Overview of NJDEP Draft Drinking Water Guidance for Cyanotoxins

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December 08, 2021

Outline

- Background on drinking water guidance values
- Timeline of NJDEP human health assessments
- Derivation of short-term Reference Doses
- Comparison of NJDEP and USEPA drinking water guidance values

Background on NJDEP Draft Drinking Water Guidance Values for Cyanotoxins

- Intended to be protective for short-term exposures – appropriate for expected duration of harmful algal blooms (HABs)
  - Short-term exposure = 1 to 30 days

- Based on ***toxicity factor*** (short-term Reference Dose) and ***exposure assumptions*** (drinking water ingestion rates)

  Guidance value (µg/L) = Reference Dose (µg/kg/day) ÷ Ingestion rate (L/kg/day)

- Short-term Reference Doses (based on Division of Science and Research assessments):
  - Contaminant-specific values based on animal toxicology or human epidemiology studies
  - Daily oral dose to human (including sensitive subgroups) likely to be without risk of adverse effects from short-term exposure
  - Not intended for chronic drinking water exposure

- Drinking water ingestion rates (based on analysis from USEPA [2015] short-term drinking water Health Advisories for cyanotoxins):
  - Infants and children (0 to less than 6 years old) = 0.15 L/kg/day
  - Children and adults (6 years and older) = 0.034 L/kg/day

Timeline of Cyanotoxin Health Effect Assessments

- NJDEP short-term Reference Doses for cyanotoxins:
  - Initially developed for use in NJDEP recreational guidance for cyanotoxins, which are based on incidental ingestion of water while swimming.
  - Also applicable to short-term exposures through drinking water.
  - Derivation underwent external peer review by experts in human health assessment and/or cyanotoxins.

- 2017: DSR derived short-term Reference Doses for anatoxin-a, cylindrospermopsin, and microcystins.

- 2020: DSR reviewed more recent toxicity literature.
  - Newer studies identified additional toxic effects, some at lower doses, and provided further support for 2017 short-term Reference Doses; no revisions were recommended by DSR.

- 2021: DSR derived short-term Reference Dose for saxitoxin.

- Detailed technical basis of short-term Reference Doses are provided in NJDEP (2018, 2020, 2021) *Cyanobacterial Harmful Algal Bloom (HAB) Freshwater Recreational Response Strategy.*
  - 2018: https://www.state.nj.us/dep/hab/download/NJHABResponseStrategy2018.pdf (2017 Reference Doses)
  - 2020: https://www.state.nj.us/dep/hab/download/NJHABResponseStrategy.pdf (2020 review of more recent studies)
  - 2021: https://www.state.nj.us/dep/hab/download/HAB2021StrategyFinal.pdf (Saxitoxin Reference Dose)

Derivation of NJDEP Cyanotoxin Short-Term Reference Doses

	Anatoxin-A	Cylindrospermopsin	Microcystin-LR	Saxitoxin
Critical effect	Death in male and female mice	Increased relative kidney weight in male mice	Decreased body weight in male mice	Paralytical shellfish poisoning in humans
Point of Departure (µg/kg/day)	98 NOAEL	30 NOAEL	40 LOAEL	0.37 modeling
Total Uncertainty Factor	1000	1000	3000	100
Short-term Reference Dose (µg/kg/day)	0.1 (rounded from 0.098)	0.03	0.01 (rounded from 0.013)	0.0037
USEPA (2015) Short-term Reference Dose (µg/kg/day)	Not available	0.1 (UF_{TOTAL} = 300)	0.05 (UF_{TOTAL} = 1000)	Not available
Reason for difference between NJDEP and USEPA	Not applicable	Database UF (potential for other types of toxicity at lower doses)	Critical effect, LOAEL, Database UF (potential for other types of toxicity at lower doses)	Not applicable

LOAEL = lowest observed adverse effect level; NOAEL = no observed adverse effect level; UF = uncertainty factor

Comparison of Drinking Water Guidance Values

Guidance value (µg/L) = Reference Dose (µg/kg/day) ÷ Ingestion rate (L/kg/day)

Guidance values (µg/L) for children < 6 years old (based on ingestion rate of 0.15 L/kg/day)				
	Anatoxin-A	Cylindrospermopsin	Microcystin-LR	Saxitoxin
NJDEP (draft)	0.7	0.2	0.07	0.025
USEPA (2015)	---	0.7	0.3	---

Guidance values (µg/L) for ≥ 6 years of age (based on ingestion rate of 0.034 L/kg/day)				
	Anatoxin-A	Cylindrospermopsin	Microcystin-LR	Saxitoxin
NJDEP (draft)	3	1	0.3	0.11
USEPA (2015)	---	3	1.5	---

Thank you!

For questions or additional information:

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