PFASs measured in Biomonitoring California’s Asian/Pacific Islander Community Exposures (ACE) Project

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PFAS in San Francisco Bay Fish
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Biomonitoring California

• Established by the Legislature in 2006 with these main goals:
  • Determine levels of chemicals in Californians
  • Establish trends in the levels of these chemicals over time
  • Help assess the effectiveness of public health efforts and environmental policies to reduce chemical exposures

• Guiding principles in the enabling legislation:
  • Environmental justice
  • “Right to know” – return of all individual results to study participants

Program website: https://www.biomonitoring.ca.gov/
Asian/Pacific Islander Community Exposures (ACE) Project

- Extension of collaborations with community groups on health education & outreach related to safer fish consumption

- Community-based study to biomonitor Asian populations
  - Metals in blood and/or urine: arsenic, cadmium, lead, mercury
  - 32 PFASs in serum (blood)
Concerns about PFASs

- Persistence
- Widespread use
- Linked to serious human health effects
- Widespread detections in the environment and in human and animal samples, including fish
- Continuing substitution of new PFASs
Two phases of ACE

- **ACE 1**: 100 Chinese American participants, mostly in San Francisco
  - Collaboration with APA Family Support Services
  - Urine and blood samples collected in 2016

- **ACE 2**: 100 Vietnamese American participants, mostly in San Jose
  - Collaboration with Vietnamese Voluntary Foundation (VIVO)
  - Urine and blood samples collected in 2017

Biomonitoring CA projects page: [https://biomonitoring.ca.gov/projects/archive](https://biomonitoring.ca.gov/projects/archive)
# Demographics

<table>
<thead>
<tr>
<th></th>
<th>ACE 1 (N=96)</th>
<th>ACE 2 (N=99)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>44</td>
<td>47</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Female</td>
<td>52%</td>
<td>55%</td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;$25K</td>
<td>27%</td>
<td>45%</td>
</tr>
<tr>
<td>$25-$75K</td>
<td>41%</td>
<td>26%</td>
</tr>
<tr>
<td>&gt;$75K</td>
<td>13%</td>
<td>10%</td>
</tr>
<tr>
<td>Declined</td>
<td>20%</td>
<td>18%</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Greater than high school</td>
<td>58%</td>
<td>42%</td>
</tr>
<tr>
<td><strong>Birth country</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Outside the U.S.</td>
<td>81%</td>
<td>96%</td>
</tr>
<tr>
<td><strong>Portion of life in U.S.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average %</td>
<td>51%</td>
<td>36%</td>
</tr>
<tr>
<td><strong>Interview language</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Not English</td>
<td>57%</td>
<td>63%</td>
</tr>
<tr>
<td><strong>Home language</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Not English</td>
<td>79%</td>
<td>97%</td>
</tr>
</tbody>
</table>
Overall detections

- 19 of the 32 PFASs measured were detected in at least 1 participant
- 11 PFASs were detected in at least half of the participants

Data available online at: https://biomonitoring.ca.gov/results/chemical/2183
Overall detections, continued

- **6 PFASs detected in 50-98% of participants**
  - Me-PFOSA-AcOH
  - PFBA
  - PFDeA
  - PFDaO
  - PFDoA
  - PFDS
  - PFHxA

- **5 PFASs detected in >98% of participants**
  - PFOA
  - PFOS
  - PFHxS
  - PFUdA
  - PFNA
ACE compared to NHANES*

*National Health and Nutrition Examination Survey
Demographics associated with PFAS levels

- Sex
- Age
- Birth country
- Time spent in the U.S.
- Interview language
What have we learned?

- Targeted studies can reveal more about sub-groups within California

- California’s regional immigration and racial/ethnicity patterns may contribute to differences in PFAS and other contaminants across the state
What else have we learned?

- Work closely with community partners on outreach, recruitment, education, and dissemination of findings
- Include bilingual and bicultural staff at all levels
- Offer financial incentives for participation
- Be proactive in addressing community concerns (for example, cultural beliefs about giving blood)
Next steps for data analysis

- Further explore exposure questionnaire items
  - Extensive questions on fish & seafood consumption (frequency, types, sources, parts consumed)
  - Other foods (baked goods, dim sum)
  - Use of nonstick rice cooker, personal care products, and waterproofing sprays, waxes, etc. that might contain PFASs
  - Limitations: does not address drinking water sources or ask about number of children or breastfeeding
- Exposures from home country vs. in California

Wang et al. 2015
For more information

• Presentation – Serum PFAS levels and their predictors in San Francisco Bay Area Asian and Pacific Islander Communities:
  https://biomonitoring.ca.gov/events/biomonitoring-california-scientific-guidance-panel-meeting-august-2018

• Exposure questionnaire and results packet:
  https://biomonitoring.ca.gov/events/biomonitoring-california-scientific-guidance-panel-meeting-november-2018
Your Lab Results for **PFASs in Blood**

