

What can science tell us about potential health effects of PFAS found in NC:

**Why understanding effects of PFAS on the immune
system is important**

PFAST Network Team 5C

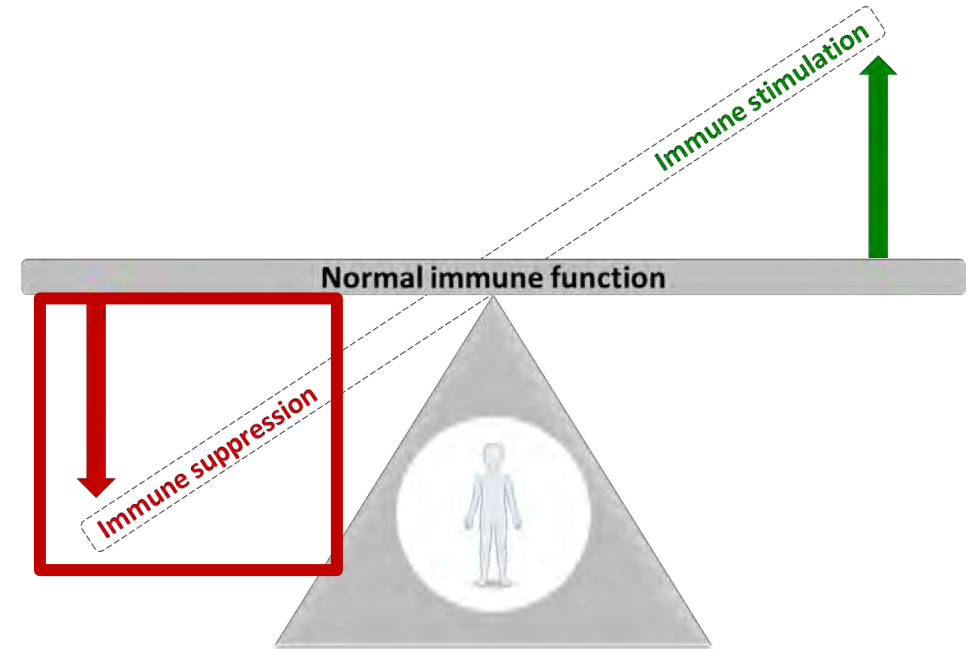
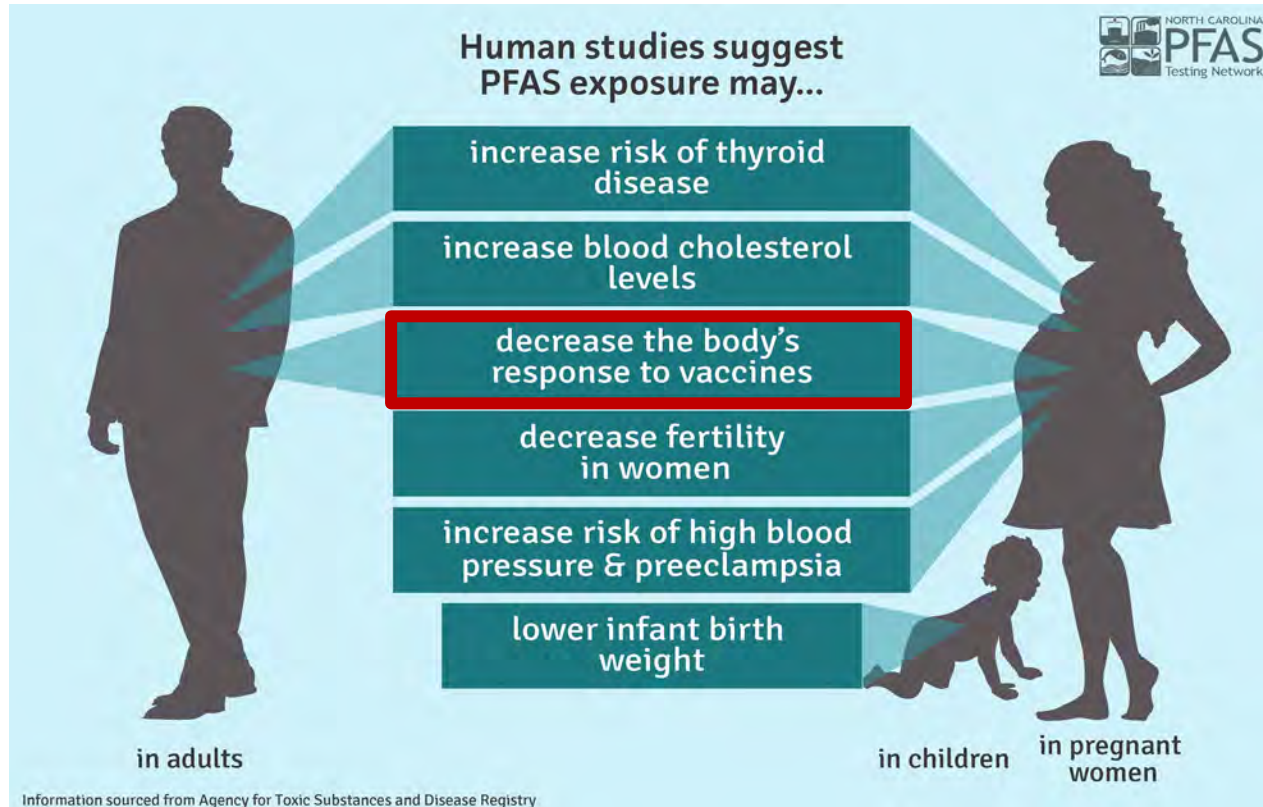
Presented by: Jamie DeWitt

