PFAS Health, Toxicology Regulatory Subgroup Meeting

Virginia Department of Health Office of Drinking Water
January 8, 2021
2:00pm – 4:00pm

Opening Remarks

Member Introduction

Review of previous meeting

Presentation

Discussion

Closing items

PFAS Health & Toxicology Subgroup

Draft Meeting Minutes

WebEx, Office of Drinking Water, 109 Governor Street 6th Floor, Richmond, VA 23219

January 8, 2021 from 2:00 – 4:00 p.m.
2 hours (appx)

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1. Opening Remarks

VDH State Toxicologist, Dwight Flammia, Ph.D. called the meeting to order 2:03 p.m. The meeting was conducted in a public format and recorded minutes will be posted on Town Hall. He discussed the tasks and presented a power point presentation.

2. Member Introduction

Jillian Terhune (City of Norfolk)
Kelly Ryan (Va American Water)
David Jurgens (City of Chesapeake)
Erin Reilly (James River Association)
Steve Risotto (ACC)
Benjamin Hollard (DEQ)
Dwight Flammia (VDA, State Toxicologist)
Andrea Wortzel (Mission H2O)
Steve Herzog (Hanover County)
Paul Nyffeler (Chem)Law

Guest

J. Cherry
Dr. Mann

ODW Participants

Tony Singh, ODW
Nelson Daniel, ODW
Kris Latino, ODW

3. Review of previous meeting

The group discussed the chemicals that should be studied and determined that they would focus on those only listed in the house bill with the understanding that later studies may include additional PFAS. The group also discussed if the individual chemicals should be studied as a unit or separately.

4. Presentation

Dwight discussed Risk Assessment Explaining:

Hazardout identification
Dose Response assessment
Exposure assessment
Risk characterization
Dose-Response Assessment
Critical Effect and Defining Adverse Effect Level
Benchmark dose modeling and Reference Dose
Uncertainty Factors and Exposure Assessment
Risk Characterization and Risk Management

For more information on how to determine Risk Assessment: ToxTutor -- https://toxtutor.nlm.nih.gov/

5. Discussion

Dwight asked the group for suggestions on how to collect data. He suggested starting with the chemicals that we currently have the most information (PFOA, PFOS, PFNA, PFHxS) then work on collecting data on PFBA and PFHpA last. The group agreed to study the methods as follows:

February	PFOA	Dwight	Steve Rosotto and Erin Reilly will provide Risk assessment.
March	PFOS		
April	PFNA		
May	PFHxS		
June	PFHpA		
July	PFBA		

The workgroup also discussed the methods of collect samples: Method 537.1 or 533. It was determined that Method 533 would be the best method to use because it included 18 compounds, and incorporates the six compounds that are needed to satisfy the House Bill. Steve Risotto added that Method 537.1 would also capture PFAS precursors.

The group would also like to incorporate any past testing information in Virginia. David Jurgens suggested the possibility of adding a representative from the Navy. In addition, the group would like to use any old pertinent information that would help complete this study. David Jurgens mentioned the Navy site, NALF Fentress, in Chesapeake. Dwight asked the group to share any additional information they find with the group for future use. He also suggested adding another Toxicologist and getting some perspective from the EPA. Dwight would like to reach out to New Jersey to get their thoughts and work with Universities on the data they have collected.

The group would like clarity regarding the expectation of the Toxicology group and how it will relate to the information needed as it relates to determining MCLs. Ben Holland provided the following link: https://www.epa.gov/ground-water-and-drinking-water/supporting-documents-drinking-water-health-advisories-pfoa-and-pfos

The larger PFAS Workgroup will meet January 19, 2021. When discussing with the larger group, we should get more clarity on exact expectations for each group.

6. Closing Items:

The group will meet the second Friday of the month from 1:30 to 3:30 for February, March, April, and May then at the same time on the second Wednesdays of the month.

