GenX Exposure Study

PFAS blood sample results

Wilmington, November 13, 2018
PFAS stands for per- and polyfluoroalkyl substances

1. Group of chemicals (for example: GenX)
2. Used in consumer products (for example: non-stick pans)
3. Can be released to environment by PFAS manufacturers
Newly identified PFAS in Wilmington drinking water

Cape Fear River

upper Chemours Plant, Fayetteville, NC

lower Wilmington, NC

GenX
It’s not just GenX

GenX and other poorly-understood PFAS
It’s not just GenX

GenX and other poorly-understood PFAS
The GenX Exposure Study

Assess exposure to GenX and related PFAS in people living in the Lower Cape Fear River Basin.

Look for GenX and other PFAS in drinking water, blood and urine.
The GenX Exposure Study

345 participants (56 children)

310 enrolled in November 2017

35 enrolled in May 2018

Collected tap water, blood and urine

44 participants gave two blood samples
GenX Exposure Study Timeline

Nov 2017  Study funded by NIEHS
          Collected tap water, blood and urine

Nov-Feb, 2017  Analyzed tap water from 198 homes

Mar 2018  Review water letters

Apr 2018  Report water results
Most tap water with Cape Fear River source had:

1. GenX
   Median: 50 parts per trillion GenX

2. Nafion byproduct 2, PFMOAA, PFO2HxA, and PFO4DA
<table>
<thead>
<tr>
<th>Date</th>
<th>Task Description</th>
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<tbody>
<tr>
<td>Oct 2017</td>
<td>Study funded</td>
</tr>
<tr>
<td>Nov 2017</td>
<td>Collected tap water, blood and urine</td>
</tr>
<tr>
<td>Nov-Feb, 2017</td>
<td>Analyzed tap water from 198 homes</td>
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<tr>
<td>Mar 2018</td>
<td>Review water letters</td>
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<tr>
<td>Apr 2018</td>
<td>Report water results</td>
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<tr>
<td>May 2018</td>
<td>Blood method development; Update advisory board</td>
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<tr>
<td>Jun 2018</td>
<td>Begin analysis of 388 blood samples</td>
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<tr>
<td>July 2018</td>
<td>Blood sample analysis; Update advisory board</td>
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<tr>
<td>Aug-Sept 2018</td>
<td>Blood sample analysis; Quality controls</td>
</tr>
<tr>
<td>Oct 2018</td>
<td>Review blood letters</td>
</tr>
<tr>
<td>Nov 2018</td>
<td>Report blood results</td>
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</table>
PFAS blood results: Key findings

1. GenX was NOT detected

2. Found new PFAS: Nafion byproduct 2, PFO4DA, PFO5DoDA and Hydro-EVE

3. Levels of historically-used PFAS were higher in Wilmington than United States
Monitored for 23 PFAS in blood
Monitored for 23 PFAS in blood

Newly identified in lower Cape Fear River

GenX
Nafion byproduct 2
PFO3OA
PFO4DA
PFO2HxA

Nafion byproduct 1
Nafion byproduct 4
PFO5DoDA
PEPA
PMPA
NVHOS
Hydro-EVE
Monitored for 23 PFAS in blood

Newly identified in lower Cape Fear River

| GenX                           | PFBA            |
| Nafion byproduct 2             | PFPeA           |
| PFO3OA                        | PFHxA           |
| PFO4DA                        | PFHpA           |
| PFO2HxA                       | PFOA            |
| Nafion byproduct 1             | PFNA            |
| Nafion byproduct 4             | PFDA            |
| PFO5DoDA                      | PFBS            |
| PEPA                          | PFHxS           |
| PMPA                          | PFOS            |
| NVHOS                         | 6:2 FTS         |
| Hydro-EVE                     |                 |
Results for 15 PFAS

Newly identified in lower Cape Fear River

- GenX
- Nafion byproduct 2
- PFO4DA
- Nafion byproduct 1
- PFO5DoDA
- PEPA
- PMPA
- Hydro-EVE

Historically-used

- PFHxA
- PFOA
- PFNA
- PFDA
- PFHxS
- PFOS
- 6:2 FTS

15 New PFAS Newly identified in lower Cape Fear River
What are the results?
Did we find GenX in blood?

No, we did NOT find GenX in blood samples

Method reporting limit: 2 parts per billion GenX
Did we find GenX in blood?

