HEALTH EFFECTS OF PFAS

DR. KRISTIN BRIDGES, PHD
PUBLIC HEALTH SCIENTIST
ENVIRONMENTAL PUBLIC HEALTH PROGRAM
ALASKA DEPARTMENT OF HEALTH AND SOCIAL SERVICES
• HUMAN-MADE CLASS OF CHEMICALS WITH A WIDE VARIETY OF APPLICATIONS

• EXTREMELY STABLE IN THE ENVIRONMENT WIDELY DISTRIBUTED
HOW CAN I BE EXPOSED TO PFAS?

Contaminated water  Firefighting foams  Contaminated food

Hand to mouth transfer  Maternal Transfer  PFAS treated fabrics
WHAT IF I’M EXPOSED?

Globally Distributed

Human Exposure

NHANES survey found PFAS present in the blood of nearly every person tested (> 2,000 people)

EXPOSURE DOESN’T ALWAYS LEAD TO HEALTH EFFECTS!
PFAS Use in products

- Fire Fighting Foams
- Cookware, pizza boxes, fast food wrappers, popcorn bags...
- Stain repellants for carpets, clothing, furniture...
- Personal care products – shampoo, conditioner, toothpaste, floss...
- Polishes, waxes, and paints
- Electronics manufacturing
Contaminated Site Regulatory Process

Site Discovery
- Spill occurs and is reported
- Contamination discovered
- Compounds found to be harmful

Characterization
- What is it
- Where is it
- How did it get there
- Where is it going
- Who and what may be effected

Cleanup and Mitigation
- Interim actions (e.g., provide water)
- Long-term Solution

Site Closure
Soluble contaminants can be transported in groundwater. As groundwater moves, it will carry dissolved substances with it. If an ongoing source exists, the plume will expand.
PFAS AWARENESS

2012-2015

• Third Unregulated Contaminant Monitoring Rule (UCRM3)

2016

• EPA Lifetime Health Advisory level 70 ppt PFOA+PFOS
• DEC groundwater cleanup 400 ppt PFOA and 400 ppt PFOS

2018

• DEC action level 70 ppt for five PFAS
### DEC PFAS ACTION LEVELS (Aug 2018)

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Summed Action Level</th>
<th>Action Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>perfluorooctanesulfonic acid (PFOS)</td>
<td></td>
<td>70 ppt</td>
</tr>
<tr>
<td>perfluorooctanoic acid (PFOA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>perfluorononanoic acid (PFNA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>perfluorohexanesulfonic acid (PFHxS)</td>
<td></td>
<td></td>
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<tr>
<td>perfluoroheptanoic acid (PFHpA)</td>
<td></td>
<td></td>
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<tr>
<td>perfluorobutanesulfonic acid (PFBS)</td>
<td></td>
<td>2000 ppt</td>
</tr>
</tbody>
</table>
## SUMMARY OF INITIAL GUSTAVUS SAMPLE RESULTS - REVISED

<table>
<thead>
<tr>
<th>Sample Name</th>
<th>Well Owner</th>
<th>Sample Date</th>
<th>Perfluorobutane sulfonic acid (PFBS)</th>
<th>Perfluorooctanoic acid (PFOA)</th>
<th>Perfluorooctanoic acid (PFNA)</th>
<th>Perfluorohexane sulfonic acid (PFHxS)</th>
<th>Sum of 5 PFAS$\text{§}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alaska Airlines Well AE20399</strong></td>
<td>ADOT&amp;PF</td>
<td>6/27/18</td>
<td>3.7 JH$^*$</td>
<td>250 JL$^*$</td>
<td>287 J$^*$</td>
<td>70$^§$</td>
<td></td>
</tr>
<tr>
<td><strong>Gustavus Water Plant AE20398</strong></td>
<td>NPS</td>
<td>6/27/18</td>
<td>&lt;1.9 B$^*$</td>
<td>16 JL$^*$</td>
<td>44 J$^*$</td>
<td>70$^§$</td>
<td></td>
</tr>
</tbody>
</table>

