City of Toronto Sewer Use By-law and Green Purchasing

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Canadian Centre for Pollution Prevention

Greening Health Care:

Purchasing Choices that will Reduce Your Energy Costs & Environmental Impact Toronto, Sept. 22, 2003

City of Toronto Sewer Use By-law

- Sewer use by-laws restrict what can be disposed of through the sewer and in what quantities
  - e.g. City of Toronto
    - 38 subject pollutants identified for reduction and/or elimination through the development and implementation of pollution prevention plans

City of Toronto Sewer Use By-law

- City of Toronto Sewer Use By-law 457-2000
  - Requirement for Pollution Prevention Plan and submission of plan summary by December 31, 2001 to Commissioner (revised to March 31, 2002);
  - Submit a revised and updated plan summary at least once every 2 years (from original submission date);
  - Prepared a revised and updated P2 plan once every 6 years (from original submission date).

What is in a Pollution Prevention Plan?

- A description of the processes at the premises which use or produce subject pollutants;
- A description of those processes at the premise which are to be subject of pollution prevention planning;

What is in a Pollution Prevention Plan (cont.)?

- A list of the subject pollutants present at the premises at any stage of the operation of the premises;
- A summary of the plan;
- A declaration from an authorized person that the content of the plan is, to the best of that person's knowledge, true, accurate and complete

Subject Pollutants: Inorganics (Total =11)

- Arsenic
- ***Cadmium***
- ***Cobalt***
- ***Chromium***
- Copper
- ***Mercury***
- ***Molybdenum***
- Nickel
- ***Lead***
- ***Selenium***
- ***Zinc***

Subject Pollutants: Organics (Total = 27)

- ***Benzene***
- ***Chloroform***
- ***1,2-dichlorobenzene***
- ***1,4-dichlorobenzene***
- Cis-1,2-dichloroethylene
- Trans-1,3-dichloropropylene
- Ethyl benzene
- Methylene chloride
- 1,1,2,2-tetrchloroethane
- tetrachloroethylene
- ***Toluene***
- Trichloroethylene
- ***Total xylene***
- ***Di-n-butyl phthalate***
- ***Bis (2-ethylhexyl) phthalate***
- ***Alkylphenols***
- ***Alkylphenol ethoxylates***
- Aldrin/dieldrin
- Chlordane
- DDT
- Hexachlorobenzene
- Mirex
- ***PCB's***
- 3,3'-dichlorobenzidine
- Hexachlorobenzidine
- Pentachlorophenol
- Total PAHs

Example of Some‘Subject Pollutants’ Found in Health Care Facilities

- Cadmium
- Chromium
- Cobalt
- Lead
- Mercury
- Molybdenum
- Selenium
- Zinc
- Alkylphenols
- Alkylphenol ethoxylates
- Benzene
- Chloroform
- 1,2-dichlorobenzene
- 1,4-dichlorobenzene
- Bis (2-ethylhexyl) phthalate
- Di-n-butyl phthalate
- PCB’s
- Toluene
- Xylene

Where are Subject Pollutants Found?

- **Mercury**:
  - Housekeeping & Central Services: spills clean up, bleach
  - Laboratories: reagents, preservatives (thimerosal), stains, fixatives (B5), plumbing (accumulates in trap)
  - Patient Care Areas:
    - thermometers, blood pressure cuffs, manometers, Anderson tubes; esophogeal dilators, pressure gauges,
  - Facility: fluorescent lights, batteries, thermostats
  - Diagnostic Imaging: X-ray films and solutions
  - Dentistry: dental amalgams
  - Pharmacy: old pharmacy stock, medications

Where are Subject Pollutants Found?

- Chromium
  - Laboratories: chrome washing solutions
- Cobalt, Molybdenum
  - Physical Plant: scavenger in boilers for corrosion prevention
  - Laboratory: cobalt catalyst in microbiology reagents
- Lead
  - Diagnostic Imaging: shields and aprons

Where are Subject Pollutants Found?