No, we did NOT find GenX in blood samples

Method reporting limit: 2 parts per billion GenX

GenX was NOT found in blood even though 50 parts per trillion in tap water
Did we find GenX in blood?

No, we did NOT find GenX in blood samples

Method reporting limit: 2 parts per billion GenX

GenX was NOT found in blood even though 50 parts per trillion in tap water

GenX was NOT found in blood from 30 people living near the Chemours plant
<table>
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<th>Historically-used</th>
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<tr>
<td>GenX</td>
<td>PFHxDA</td>
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<tr>
<td>Nafion byproduct 1</td>
<td>6:2 FTS</td>
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<tr>
<td>PMPA</td>
<td></td>
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<tr>
<td>PEPA</td>
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Four newly-identified PFAS in blood

1. Nafion byproduct 2 (99% of samples)

2. PFO4DA (98%)

3. PFO5DoDA (87%)

4. Hydro-EVE (76%)
How much was found?

Median blood concentration (parts per billion)
How much was found?

Median blood concentration (parts per billion)
Median blood concentration (parts per billion)

How much was found?

- Nafion byproduct 2
  - PFO4DA
  - PFO5DoDA
How much was found?

Median blood concentration (parts per billion)

- Nafion byproduct 2
- PFO4DA
- PFO5DoDA
- Hydro-EVE
How much was found?

Median blood concentration (parts per billion)

No published health or toxicology data
Are these findings unique to Wilmington?

Yes.
Are these findings unique to Wilmington?

Yes.

We did not find Nafion byproduct 2, PFO4DA, PFO5DoDA or Hydro-EVE in blood from two other groups.


Blood concentrations decrease after six months

Median blood concentration for 44 participants (parts per billion)
Blood concentrations decrease after six months

Median blood concentration for 44 participants (parts per billion)
PFAS blood results: Key findings

1. GenX was NOT detected

2. Found four new PFAS: Nafion byproduct 2, PFO4DA, PFO5DoDA and Hydro-EVE
   The levels decreased after six months

3. Levels of historically-used PFAS were higher in Wilmington than United States
PFAS blood results: Key findings

1. GenX was NOT detected

2. Found new PFAS: Nafion byproduct 2, PFO4DA, PFO5DoDA and Hydro-EVE
   Their levels decreased after six months

3. Levels of historically-used PFAS were higher in Wilmington than United States
How do we know about other people in United States?

Centers for Disease Control and Prevention’s National Health and Nutrition Examination Survey (NHANES)

PFOA, PFOS, PFHxS, PFNA, PFDA results are publicly-available

1999-2000 survey
2015-2016 survey
PFOA concentration (parts per billion)
PFOA blood levels in United States have decreased
Wilmington PFOA levels similar to US levels 20 years ago.

PFOA concentration (parts per billion)
Half of Wilmington samples above levels for 95% US population in 2015

95% of US at or below 4.1 in 2015
Were other historically-used PFAS levels higher in Wilmington than United States?

Yes.
Were other historically-used PFAS levels higher in Wilmington than United States?

Yes.

Median blood concentration (parts per billion)
What does this mean for Wilmington?

Unusually high exposure to historically-used PFAS compared with United States
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Exposure to historically-used PFAS may result in health effects
What does this mean for Wilmington?

Unusually high exposure to historically-used PFAS compared with United States

Exposure to historically-used PFAS may result in health effects

Do not know what your individual blood level means for your health
Historically-used PFAS levels didn’t change much

Median blood concentration for 44 participants (parts per billion)

- November 2017
- May 2018
Historically-used PFAS levels didn’t change much

Median blood concentration for 44 participants (parts per billion)
PFAS blood results: Key findings

1. GenX was not found
   Even though it was present in tap water

2. Found four new PFAS: Nafion byproduct 2, PFO4DA, PFO5DoDA and Hydro-EVE
   Levels decreased after six months

3. Levels of historically-used PFAS were higher in Wilmington than United States
   Levels didn’t change much after six months
Next steps

Test urine samples for PFAS

Identify predictors of PFAS in blood and urine

Analyze PFAS associations with health measures
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Thank you to GenX Exposure Study participants