DeWitt Lab PFAS Team: Qing Hu, Dr. Tracey Woodlief, Emma Tobin, Erica Stewart

Department of Pharmacology & Toxicology, Brody School of Medicine, ECU


PFAS Testing Network Seminar Series, 11/6/20

Why ask about effects of PFAS on the immune system?



Why ask about effects of PFAS on the immune system?

Animal studies suggest PFAS exposure is linked to...

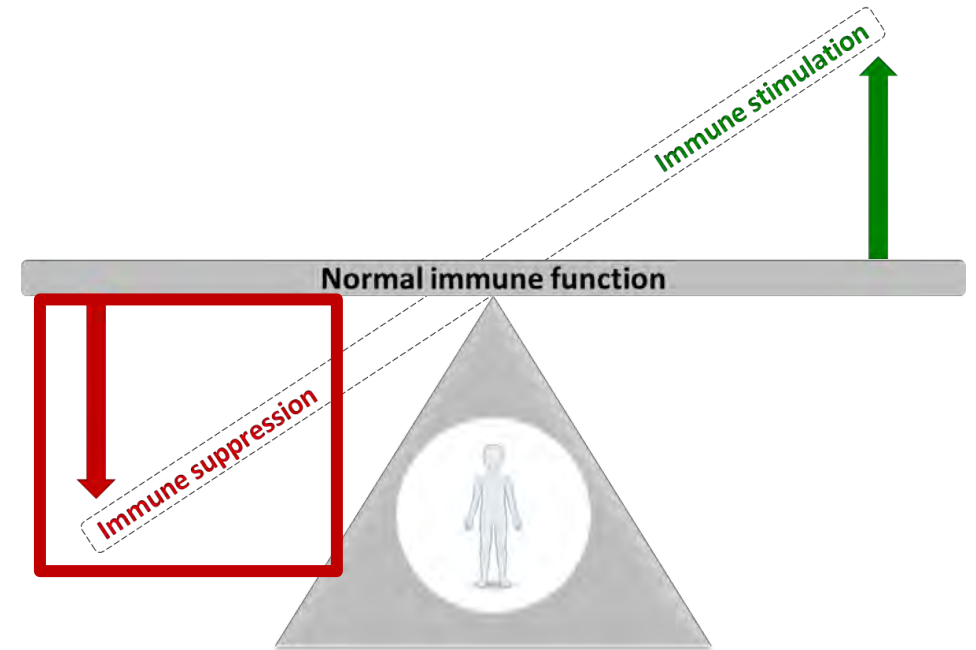



damage to the immune system

liver damage

birth defects, delayed development, and newborn deaths

Information sourced from Agency for Toxic Substances and Disease Registry



Why ask about effects of PFAS on the immune system?





Statement on Potential Intersection between PFAS Exposure and COVID-19:

CDC/ATSDR understands that many of the communities we are engaged with are concerned about how PFAS exposure may affect their risk of COVID-19 infection. We agree that this is an important question.

CDC/ATSDR recognizes that exposure to high levels of PFAS may impact the immune system. There is evidence from human and animal studies that PFAS exposure may reduce antibody responses to vaccines (Grandjean et al., 2017, Looker et al., 2014), and may reduce infectious disease resistance (NTP, 2016). Because COVID-19 is a new public health concern, there is still much we don't know. More research is needed to understand how PFAS exposure may affect illness from COVID-19.

References:

1. Grandjean P, Heilmann C, Weihe P, et al. Estimated exposures to perfluorinated compounds in infancy predict attenuated vaccine antibody concentrations at age 5-years. *J Immunotoxicol.* 2017;14(1):188-195. doi:10.1080/1547691X.2017.1360968
2. Looker C, Luster MI, Calafat AM, et al. Influenza vaccine response in adults exposed to perfluorooctanoate and perfluorooctanesulfonate. *Toxicol Sci.* 2014;138(1):76-88. doi:10.1093/toxsci/kft269
3. NTP (National Toxicology Program). 2016. Monograph on Immunotoxicity Associated with Exposure to Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS). Research Triangle Park, NC: National Toxicology Program. https://ntp.niehs.nih.gov/ntp/ohat/pfoa_pfos/pfoa_pfosmonograph_508.pdf  



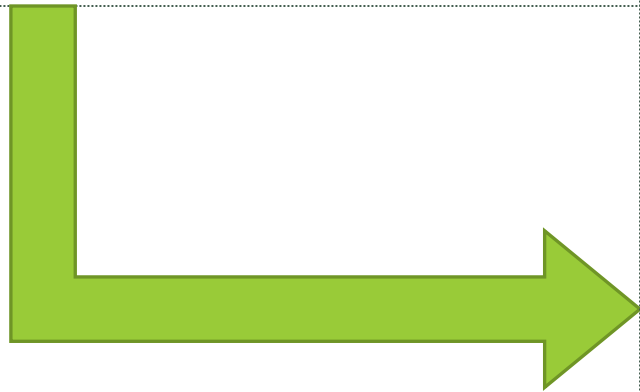
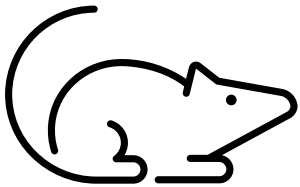
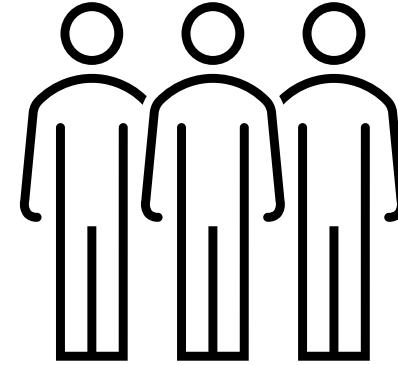
National Toxicology Program
U.S. Department of Health and Human Services

PFOA and **PFOS** (two well-studied PFAS) are presumed to be immune hazards to humans based on evidence that they can suppress antibody production in humans and experimental animals.