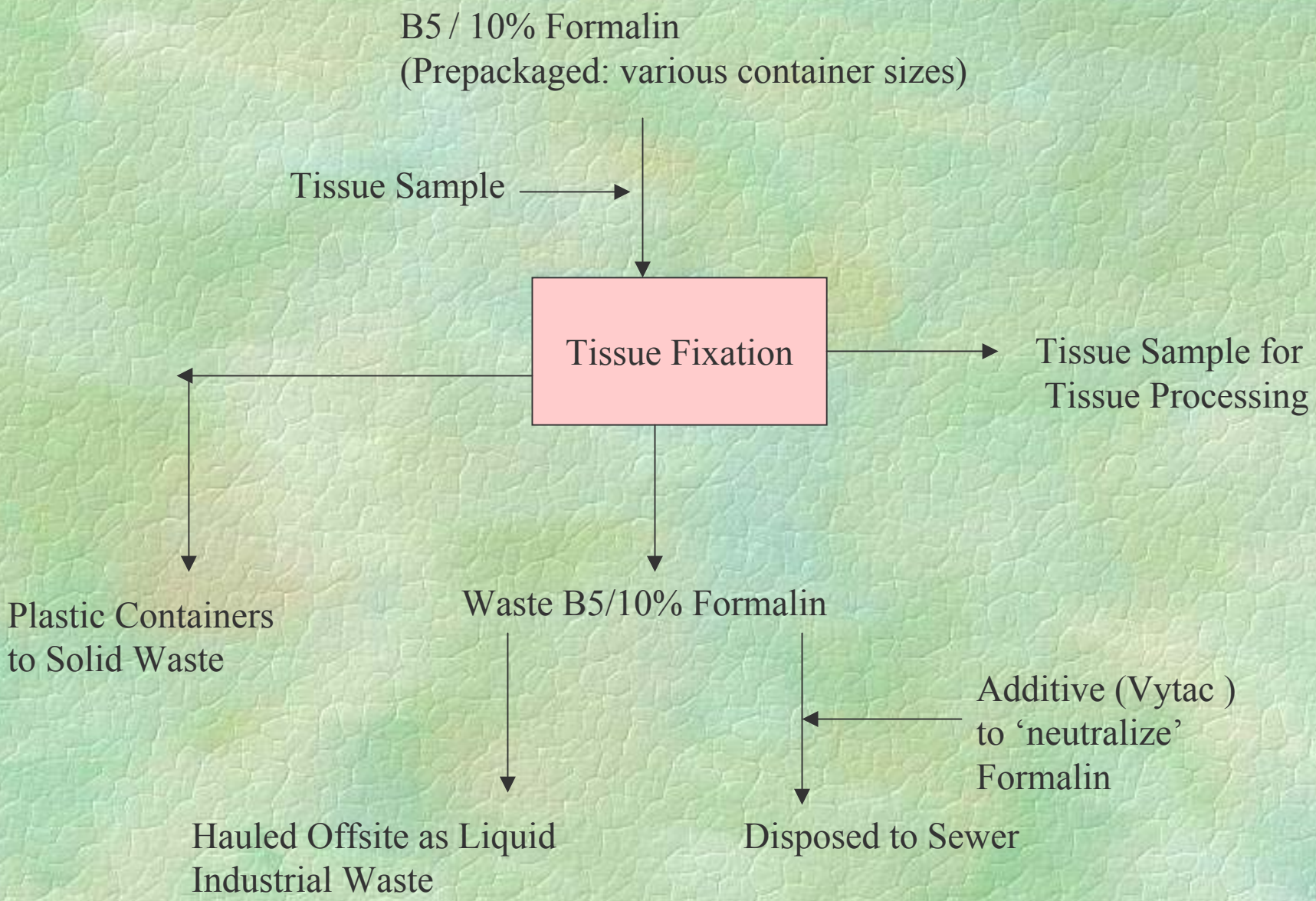
- Selenium
  - Patient Care, Pharmacy, Housekeeping: hair care products
- Zinc
  - Laboratories: tissue fixative ($ZnCl_2$)
  - Pharmacy: ointment,
  - Housekeeping: floor care products

Where are Subject Pollutants Found?

- Alkyl Phenols (including nonylphenol and octylphenol) and their ethoxylates
  - Housekeeping: Odour counteractant; Tub and tile cleaner, other cleaners
- 1,2-dichlorobenzene
  - Housekeeping: Drain cleaners
- 1,4-dichlorobenzene (Para)
  - Housekeeping: para-containing urinal blocks

Where are Subject Pollutants Found?