Establishing Regulatory Limits for PFAS in Virginia Drinking Water

PFAS Toxicology Regulatory Workgroup

Dwight Flammia, Ph.D.
State Public Health Toxicologist
Virginia Department of Health

January 8, 2021

PFAS Workgroup Meeting Overview

Meeting Overview

- Opening Remarks
- Review of previous meeting
- Workgroup Members Introductions
- Presentation
- Discussion
- Assignments
- Public Comment
- Next Meeting

Introductions

Jillian Terhune (City of Norfolk)
Kelly Ryan (VA American Water)
Mark Estes (Halifax County Service Authority)
David Jurgens (City of Chesapeake)
Erin Reilly (James River Association)
Chris Leyen (VCLV)
Steve Risotto (ACC)
Benjamin Holland (DEQ)*
Dwight Flammia (VDH, State Toxicologist)
Andrea Wortzel (Mission H2O)
Steve Herzog (Hanover County)
Paul Nyffeler

Presentation

Risk Assessment

- 1. Hazard identification
- 2. Dose response assessment
- 3. Exposure assessment
- 4. Risk characterization

1. Hazard Identification

- What findings or studies provides the basis for health concern
- Are there other health endpoints of concern
- Are there epidemiological or clinical data
- What is known about how the chemical adversely affects organisms

2. Dose-response Curve

- What model was used to develop the dose-response curve
- What is the route or administration
- What is the dose administered as compared to human exposure

3. Exposure Assessment

- Significant sources of exposure
- Population assessed
- What was the basis for the exposure assessment
- Any concern about cumulative or multiple exposures

4. Risk Characterization

- The summary of the first three parts of the risk assessment process
- Major conclusions, strengths, limitations, variabilities, and uncertainties
- How the risk compares to past or similar risk assessments with significant differences described

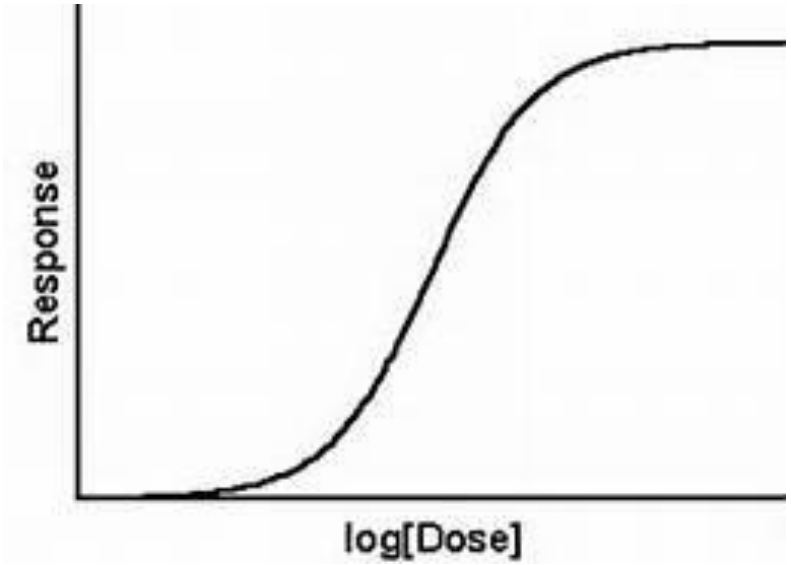
Developing a Reference Dose

- Reference dose (RfD, RfC) – ***U.S. Environmental Protection Agency**
- Total Daily Intake (TDI)-World Health Organization
- Minimal response level (MRL)-Agency for Toxic Substances and Disease Registry

Daily dose that the population including sensitive individuals can be exposed to over a lifetime to without harm