The risk of immune effects from PFAS exposure is real.

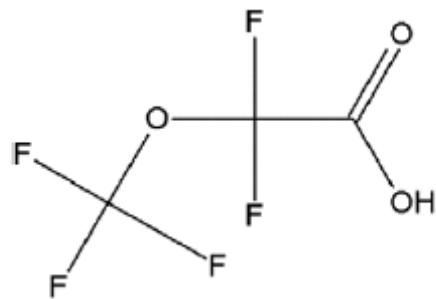
Why ask about antibody production?

Asking only a few immune questions in mice can successfully predict which chemicals are likely to be immunotoxic to humans.

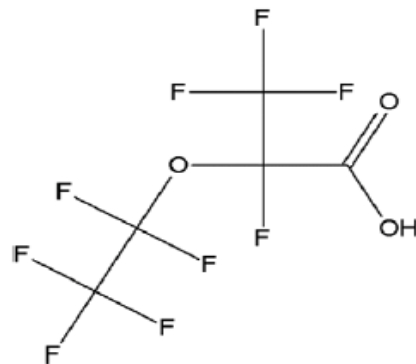


Mice and humans can both make antibodies. When antibody production is affected by a chemical in *mice*, we get concerned that it could be affected in *humans* who are exposed to the same chemical.

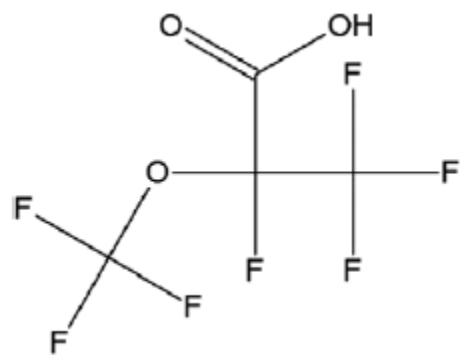
We're asking if some PFAS can affect antibody production.



