

Revisiting the PFMOAA Charge and Recommendation

NC Secretaries' Science Advisory Board

August 5, 2026

Frannie Nilsen, PhD



PFMOAA History with NC SSAB

2022:

August 1, October 3, December 5:

The Board discussed two PFMOAA peer-reviewed publications (Yao et al. 2020 and Woodlief et al. 2021) to determine if the existing data is of high enough quality and presents adequate results to derive a reference dose (RfD).

The questions posed to the Board by NCDEQ during the June 6, 2022, meeting were:

1- Review the PFMOAA studies in detail.

- *assess the quality of the studies (low, moderate, high)*
- *based on sample sizes, dose regimes, endpoints measured*

2- Do the studies provide sufficient scientific information to determine a point of departure to derive a reference dose in June 2022?

PFMOAA History with NC SSAB

The Board's response *(abridged):*

- The two studies were of high quality but had limitations that would preclude their use to derive a reference dose.

- The Board recommends that NCDEQ pause derivation of a reference dose until additional publications are available for review.

In the interim, the Board encourages NCDEQ to periodically refresh their PFMOAA literature search for other relevant papers for inclusion in a toxicological synthesis with the expected new information.

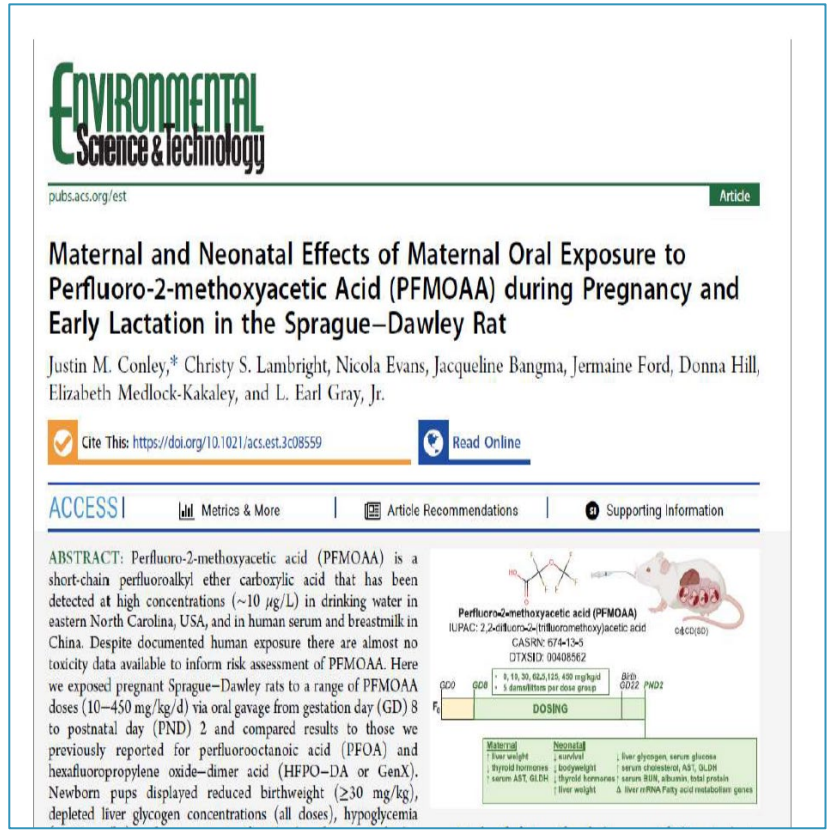
The recordings of the three Board discussions of the topic are here:
NC DEQ and DHHS Secretaries' Science Advisory Board 08/01/2022 (at 1:28:00),
NC DEQ and DHHS Secretaries' Science Advisory Board 10/03/2022 (at 0:22:50),
NC DEQ and DHHS Secretaries' Science Advisory Board 12/05/2022 (at 00:47:33)

PFMOAA History with NC SSAB

August 2024 SAB Meeting Presentation – New PFMOAA Publication

Maternal and neonatal effects of maternal oral exposure to perfluoro-2-methoxyacetic acid (PFMOAA) during pregnancy and early lactation in the Sprague-Dawley rat

Justin Conley
Center for Public Health and Environmental Assessment
US EPA Office of Research and Development



ENVIRONMENTAL Science & Technology

pubs.acs.org/est Article

Maternal and Neonatal Effects of Maternal Oral Exposure to Perfluoro-2-methoxyacetic Acid (PFMOAA) during Pregnancy and Early Lactation in the Sprague–Dawley Rat

Justin M. Conley,* Christy S. Lambright, Nicola Evans, Jacqueline Bangma, Jermaine Ford, Donna Hill, Elizabeth Medlock-Kakaley, and L. Earl Gray, Jr.

