April 29, 2025

Dear WA State Dept. of Health,

I am the executive director for the Friends of Toppenish Creek, a 501 C (3) non-profit in Yakima County. I want to bring some research to your attention. Scientists at John Hopkins have completed a study on ways to improve cumulative risk assessments.

Improving Methodologies for Cumulative Risk Assessment: A Case Study of Noncarcinogenic Health Risks from Volatile Organic Compounds in Fenceline Communities in Southeastern Pennsylvania. Available at https://ehp.niehs.nih.gov/doi/epdf/10.1289/EHP14696#:~:text=The%20purpose%20of%20this%20paper%20is%20to%20demonstrate,multiple%20target%20organ%20systems%20simultaneously%20for%20complex%20mixtures.

Abstract:

Environ Health Perspectives, DOI: 10.1289/ehp14696, Accepted 3/24/2025

Background: Cumulative risk assessment (CRA) is key to characterizing health risks in fenceline and disadvantaged communities, which face environmental pollution and challenging socioeconomic conditions. Traditional approaches for inclusion of mixtures in CRA are limited and only assess the most sensitive target organ system for each chemical.

Methods: We developed an expanded approach to cumulative risk assessment that considers all known target organ systems associated with a chemical. Specifically, we created a multi-effects toxicity database by 1) compiling toxicological and epidemiological data from the Agency for Toxic Substances and Disease Registry's (ATSDR) Toxicological Profiles and the Environmental Protection Agency's (EPA) CompTox Chemicals Dashboard; 2) developing a tiering system to prioritize identified data for use in developing toxicity values; and 3) accounting for uncertainty to create toxicity values for additional target organ

systems. We demonstrated differences between the traditional approach and our expanded approach by using state-of-the-art mobile monitoring data from our Southeastern Pennsylvania Hazardous Air Pollutant Monitoring and Assessment Project (SEPA HAP-MAP) to conduct a cumulative risk assessment.

Results: Of the 32 chemicals quantified in SEPA HAP-MAP, 28 were represented in our multi effects toxicity database, whereas only 16 were included using a traditional approach. In total, we derived toxicity values for 172 chemical-target organ system combinations. Our expanded approach found neurological, renal, respiratory, endocrine, and systemic risks (hazard index >1) in SEPA HAP-MAP fenceline communities, whereas no risks were identified using a traditional approach limited to the most sensitive target organ systems only.

Conclusion: Our results suggest that traditional approaches to CRA underestimate health risks in fenceline and other highly exposed communities and highlight the need for improved methods to inform health-protective and just risk management decisions.

This study has important implications for areas such as the Lower Yakima Valley, an overburdened and underserved community, where concentrated animal feeding operations (CAFOs) emit large amounts of volatile organic compounds (VOCs) into the ambient air.

FOTC has completed estimates of VOC emissions per cow based on research from the EPA's National Air Emissions Monitoring Study and concluded that dairies with 2,000 or more milk cows would qualify as Title V or major sources of air pollution if not for agricultural exemptions.

The study we used is *Emissions Data from Two Dairy Freestall Barns in Washington* – National Air Emissions Monitoring Study available at ASAE_Journal | US EPA ARCHIVE DOCUMENT Data from this study does not include emissions from manure lagoons, an additional source.

That study found these VOCs were emitted from two CAFO dairy barns in the Lower Yakima Valley in 2010.

Table 16. Average concentration of 20 most prevalent VOCs.

Compound	Concentration, $ng \cdot m^{-3}$	% of total	Cumulative %
n-Propanol	4.58E+05	36.56	36.56
Ethyl Acetate	2.04E+05	16.29	52.85
iso-propanol	1.68E+05	13.43	66.28
Acetaldehyde	1.20E+05	9.55	75.83
Methanol	1.00E+05	7.99	83.82
n-Propyl acetate	4.09E+04	3.26	87.08
2-butanone	2.37E+04	1.89	88.98
Toluene	1.37E+04	1.10	90.07
phenol	1.08E+04	0.86	90.93
2-butanol	7.40E+03	0.59	91.52
Benzene	7.33E+03	0.58	92.11
Hexanal	6.53E+03	0.52	92.63
Dimethyl sulfide	6.32E+03	0.50	93.13
Acetic Acid	5.89E+03	0.47	93.60
Pentanal	5.32E+03	0.42	94.03
1-butanol	5.23E+03	0.42	94.44
Heptanal	5.19E+03	0.41	94.86
4-methyl-phenol	4.83E+03	0.39	95.24
2-pentanone	4.04E+03	0.32	95.57
Benzaldehyde	3.57E+03	0.28	95.85

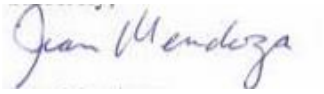
These two pieces of research strongly suggest that marginalized people in the Lower Yakima Vally are at heightened risk for adverse health effects due to exposure to many air pollutants that are not usually addressed by public health officials. Health impacts are higher than predicted because air pollutants damage more than one system in the human body. Organ systems are interdependent so damage to one system puts added strain on others.