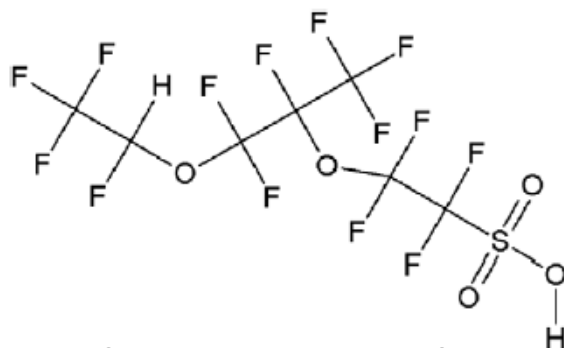
PFMOAA



PFMOBA

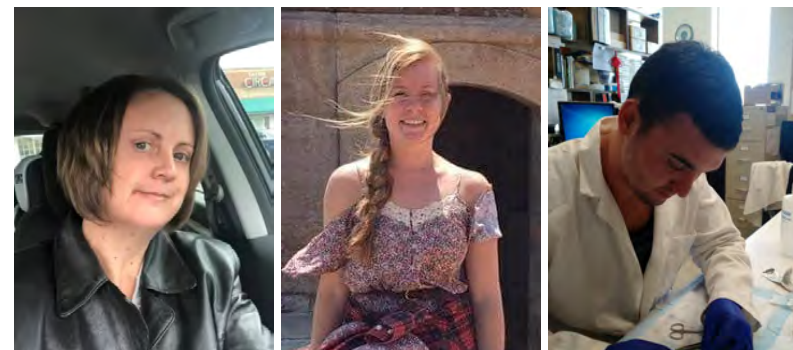


PFMOPrA

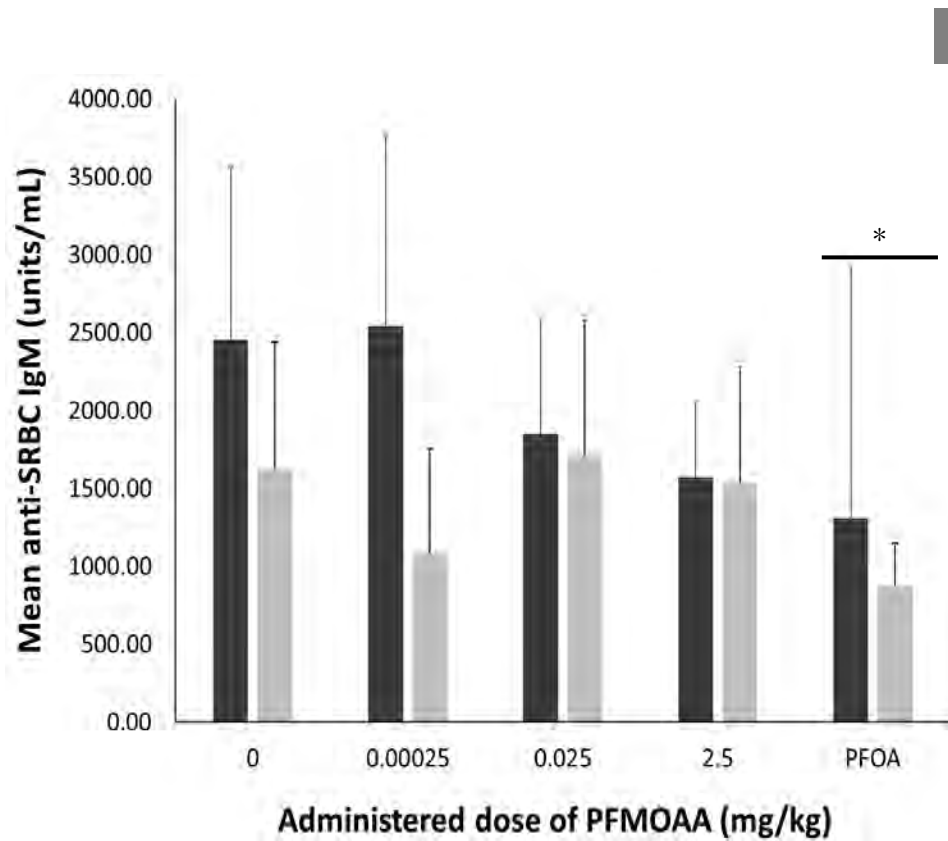


Nafion Byproduct 2

