>
<td>**</td>
<td>0.110</td>
</tr>
</tbody>
</table>

(µg/L) = micrograms per liter
LOD = limit of detection (0.01 µg/L)


** The national average was not calculated for this PFC, as the proportion of results below limit of detection was too great to provide a valid result.
PFOA average compared to NHANES

**Mean Concentration (μg/L)**

- NHANES
- NH

---

New Hampshire Department of Health & Human Services

[Graph showing comparison of PFOA concentrations between NHANES and NH]
PFOA Distribution of Results

19% above the NHANES 95th Percentile
PFOS average compared to NHANES

PFOS NH vs. NHANES

Mean Concentration (μg/L)

PFOS

NHANES

NH
PFOS Distribution of Results

PFOS Distribution

8% above the NHANES 95th Percentile

# Patients

Level (µg/L)
PFHxS average compared to NHANES
PFHxS Distribution of Results

41% above the NHANES 95th Percentile
PFNA compared to NHANES

PFNA NH VS. NHANES

Mean Concentration (μg/L)

PFNA

NHANES

NH
PFNA Distribution of Results

PFNA Distribution

#Patients

Level (μg/L)

0-0.25 0.25-0.5 0.5-0.75 0.75-1 1-1.25 1.25-1.5 1.5-1.75 1.75-2 >=2

NHANES Mean

NHANES 95th Percentile
PFDeA average compared to NHANES

![Bar chart showing PFDeA NH vs. NHANES](chart.png)
Me-PFOSA-AcOH Distribution of Results

Me-PFOSA-AcOH Distribution

No NHANES Mean Calculated

NHANES 95th Percentile

# Patients

Level (µg/L)

< LOD 0.1 0.2 0.3 0.4 0.5 0.6 0.7

0 10 20 30 40 50 60
Et-PFOSA-AcOH Distribution of Results

Et-PFOSA-AcOH Distribution

No NHANES Mean Calculated

NHANES 95th Percentile

# Patients

Level (μg/L)

< LOD

0.1

0.2
The average levels of PFOA, PFOS, and PFHxS were higher than the national averages.

The levels of the other PFCs were similar or lower than the national comparisons.

Overall the levels of PFOA, PFOS, and PFHxS are lower than what has been seen in other environmentally exposed communities and chemical plant workers.
PFOS Comparison to Other Study Populations

PFOS Geometric Mean Serum Concentration (μg/L) in Various Study Populations (Chemical Workers, Environmentally Exposed Communities, & General U.S. Population)

- 3M Workers, Decatur AL (2000)
- Ohio River Valley (2005-2006)
- Decatur, Alabama (2009)
- Red Cross Donors in 6 cities (2006)
- Pease Tradeport NH, First 98 (2015)
- NHANES (2005-2006)
- NHANES (2011-2012)
PFOS Comparison to Other Study Populations

PFOS Geometric Mean Serum Concentration (µg/L) in Various Study Populations (Environmentally Exposed Communities, & General U.S. Population)

- Ohio River Valley (2005-2006)
- Decatur, Alabama (2009)
- Red Cross Donors in 6 cities (2006)
- Pease Tradeport NH, First 98 (2015)
- NHANES (2005-2006)
- NHANES (2011-2012)
PFOA Comparison to Other Study Populations

PFOA Geometric Mean (unless otherwise noted*) Serum Concentration (µg/L) in Various Study Populations (Chemical Workers, Environmentally Exposed Communities, & General U.S. Population)

- 3M Workers, Decatur AL (2000)
- Dupont Workers, WV (2004)*
- Ohio River Valley (2005-2006)
- Decatur, Alabama (2009)
- Red Cross Donors in 6 cities (2006)
- Pease Tradeport NH, First 98 (2015)
- NHANES (2005-2006)
- NHANES (2011-2012)

* Indicates Arithmetic mean reported (instead of geometric mean). Arithmetic mean is usually higher than the geometric mean.
PFOA Comparison to Other Study Populations

PFOA Geometric Mean Serum Concentration (µg/L) in Various Study Populations (Environmentally Exposed Communities, & General U.S. Population)

- Ohio River Valley (2005-2006)
- Decatur, Alabama (2009)
- Red Cross Donors in 6 cities (2006)
- Pease Tradeport NH, First 98 (2015)
- NHANES (2005-2006)
- NHANES (2011-2012)
PFHxS Comparison to Other Study Populations

PFHxS Geometric Mean (unless otherwise noted*) Serum Concentration ($\mu$g/L) in Various Study Populations (Chemical Workers, Environmentally Exposed Communities, & General U.S. Population)

- 3M Workers (2004)*
- Ohio River Valley (2005-2006)
- Decatur, Alabama (2009)
- Red Cross Donors in 6 cities (2006)
- Pease Tradeport NH, First 98 (2015)
- NHANES (2005-2006)
- NHANES (2011-2012)

* Indicates Arithmetic mean reported (instead of geometric mean). Arithmetic mean is usually higher than the geometric mean.
PFHxS Comparison to Other Study Populations

PFHxS Geometric Mean Serum Concentration (µg/L) in Various Study Populations (Environmentally Exposed Communities, & General U.S. Population)

- Ohio River Valley (2005-2006)
- Decatur, Alabama (2009)
- Red Cross Donors in 6 cities (2006)
- Pease Tradeport NH, First 98 (2015)
- NHANES (2005-2006)
- NHANES (2011-2012)
## References for Study Comparisons

### References for Study Population Graph Comparisons:

<table>
<thead>
<tr>
<th>Location</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>3M workers (PFOS and PFOA)</td>
<td>Olsen GW, et al. Epidemiologic assessment of worker serum perfluorooctanesulfonate (PFOS) and perfluorooctanoate (PFOA) concentrations and medical surveillance examinations. J</td>
</tr>
<tr>
<td>Ohio River Valley</td>
<td>Frisbee et al. The C8 Health Project: Design, methods, and participants. Env Health Persp 2009;117(12):1873-82.</td>
</tr>
</tbody>
</table>
Perfluorohexane Sulphonic Acid (PFHxS)

- Found in firefighting foams called aqueous film-forming foams (AFFF)
- Detected in the Haven well (April-May 2014) possibly from contamination with AFFF used while Pease operated as an Air Force base
- Also found in stain resistant sprays for carpets and furniture
- PFHxS is one of the main PFCs commonly found in studies analyzing household dust (along with PFOS and PFOA)
- As with PFOS and PFOA, no one can be sure about the health effects of PFHxS on humans.
Northern New England Poison Center (NNEPC) is establishing an inquiry line for questions about individual results

DHHS will be hosting a healthcare provider Webinar next week to inform healthcare providers

Working with the Boston Environmental Health Medical Group and the CDC/ATSDR

Working closely with Department of Environmental Services

Coordinate our efforts with the Community Advisory Board (CAB)
Thank You to our Partners

- Community Advisory Board (CAB)
- Senator Shaheen and Senator Ayotte
- CDC/ATSDR
- Dr. Alan Woolf at Boston Children’s Hospital, Environmental Medical Group
- Northern New England Poison Center
- NH Department of Environmental Services
- Portsmouth Regional Hospital
Thank You!

Questions?