Cite This: https://doi.org/10.1021/acs.est.3c08559 Read Online

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ABSTRACT: Perfluoro-2-methoxyacetic acid (PFMOAA) is a short-chain perfluoroalkyl ether carboxylic acid that has been detected at high concentrations (~10 μg/L) in drinking water in eastern North Carolina, USA, and in human serum and breastmilk in China. Despite documented human exposure there are almost no toxicity data available to inform risk assessment of PFMOAA. Here we exposed pregnant Sprague–Dawley rats to a range of PFMOAA doses (10–450 mg/kg/d) via oral gavage from gestation day (GD) 8 to postnatal day (PND) 2 and compared results to those we previously reported for perfluorooctanoic acid (PFOA) and hexafluoropropylene oxide–dimer acid (HFPO–DA or GenX). Newborn pups displayed reduced birthweight (≥30 mg/kg), depleted liver glycogen concentrations (all doses), hypoglycemia

August 2024 PFMOAA Toxicity Studies presentations.pdf

NORTH CAROLINA Department of Environmental Quality

PFMOAA History with NC SSAB

- ***Dec 2024:*Charge Question:**

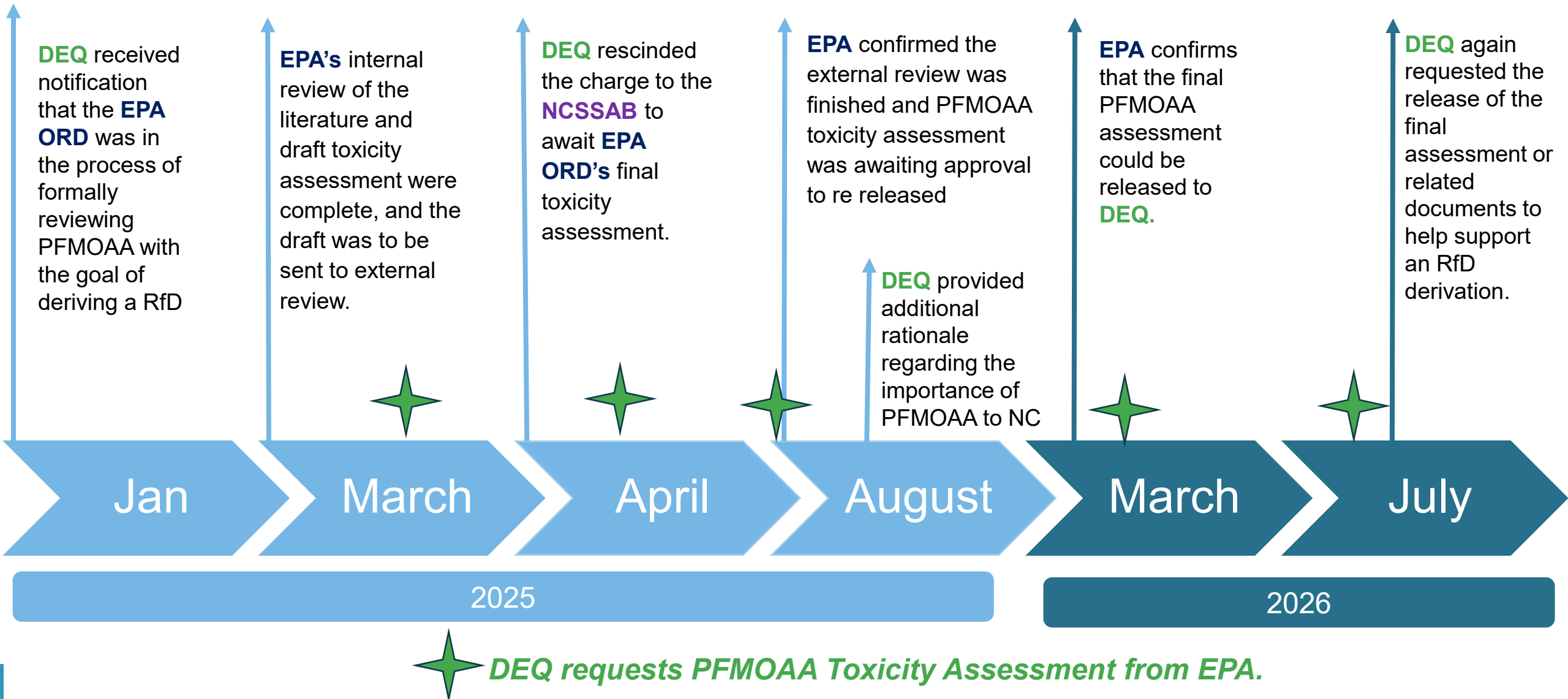
With the studies from Woodlief et al, Yao et al, and Conley et al, is there enough scientific support to identify a Point Of Departure for deriving a Reference Dose for PFMOAA?