<table>
<thead>
<tr>
<th>PFAS tested</th>
<th>Your PFAS result (µg/L)</th>
<th>Lowest result found in the ACE II Project (µg/L)</th>
<th>Highest result found in the ACE II Project (µg/L)</th>
<th>Number of ACE II participants with this PFAS found in their blood</th>
<th>Middle level in the U.S. (µg/L)</th>
<th>95th percentile in the U.S. (µg/L)</th>
<th>Level of concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFOA</td>
<td>1.4</td>
<td>0.25</td>
<td>19.9</td>
<td>All 99</td>
<td>2.1</td>
<td>5.6</td>
<td></td>
</tr>
<tr>
<td>PFHxS</td>
<td>0.77</td>
<td>0.34</td>
<td>9.5</td>
<td>All 99</td>
<td>1.4</td>
<td>5.5</td>
<td></td>
</tr>
<tr>
<td>PFOS</td>
<td>6.5</td>
<td>1.5</td>
<td>43.2</td>
<td>All 99</td>
<td>5.6</td>
<td>19.5</td>
<td></td>
</tr>
<tr>
<td>PFNA</td>
<td>1.6</td>
<td>0.35</td>
<td>4.3</td>
<td>98 of 99</td>
<td>0.70</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>PFHxA</td>
<td>0.19</td>
<td>0.06</td>
<td>1.6</td>
<td>97 of 99</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>PFUdA</td>
<td>1.2</td>
<td>0.07</td>
<td>2.9</td>
<td>97 of 99</td>
<td>*</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>Me-PFOSA-AcOH</td>
<td>0.24</td>
<td>0.01</td>
<td>0.52</td>
<td>96 of 99</td>
<td>*</td>
<td>0.60</td>
<td></td>
</tr>
<tr>
<td>PFDeA</td>
<td>0.73</td>
<td>0.26</td>
<td>2.7</td>
<td>87 of 99</td>
<td>0.20</td>
<td>0.80</td>
<td></td>
</tr>
<tr>
<td>PFBA</td>
<td>0.08</td>
<td>0.05</td>
<td>0.92</td>
<td>67 of 99</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>PFDS</td>
<td>0.05</td>
<td>0.01</td>
<td>0.10</td>
<td>59 of 99</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>PFDoA</td>
<td>0.07</td>
<td>0.05</td>
<td>0.29</td>
<td>52 of 99</td>
<td>*</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>PFHpA</td>
<td>Not found</td>
<td>0.05</td>
<td>0.36</td>
<td>20 of 99</td>
<td>*</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>7:3FTA</td>
<td>Not found</td>
<td>0.05</td>
<td>0.15</td>
<td>5 of 99</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>PFbU5</td>
<td>Not found</td>
<td>0.05</td>
<td>0.80</td>
<td>3 of 99</td>
<td>*</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>6:2 FTS</td>
<td>Not found</td>
<td>0.05</td>
<td>0.15</td>
<td>3 of 99</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>PFOSA</td>
<td>Not found</td>
<td>0.01</td>
<td>0.02</td>
<td>3 of 99</td>
<td>*</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>Et-PFOSA-AcOH</td>
<td>Not found</td>
<td>0.05</td>
<td>0.29</td>
<td>3 of 99</td>
<td>*</td>
<td>0.11</td>
<td></td>
</tr>
<tr>
<td>5:3 FTA</td>
<td>Not found</td>
<td>0.06</td>
<td>0.16</td>
<td>2 of 99</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>6:2 diPAP</td>
<td>Not found</td>
<td>0.05</td>
<td>0.35</td>
<td>2 of 99</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
</tbody>
</table>

No state or federal agency has established a level of concern for any PFAS.

We looked for the following additional PFASs, but we did not find any of them in anyone’s blood: 4:2 FTS, 6:6 PFPI, 6:8 PFPI, 8:2 FTS, 8:2 PAP, 8:2 diPAP, FHEA, FHUEA, FOEA, FOUEA, PFHpA, PFOPA, and FOSA.

NA: Not available

* The middle level in the U.S. cannot be calculated because this PFAS was not found in enough people.

** The 95th percentile in the U.S. cannot be calculated because this PFAS was not found in enough people.
Perfluoroalkyl and Polyfluoroalkyl Substances (PFASs) Fact Sheet

PFASs are used to make various products resistant to oil, stains, grease, and water. These chemicals are very long lasting and have spread through the environment.

**PFASs are found in**
- Some food, such as:
  - Some meat and seafood, because some PFASs in the environment can accumulate in animals, fish, and shellfish.
  - Some vegetables grown with water that contains PFASs.
  - Food in certain grease-repellent packaging, including some fast-food wrappers, microwave popcorn bags, take-out boxes, and cardboard containers for frozen foods.
- Some textiles, such as stain-resistant carpets, water-repellent outdoor fabrics, and leather.
- Certain stain- and water-repellent sprays; sealants for granite and other natural stone tiles or countertops; cleaning products; lubricants; polishes; and waxes.
- Some personal care products, such as some skin creams, eye makeup, and dental floss.
- Some nonstick cookware.
- Drinking water sources affected by releases of PFASs into the environment.

**Possible health concerns**
Some PFASs:
- May harm the fetus and child, including effects on growth and development.
- May affect the immune system and liver function.
- May increase the risk of thyroid disease.
- May interfere with the body’s natural hormones.
- May increase cancer risk.

**Possible ways to reduce exposure**
- Include plenty of variety in your and your child’s diet, and limit how often you eat foods in grease-repellent wrappers and containers.
- Avoid products labeled as stain- or water-resistant, such as carpets, furniture, and clothing.
- Check labels of household and personal care products, and avoid those with “fluoro” ingredients. Contact the manufacturer if you can’t find the ingredients on the label.
- If you choose to use protective sprays, sealants, polishes, waxes, or similar products, make sure you have enough ventilation and follow other safety precautions.
- Because PFASs can come out of products and collect in dust:
  - Wash your and your child’s hands often, especially before preparing or eating food.
  - Clean floors regularly, using a wet mop or HEPA vacuum if possible, and use a damp cloth to dust.

Chemical fact sheets: [https://www.biomonitroing.ca.gov/chemicals/fact-sheets](https://www.biomonitroing.ca.gov/chemicals/fact-sheets)
Thanks to:

- ACE 1 and ACE 2 participants
- APA Family Support Services
  - Farmmary Saephan
  - Alex Nguyen
  - Amor Santiago
- VIVO
  - Hang Ho
- All Biomonitoring California staff who contributed to ACE 1 and ACE 2
Thank you for your time!

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