Emerging Contaminants in Pennsylvania

Water Resources Advisory Committee

July 25, 2019

Tom Wolf, Governor

Patrick McDonnell, Secretary
Contaminants of emerging concern (CECs) are those that were either not detected previously or are now found in higher concentrations than the past.

- They are NOT necessarily “new” compounds.
- These include many categories of chemicals.
Endocrine Disrupting Chemicals

- Many CECs are endocrine disrupting chemicals (EDCs).
- EDCs change the normal function of hormones in organisms.
- This can lead to reproductive and other effects, often at extremely low levels.
- For many of these compounds there are no benchmarks or water quality standards.

https://www.epa.gov/wqc/contaminants-emerging-concern-including-pharmaceuticals-and-personal-care-products
Disruption of the endocrine system can cause issues with development, reproduction, cancer, and the immune/nervous systems.

EDCs can mimic hormones, or stimulate/inhibit endocrine processes.
• In the early 2000s, PA Fish & Boat Commission & anglers found smallmouth bass with lesions/other maladies and low numbers of both adults & young-of-year (YOY).

• Intensive study began by DEP in 2012 to find causes.
Initial purposes of study:

• Determine if emerging contaminants are contributing to smallmouth bass die-offs in Susquehanna River watershed.

• Determine levels of emerging contaminants in surface waters.

• Assess attainment of Aquatic Life & Recreational Uses of the mainstem Susquehanna River.
Evolving purposes of study:

- Determine concentrations and extent of emerging contaminants in water & sediment throughout the state.
- Explore sources (i.e. sampling upstream and downstream point source discharges).
Emerging contaminants/endocrine disruptors among the parameters studied in:

- Passive water samples
- Sediment samples
- Water grab samples
Passive Water Samplers
Passive Water Samplers

Polar Organic Chemical Integrated Sampler (POCIS):

Semi-Permeable Membrane Device (SPMD):
Passive Water Samplers - Deployment
Testing began in 2012 with four locations:
3 Susquehanna @ Harrisburg
1 Delaware @ Morrisville

Increased to >70 locations total by 2018.
Passive Samplers - Compounds Sampled

- Total estrogenicity/hormones
- Pharmaceuticals
- Various wastewater compounds
- Pesticides (current & historical)
- PCBs
- PBDEs
- PAHs
Emerging Contaminant Passive Sampler Sites 2012 through Fall 2018
Passive Sampler % Total Compound Detections
2013 through Fall 2017

Legend -
% Detected
- <22.1
- 22.2 - 27.9
- 28.0 - 31.6
- 31.7 - 36.7
- 36.8 - 45.4
- Counties

Pennsylvania Department of Environmental Protection
Passive Sampler % Hormones Detected
2013 through Fall 2017

Legend -
Hormones
% Detected
- < 13.5
- 13.6 - 20.5
- 20.6 - 27.4
- 27.5 - 38.2
- 38.3 - 58.8
- Counties

Miles

 pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Concentrations (ng/L) of PCBs in Passive Samplers
2013 through Fall 2017

Legend -
Concentration (ng/L)
- ND
- <3.1
- 3.2 - 9.9
- Counties

North
Sediment Samples
Sediment - Collection
Sediment - Compounds Sampled

- Pesticides
- Various wastewater compounds
- Hormones
- Metals
Sediment % Compounds Detected Per Site
2013 through Fall 2017
• Total estrogenicity
• Pesticides
• Triazine pesticides
• Glyphosate
Total estrogenicity/estimated estradiol equivalent (EEQ):
• Measured as a bioluminescent yeast estrogen assay (BLYES)
• Measures all estrogenic activity that affects estrogen receptors
• Particularly important for changes in the reproductive system
Take-home points

- Hormones = ag areas
- Pesticides = ag areas
- Wastewater indicators = ubiquitous
- Control areas impacted
- Reference-quality sites = good
- Still receiving & analyzing data
Current & Future Plans

• Passive sampling to occur at 21 WQN sites in summer 2019 (including PFAS)
• Total estrogenicity grab sampling at 11 springs in summer 2019
• Analyses continue:
  – Presence/absence of compounds
  – Quantitative analyses of compounds
  – Comparison of compound detection vs. fish health sites
  – New ways to interpret data constantly underway
• Story Map(s) will be published
• Data to be available
• Documents to be published at:

https://www.dep.pa.gov/Business/Water/CleanWater/WaterQuality/Pages/CECs.aspx
Questions?
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