Dose-Response Assessment

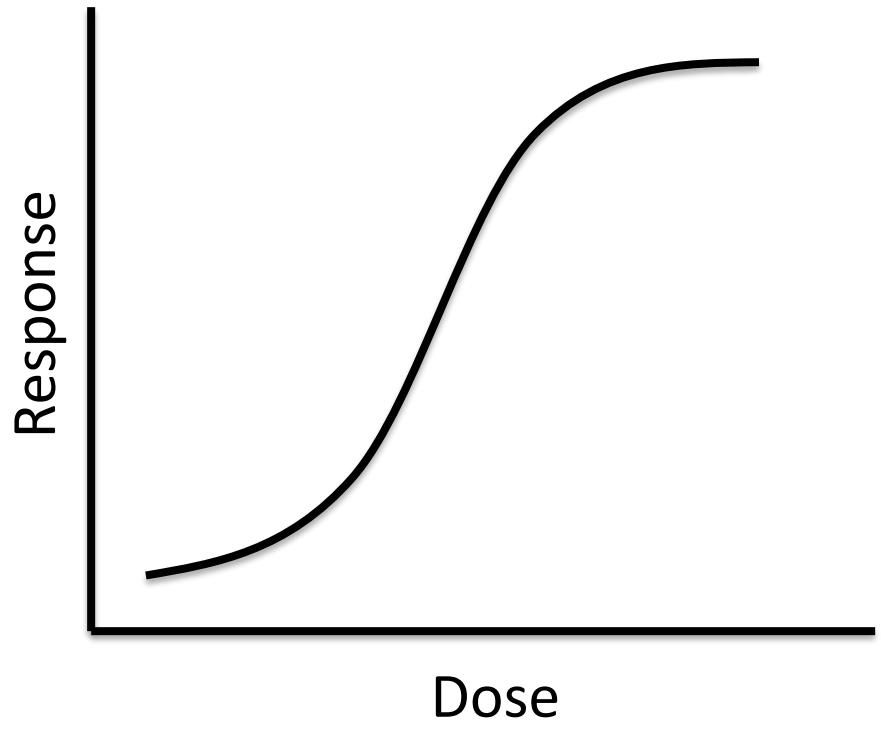
The determination of the relation between the magnitude of exposure and the probability of occurrence of the health effects in question.