- ***DEQ proposed PFMOAA to the EPA as a priority compound to review (circa 2022-2023).***
- ***In January 2025, DEQ received notification that the EPA Office of Research and Development (ORD) was in the process of formally reviewing PFMOAA with the goal of deriving a RfD.***
- ***As of Mid-March 2025, the internal review of the literature and draft toxicity assessment were completed, and the draft was to be sent to external review.***

April 2025 NC SSAB Meeting:

- ***DEQ rescinded the previous charge to the Board and await EPA ORD's final toxicity assessment before asking the Board for a review and/or recommendation.***

Timeline of PFMOAA Toxicity Assessment Requests



PFMOAA Updated Literature Search (August 2026)

1. Woodlief T, Vance S, Hu Q, DeWitt J. 2021. Immunotoxicity of per- and polyfluoroalkyl substances: Insights into short-chain PFAS exposure. *Toxics* 9(5):100.
2. Yao J, Pan Y, Sheng N, Su Z, Guo Y, Wang J, Dai J. 2020. Novel perfluoroalkyl ether carboxylic acids (PFECAs) and sulfonic acids (PFESAs): Occurrence and association with serum biochemical parameters in residents living near a fluorochemical plant in China. *Environmental Science & Technology* 54 (21): 13389-13398.
3. Justin M. Conley, Christy S. Lambright, Nicola Evans, Jacqueline Bangma, Jermaine Ford, Donna Hill, Elizabeth Medlock-Kakaley, and L. Earl Gray Jr. 2024. Maternal and neonatal effects of maternal oral exposure to PFMOAA during pregnancy and early lactation in the Sprague-Dawley rat. *Environmental Science & Technology* 58 (2), 1064-1075.
4. Killius, A., M. Wheeler, L. Covell, S. Price, and B. Finley. 2026. " Derivation of Provisional Chronic Oral Toxicity Values (PCOTV) for Novel Short-Chain PFAS Congeners." *Journal of Applied Toxicology* 1–9. https://doi.org/10.1002/jat.70156.
5. Matthew Farrell, Ria Bakshi, Emily Griffith, Antonio Planchart. Developmental Toxicity and Lethality of Structurally Diverse PFAS in Zebrafish. bioRxiv 2025.08.07.669106; doi: https://doi.org/10.1101/2025.08.07.669106
6. Tess C Leuthner, Sharon Zhang, Brendan F Kohrn, Heather M Stapleton, L Ryan Baugh, Structure-specific variation in per- and polyfluoroalkyl substances toxicity among genetically diverse *Caenorhabditis elegans* strains, *Toxicological Sciences*, Volume 205, Issue 1, May 2025, Pages 205–219, https://doi.org/10.1093/toxsci/kfaf014
7. Qin W, Henneberger L, Glüge J, König M, Escher BI. Baseline Toxicity Model to Identify the Specific and Nonspecific Effects of Per- and Polyfluoroalkyl Substances in Cell-Based Bioassays. Environ Sci Technol. 2024 Apr 2;58(13):5727-5738. doi: 10.1021/acs.est.3c09950. Epub 2024 Feb 23. PMID: 38394616; PMCID: PMC10993398.

Current PFMOAA Status and Needs

Revised Charge to the Board:

With the studies current literature base, is there enough scientific support to identify a Point Of Departure for deriving a Reference Dose for PFMOAA?

DEQ's PFMOAA Needs

Does the NCSSAB have the availability and bandwidth to:

1. **Conduct a review of the new literature?**

And then,

2. Form a focused team to derive an RfD using EPA's Benchmark Dose Modeling Software?