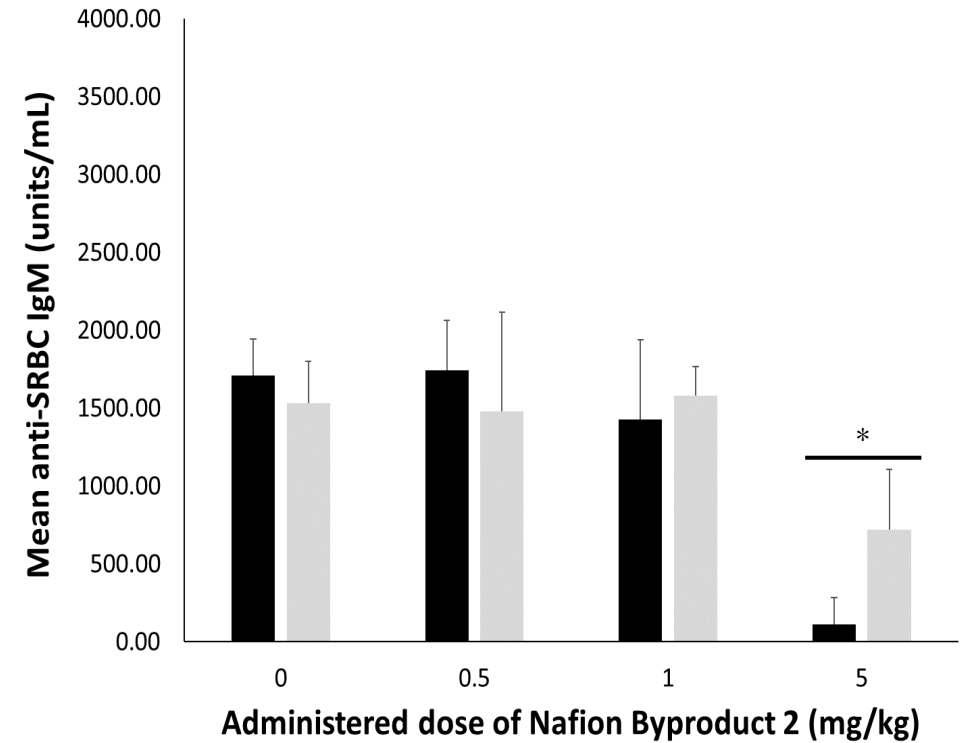
Dr. Tracey Woodlief (postdoc),
Emma Tobin (master's student),
and Sam Vance (past master's
student) are/were running
these experiments.