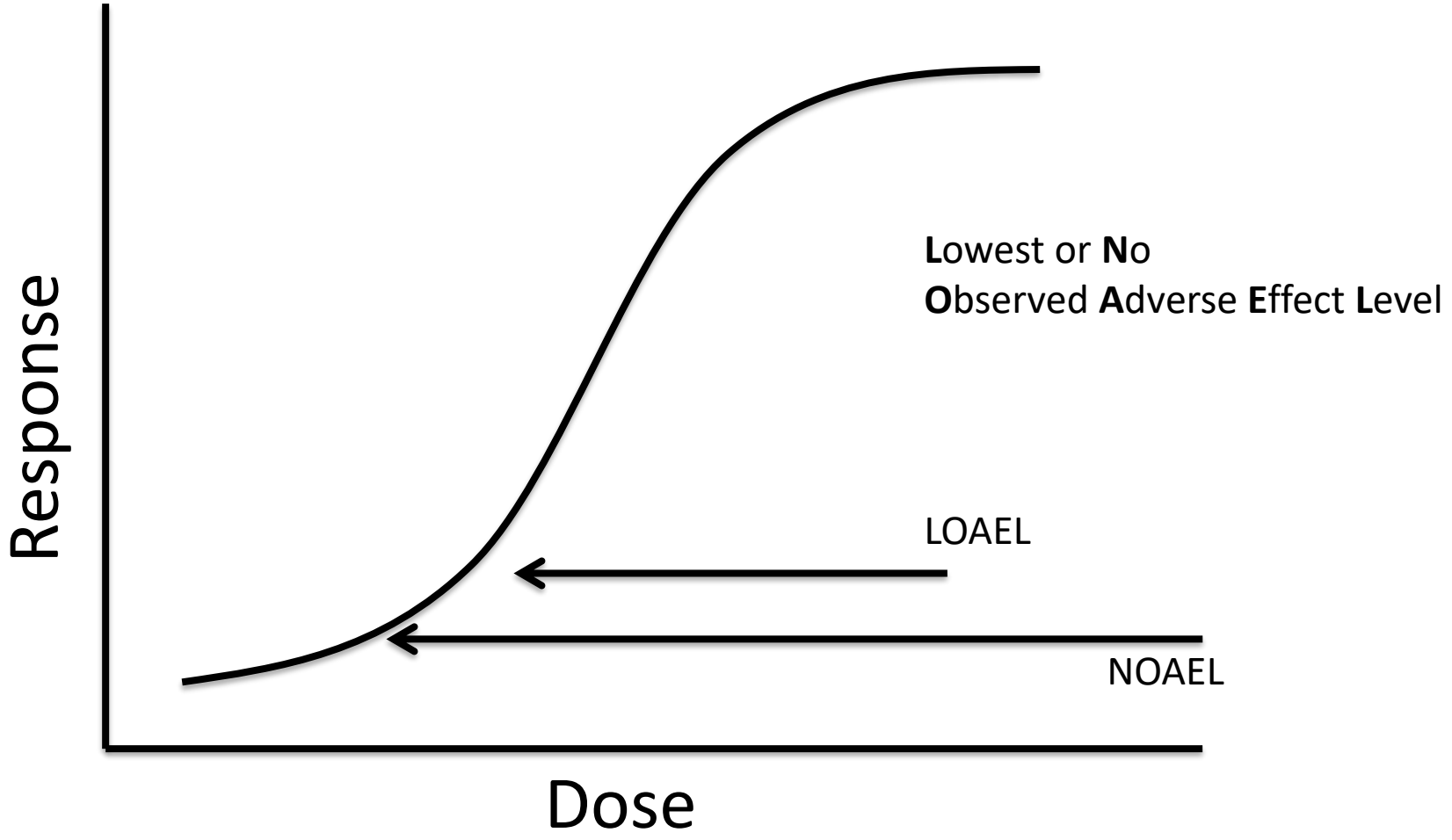
Critical Effect

The first adverse effect, or its known precursor, that occurs in the most sensitive species as the dose rate of an agent increases.

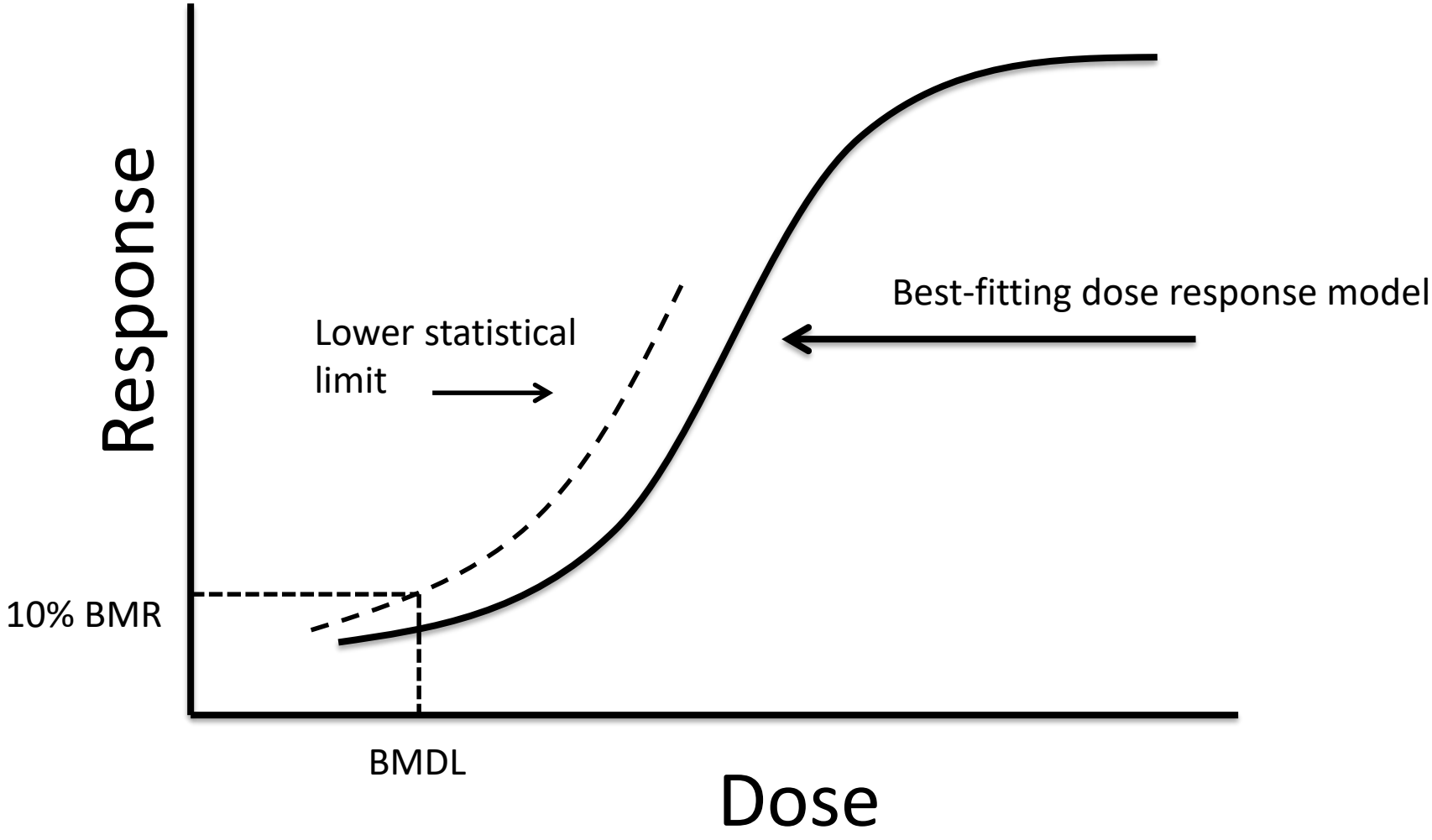
- biochemical change
- cellular changes
- Maternal toxicity
- Change in weight



