Investigating Pharmaceutical Contaminants in Lake Champlain: Levels, Sources, and Interventions

Bret Turner (bretturner93@gmail.com), Senior at Penn State U. studying Environmental Science
Working with the aid of Dr. Christine Vatovec (cvatovec@uvm.edu)

1. Pharmaceuticals as a contaminant
- Studies link pharmaceutical contaminants to negative changes in aquatic ecosystems (Daughton 2008).
- Pharmaceuticals enter the aquatic environment through human waste, wastewater effluents, and runoff (Daughton 2008).
- These chemicals can cause deformations and death of organisms. (Daughton 2008).

2. Objectives
1. Which pharmaceuticals are present in Lake Champlain and how are they affecting the ecosystem?
2. Which areas in the watershed are the most at risk based on human factors?
3. Is legislation being made to address this issue and how can interventions be made for more effective policy?

3. Materials & Methods
- Literature review and pharmaceutical profiling
- Acute 48-hr toxicity testing on Daphnia pulex
- Mapping of population demographics and waste facilities within the watershed using GIS software
- Investigation of federal and state policies regarding disposal

4. Recommended disposal method from state legislation
1. Consumer return (29%)
2. Non-federal take-back event (28%)
3. Dissolve & dispose (17%)
4. Federal take-back event (7%)
5. Establishes rules for return events (6%)
6. Policies about consumer behavior (5%)
7. Landfill disposal (3%)
8. Nonspecific/Other (2%)
9. Sewage or contingent sewage disposal (2%)
10. Refer elsewhere (2%)

5. Disposal Legislation Targets

6. Historic Pharmaceutical Use Data by Age

7. Population 65+ Years by 2010 Census Block

8. Pharmaceutical Waste Point Sources

9. Results & Conclusions
- Pharmaceutical contaminants are especially deleterious to the aquatic ecosystem due to their targeted and pathway-specific mechanisms of action.
- Further chronic testing should be done to assess the long-term effects of pharmaceutical contaminants on aquatic organisms.
- Southern areas within the watershed as well as the Burlington municipal area are of high threat to the lake ecosystem due to the older population.
- Policies are wide-ranging; mostly focusing on consumer returns of products through collections. These need to be standardized across the nation; avoiding sewage or landfill disposal and emphasizing take-back events and sustainable pharmacy.

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