What have we found?



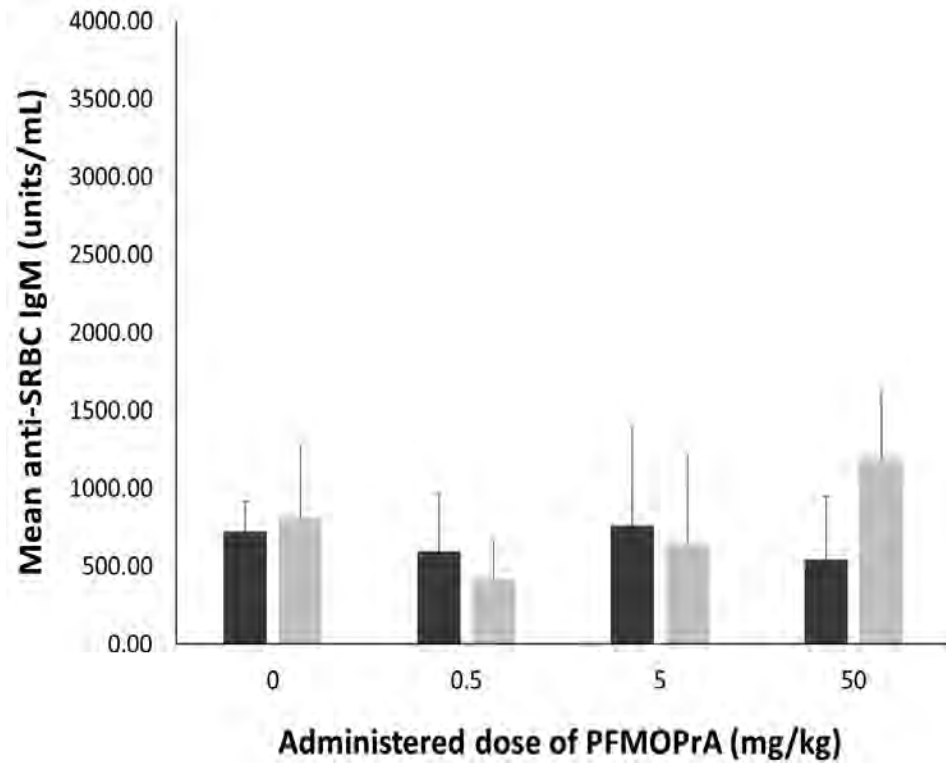
PFMOAA



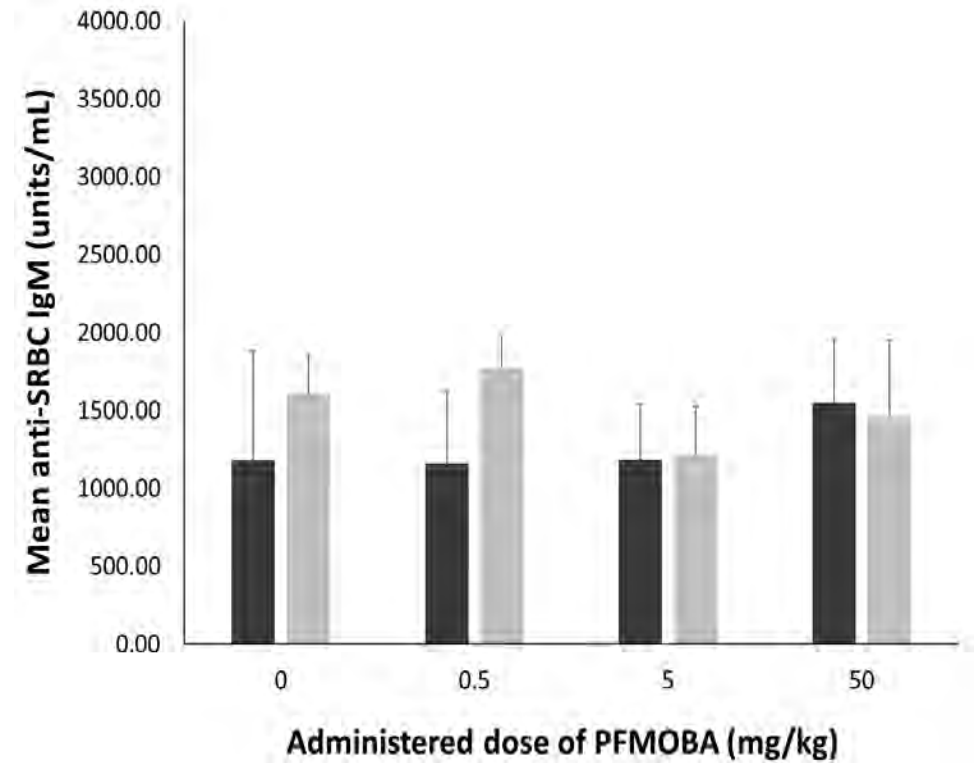
Nafion Byproduct 2

What have we found?

■ Males ■ Females



PFMOPrA



PFMOBA

What do our results so far mean?

PFMCAA - C₃HF₅O₃

perfluoro-2-methoxyacetic acid
(mono-ether carboxylic acid)

PFMOPrA - C₄HF₇O₃

Perfluoro-2-methoxypropanoic acid
(mono-ether carboxylic acid)

PFMABA - C₅HF₉O₃

Perfluoro-4-methoxybutanoic acid
(mono-ether carboxylic acid)

We saw no reductions in antibody production in mice at the doses we tested.

Nafion Byproduct 2 - C₇H₂F₁₄O₅S

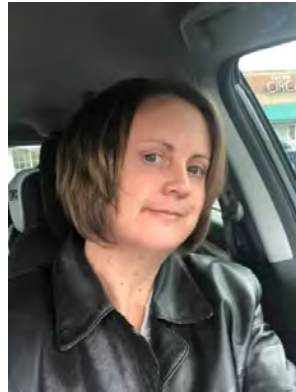
Perfluoro-4-methoxybutanoic acid
(di-ether sulfonic acid)

We saw a reduction in antibody production in mice at the highest dose (5 mg/kg) we tested.

Concern that it may be immunotoxic to humans.

Need to better understand its behavior in humans.

Publications for the studies of these PFAS are very close to being ready to submit!



Sources of DeWitt laboratory funding for PFAS:

- NC General Assembly via the North Carolina Policy Collaboratory
- US EPA/Oregon State University (83948101)
- NIEHS/NC State University (1 P42 ES031009-01)
- NC State University Center for Human Health and the Environment (Dr.Woodlief)
- Brody Brothers Endowment