Defining Adverse Effect Level



Benchmark Dose Modeling



Reference Dose

$$\text{RfD} = \frac{\text{Animal Dose (NOAEL or LOAEL)}}{\text{UF x UF x UF x UF}}$$

~~Safety~~ Uncertainty Factors

- LOAEL to NOAEL - adjustment 10 fold
- Acute to Chronic - adjustment 10 fold
- Animal to Human - adjustment 10 fold
- Variability in Susceptibility in Humans - adjustment 10 fold
- Database completeness - adjustment 10 fold

Exposure Assessment

The determination of the extent of human exposure before or after application of regulatory controls.

Risk Characterization

The description of the nature and often the magnitude of human risk, including uncertainty.

Risk Management

Risk management utilizes the results of risk assessment, technological factors, legal, economic, and social considerations in reaching a regulatory decision.

Chemical Summary for PFHxA

	Decision point	Rationale/justification
Critical study	Klaunig, J.E., Shinohara, M., Iwai, H., Chengelis, C.P., Kirkpatrick, J.B., Wang, Z., Bruner, R.H., 2015. Evaluation of the chronic toxicity and carcinogenicity of perfluorohexanoic acid (PFHxA) in Sprague-Dawley rats. Toxicol. Pathol. 43 (2), 209–220.	The Workgroup reviewed the Luz et al. (2019) compiled information and development of a toxicity value. The Workgroup was in agreement with Luz et al. (2019) on selection of the chronic study (Klaunig et al. 2015) for toxicity value development.
Description of the critical study	PFHxA was administered to male and female Crl:CD rats (n=60-70/sex/dose) via daily oral gavage for up to 104 weeks. Males: 0, 2.5, 15, and 100 mg/kg/day. Females: 0, 5, 30, and 200 mg/kg/day. Functional observational battery, locomotor activity, ophthalmic, hematology, serum chemistry, and tissue and organ histopathology endpoints were evaluated.	The Workgroup also considered the developmental effects observed in Loveless et al. (2009) one generation reproductive assay. Pup body weight was significantly reduced in the 500 mg/kg/day, resulting in NOAEL of 100 mg/kg/day. Data were not available for Benchmark Dose Modeling for further evaluation.
Point of Departure	Critical effect renal tubular degeneration and renal papillary necrosis in female rats – $BMDL_{10}$ 90.4 mg/kg/day (Luz et al., 2019).	The Workgroup noted that the Benchmark Dose approach is preferred over the use of a NOAEL/LOAEL.
Human equivalent dose	Therefore, the BMD was adjusted by $(80kg/0.45\ kg)^{¼} = 3.65$. The resulting POD_{HED} (90.4 mg/kg/day divided by 3.65) = 24.8 mg/kg/day. (Luz et al., 2019).	The Workgroup discussed the description of the Benchmark Dose modeling conducted by Luz et al. (2019) and concluded the modeling was adequate for use. The Workgroup did not conduct their own Benchmark Dose modeling. The Workgroup took into consideration the available serum half-life data presented in Russell et al. (2013) and concluded that, unlike most PFAS, allometric scaling could be supported.
Uncertainty factors	Total uncertainty factor of 300: • 1 for LOAEL to NOAEL • 10 for human variability • 3 ($10^{0.5}$) for animal to human variability • 1 for subchronic to chronic • 10 for database deficiencies – lack of additional chronic toxicity studies and no additional developmental data in a second species, and immune and thyroid endpoints	The Workgroup discussed the uncertainty factors and selected an uncertainty factor of 10 for database deficiencies. Several items noted were that the available studies were largely in one species, with no mouse or non-human primate data, and that there was insufficient information addressing immune or thyroid endpoints.
Toxicity value	83,000 ng/kg/day (8.3 mg/kg/day)	Human equivalent dose divided by the total uncertainty factor = toxicity value