- Phthalates
  - Print shop: binding glue
  - Facility wide: e.g. from leaching of plasticizers in plastics
- Xylene
  - Pathology, Histology: tissue preparations
- Other Solvents (toluene, chloroform)
  - Laboratories



Example of a Process Flow Diagram for B5 ($HgCl_2$) / Formalin Use in Pathology

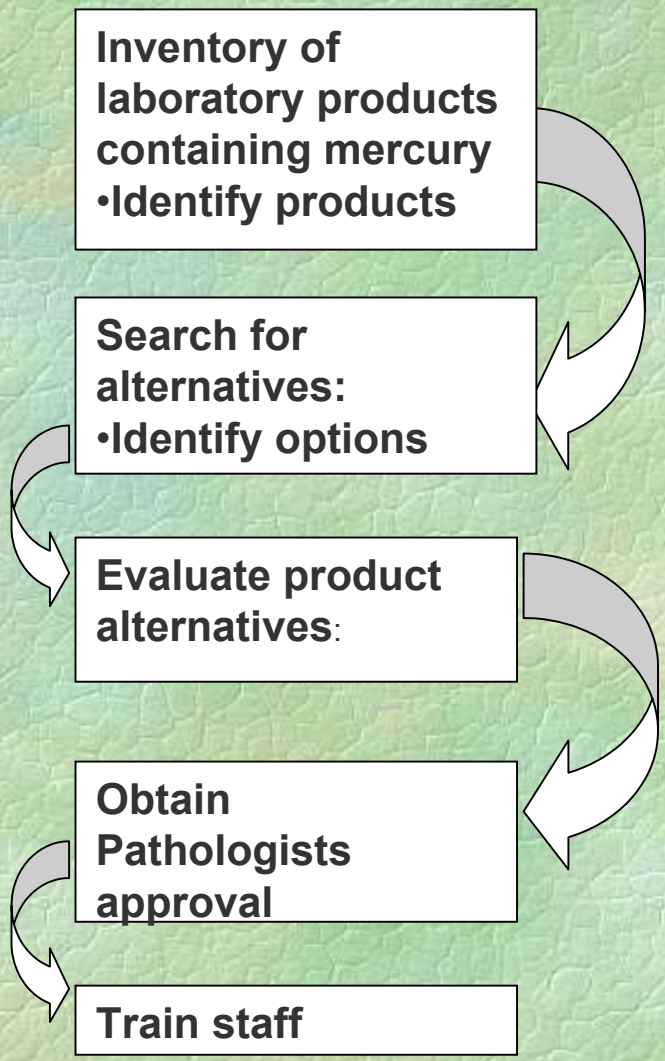
Example: Substituting mercury based fixative (B5) in Pathology

- Facility assessment
- Review MSDSs
- Interview staff
- Contact suppliers

- Review information in literature
- Contact vendors, pathologists
- Find others who have used process with success

- Conduct comparison trials
- Get guidance from others who have used it with success (mentoring)

- Have pathologist & staff from mentor facility talk with pathologist & staff in learning facility



Primary Pollution Prevention Option Used to Meet Requirements in Sewer Use By-law

- Product Substitution:
  - Identify possible alternatives which are commercially available;
  - Test alternative product with no or reduced subject pollutants;
  - Replace original product with alternative that has reduced or no subject pollutants, if its acceptable.

Challenges:

- MSDSs do not show constituents below 1%;
- Some products do not require MSDS's (FDA products in labs)
- Significant data gaps due to out of date, or lost documents;
- Some subject pollutants are listed under various names;

Some of the many names of mercury additives (www.sustainablehospital.org)

- Merthiolate salt
  Merthiolate sodium
  Merzonin sodium
  Merzonin, sodium salt
  Nosemack
  Sodium ethylmercurithiosalicylate
  Mercurothiolate
  Mertorgan
  Merfamin
  Septicol
  SET
  Sodium ethylmercuric thiosalicylate
  Sodium ethylmercurithiosalicylate
  Sodium merthiolate
  Sodium o-(ethylmercurithio)benzoate
  Sodium salt of 2-(carboxyphenyl)thioethylmercury
  Sodium 2-(ethylmercurithio)benzoate
- Thimerosal
  Thimerosal solution
  Thimerosalate
  Thimerosol
  Thimerosol solution
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Challenges

- As soon as you finish a P2 Plan it becomes obsolete if you do not have control on new products coming in;
- Difficulty engaging purchasing department to develop a system to monitor incoming product content for subject pollutants;
- Each hospital is conducting own research and contacting suppliers to determine similar issues …. redundancy in cost and time