We suggest that research demonstrates a need for comprehensive air testing in areas such as the LYV or alternatively, robust modeling of potential impacts of air pollution from

CAFOs on fenceline communities.

Thank you for considering our concerns.

Best wishes.



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Attachment 1: Who Has to Obtain a Title V Permit?

Any major source:

- A major source has actual or potential emissions at or above the major source threshold for any "air pollutant."
- The major source threshold for any air pollutant is 100 tons/year (this is the "default value").
- Major source thresholds for "hazardous air pollutants" (HAP) are 10 tons/year for a single HAP or 25 tons/year for any combination of HAP.

Source of Information: Who Has to Obtain a Title V Permit? | US EPA

Attachment 2: Emissions from Yakima County Title V Sources in 2023 as Tons per Year available at Air emissions inventory - Washington State Department of Ecology

Name	PM10	PM2.5	SO2	NOX	VOC	CO	NH3
Novolex Shields, LLC	0	0	0	1.6	352.8	2.3	0
Terrace Heights LF	24.39769	4.13769	1.48	2.28	19.62	6.8	0

Attachment 3: Estimates of Emissions from Dairy Cows

From Environmental Protection Agency Models for Washington State available at State Inventory and Projection Tool | US EPA

Methane

Manure Management 43,041,000,000 g/year for 275,000 cows = 428.80 g/day/cow

Enteric Fermentation 150.9 kg/cow per year = 410.96 g/day/cow

Total Methane 839.76 g/cow/day

From *Emissions Data from Two Dairy Freestall Barns in Washington* – National Air Emissions Monitoring Study available at ASAE_Journal | US EPA ARCHIVE DOCUMENT

Ammonia

Barn 2: 56.5 g/day/cow

Barn 4: 56.5 g/day/cow

56.5 g/day/cow average

Hydrogen Sulfide

Barn 2: 1.08 g/day/cow

Barn 4: 1.15 g/d/cow

1.12 g/day/cow average

Volatile Organic Compounds

Barn 2: 86.67 g/day/cow

Barn 4: 145.71 g/day/cow

116.19 g/day/cow average

PM 2.5

Barn 2: 5.25 g/day/cow

Barn 4: 1.90 g/day/cow

3.58 g/day/cow average

PM 10

Barn 2: 6.94 g/day/cow

Barn 4: 10.0 g/day/cow

8.47 g/day/cow average

Estimated emissions from dairy cows in grams/cow/day and lb./cow/day

Pollutant		**Grams/cow/day**	**Lbs./cow/day**
Methane (Manure Mgmt. + Enteric)		839.76	1.849692
Ammonia		56.50	0.124449
Hydrogen Sulfide		1.12	0.002467
VOCs		116.19	0.255925
PM 2.5		3.58	0.007885
PM 10		8.47	0.018656

Estimated Emissions from 100,000 milk cows in Yakima County in Metric Tons and Tons Per Year based on NAEMS data and EPA models.

Pollutants		**Metric tons**	**Tons**
Methane		30,651	33,716
Ammonia		2,062	2,270
Hydrogen Sulfide		41	45
VOCs		4,241	4,665
PM 2.5		131	144
PM 10		309	340

Attachment 4: FOTC Estimates of air emissions from large dairies

Pollutant	Lbs./cow/day	Tons/day for a 2,000 head dairy	Tons per year for a 2,000 head dairy
Methane (Manure management plus enteric fermentation)	1.8497	1.8497	675.1405
Ammonia	0.1244	0.1244	45.406
Hydrogen sulfide	0.0025	0.0025	0.9125
VOCs	0.2559	0.2559	93.4035
PM 2.5	0.0079	0.0079	2.8835
PM 10	0.0187	0.0187	6.8255
Pollutant	Lbs./cow/day	Tons/day for a 5,000 head dairy	Tons per year for a 5,000 head dairy
Methane (Manure management plus enteric fermentation)	1.8497	4.62425	1687.851
Ammonia	0.1244	0.311	113.515
Hydrogen sulfide	0.0025	0.00625	2.28125
VOCs	0.63975	0.63975	233.5088
PM 2.5	0.01975	0.01975	7.20875
PM 10	0.0187	0.04675	17.06375
Pollutant	Lbs./cow/day	Tons/day for a 10,000 head dairy	Tons per year for a 10,000 head dairy
Methane (Manure management plus enteric fermentation)	1.8497	9.2485	3375.703
Ammonia	0.1244	0.622	227.03
Hydrogen sulfide	0.0025	0.0125	4.5625
VOCs	1.2795	1.2795	467.0175
PM 2.5	0.2559	0.0395	14.4175
PM 10	0.0187	0.0935	34.1275