- Ppt: parts per trillion, equivalent to nanograms per liter
- ADEC: Alaska Department of Environmental Conservation
- ADOT&PF: Alaska Department of Transportation & Public Facilities
- NPS: National Park Service
- §: Sum of 5 PFAS is equal to the sum of PFOS, PFOA, PFHxS, PFHpA, and PFNA. Action level is 70 ppt; results are compared to 65 ppt. ADEC technical memorandum issued August 20, 2018.
- Bold: Concentration exceeds action level.
- <: Analyte not detected; listed as less than the reporting limit (RL) unless otherwise flagged due to quality-control (QC) failures.
- B$: Result considered non-detect due to method blank contamination. Listed as less than the reporting limit. Flag applied by Shannon & Wilson, Inc.
- JH*: Estimated concentration, biased high, due to method blank contamination. Flag applied by Shannon & Wilson, Inc.
- JL*: Estimated concentration, biased low, due to extraction outside the specified holding time. Flag applied by Shannon & Wilson, Inc.
WHAT ARE THE POTENTIAL HEALTH EFFECTS?
WHAT DOES THE SCIENCE SAY?

• PFAS ARE AN “EMERGING” CONTAMINANT
  • SCIENCE IS STILL EVOLVING
  • CURRENT GUIDANCE BASED OFF OF:
    • EPIEMIOLOGICAL STUDIES
    • EVIDENCE FROM ANIMAL TOXICITY TESTS

• STUDIES OF HIGHLY EXPOSED COMMUNITIES SHOW A PROBABLE LINK BETWEEN 
  EXPOSURE TO CERTAIN TYPES OF PFAS AND EFFECTS ON:
  • GASTROINTESTINAL SYSTEM- ULCERATIVE COLITIS
  • LIVER- LIVER DAMAGE, ABNORMAL FAT METABOLISM, HIGH CHOLESTEROL
  • KIDNEY- KIDNEY CANCER AND CHRONIC KIDNEY DISEASE
  • CARDIOVASCULAR SYSTEM- PREGNANCY-INDUCED HYPERTENSION
  • IMMUNE SYSTEM- DECREASED RESPONSE TO VACCINES
  • REPRODUCTIVE SYSTEM- TESTICULAR CANCER AND DECREASED FERTILITY
  • ENDOCRINE SYSTEM- THYROID DISEASE
  • DEVELOPMENT- REDUCED BIRTH WEIGHT
LIMITATIONS OF EXISTING DATA

EPIDEMIOLOGICAL STUDIES
• CONFOUNDING VARIABLES
• IS THERE ANOTHER POSSIBLE EXPLANATION FOR EFFECTS?
  • PRESENCE OF OTHER CONTAMINANTS
  • GENETICS, AGE, GENDER
  • SOCIOECONOMIC AND NUTRITION STATUS

ANIMALS EXPOSURES
• HIGHER EXPOSURE LEVELS
• DIFFERENCES IN PHYSIOLOGY BETWEEN SPECIES AFFECT:
  • ABSORPTION, DISTRIBUTION, METABOLISM, EXCRETION
  • SENSITIVITY TO CONTAMINANT EXPOSURE

Scientists are still uncertain how long-term, chronic PFAS exposure to may impact human health.
Developing embryos and children through age 18 are considered to be “susceptible populations” according to the U.S. Agency for Toxic Substances and Disease Registry toxicological profile for PFAS.

**Anything Else?**

**This is because of:**

- Transfer from mother to child during pregnancy and breastfeeding
- Hand-to-mouth transfer after handling objects/crawling
- Higher concentration per kg of body weight
- Contaminants that cause developmental and endocrine effects can have permanent effects at lower concentrations in children

**The benefits of breastfeeding outweigh the potential risks**

- We recommend you continue breastfeeding,
- It is essential that pregnant and nursing women do not continue to drink PFAS-contaminated water
Questions About:

HUMAN HEALTH EFFECTS
KRISTIN BRIDGES, PHD
PUBLIC HEALTH SCIENTIST- DHSS
(907) 269-8028
KRISTIN.BRIDGES@ALASKA

CONTAMINATED SITES
JOHN HALVERSON
PROGRAM MANAGER - DEC
(907) 269-7545
JOHN.HALVERSON@ALASKA.GOV
DHSS RECOMMENDATIONS

IF PFAS EXCEEDS DEC’S 70 PPT ACTION LEVEL, YOU SHOULD:

FIND AN ALTERNATIVE WATER SOURCE FOR

Drinking
Giving to pets
Brushing your teeth

YOU CAN CONTINUE USING THE WATER FOR

Showering/Bathing
General cleaning
Laundry