Exposure parameters for drinking water HBVs	95th percentile of water intake for consumers only (direct and indirect consumption) for adults (>21 years old) of 3.353 L/day, per Table 3-1, USEPA Exposure Factors Handbook, 2019. An adult body weight of 80 kilograms was used (Table 8-1, USEPA 2011b). A default Relative Source Contribution of 20% was included.	The Workgroup discussed the use of an upper percentile water intake. The 95th percentile for consumers only was selected as it would protect those drinking larger amounts of water. As no human serum data were available to assess the population's exposure to PFHxA from sources other than drinking water, a default Relative Source Contribution of 20% was selected consistent with USEPA (2000) guidance. The Workgroup evaluated the protectiveness of the renal tubular degeneration and renal papillary necrosis in relation to the reduced pup weights observed in Loveless et al. (2009). Available data did not support Benchmark Dose Modeling for further evaluation of Loveless et al. (2009) data.
Drinking water HBV	400,000 ng/L (ppt) (400 micrograms per Liter or parts per billion)	Numeric HBV derived and justified using the above information in the following equation: $$HBV = \frac{RSC \times Toxicity\ value \times Body\ weight}{Water\ intake}$$

Discussion

- Material distributed after December meeting
- What to provide to Occurrence and Monitoring workgroup
- Start with PFOA,PFOS,PFNA,PFHxS
- PFBA PFHpA not as much data
- Best approach

Virginia PFAS Workgroup – Objectives

Month	Substance	Member	Notes
February	Perfluorooctanoic acid (PFOA)	Dwight	Steve R. and Erin will provide risk assessments
March	Perfluorooctane sulfonate (PFOS)		
April	Perfluorononanoic acid (PFNA)		
May	Perfluorohexane sulfonate (PFHxS)		
June	Perfluoroheptanoic acid (PFHpA)		
July	Perfluorobutyrate (PFBA)		

Public Comment

Next meeting

Second Friday of each month beginning February 12, 2021 from 1:30pm till 3:30pm.

States that have taken action to regulate PFAS

State	Drinking Water Action	Compound	Level (ppt)
California	Response Levels	PFOA	10
		PFOS	40
	Notification Levels	PFOA	5.1
		PFOS	6.5
Colorado			
Connecticut	Action Level	∑ (PFOA, PFOS, PFNA, PFHxS, PFHpA)	70
Massachusetts	Adopted Regulation 9/16/20	∑ (PFOA, PFOS, PFNA, PFHxS, PFHpA, PFDA)	20
Michigan	Adopted Regulation 8/3/20	PFOA	8
		PFOS	16
		PFNA	6
		PFHxS	51
		PFBS	420
		PFHxA	400K
		GenX	370

States that have taken action to regulate PFAS

State	Drinking Water Action	Compound	Level (ppt)
Minnesota	Health Based Guidance-Water	PFOA	35
		PFOS	15
		PFHxS	47
New Hampshire	Adopted Regulation 10/1/19	PFOA	12
		PFOS	15
		PFHxS	18
		PFNA	11
New Jersey	Adopted Regulation	PFNA	13
		PFOA	14
	Adopted Regulations 6/1/20	PFOS	13
New York	Adopted Regulation 7/30/20	PFOA	10
		PFOS	10
North Carolina	Health Advisory	GenX	140
	Proposed legislation (HB1175)		
Vermont	Adopted Regulation 3/17/20	∑ (PFOA, PFOS, PFNA, PFHxS, PFHpA)	20
Virginia	HB1257/HB586		