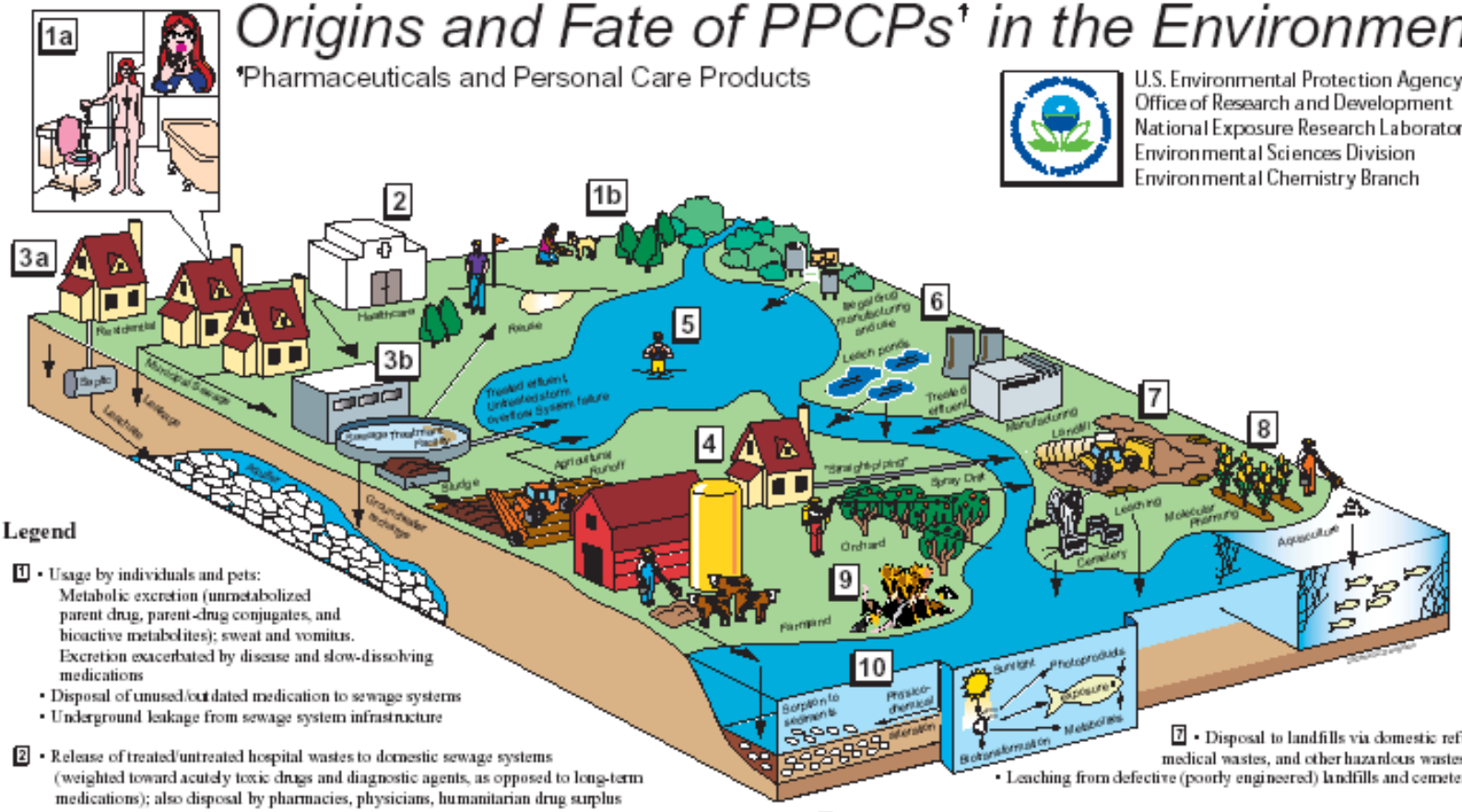
Emerging Areas of Concern

- Pharmaceuticals and Personal Care Products (PPCP)

Origins and Fate of PPCPs[1] in the Environment

[1]Pharmaceuticals and Personal Care Products

U.S. Environmental Protection Agency
Office of Research and Development
National Exposure Research Laboratory
Environmental Sciences Division
Environmental Chemistry Branch



Legend

1 • Usage by individuals and pets:
Metabolic excretion (unmetabolized parent drug, parent-drug conjugates, and bioactive metabolites); sweat and vomitus.
Excretion exacerbated by disease and slow-dissolving medications
• Disposal of unused/outdated medication to sewage systems
• Underground leakage from sewage system infrastructure

2 • Release of treated/untreated hospital wastes to domestic sewage systems (weighted toward acutely toxic drugs and diagnostic agents, as opposed to long-term medications); also disposal by pharmacies, physicians, humanitarian drug surplus

3 • Release to private septic/leach fields
• Treated effluent from domestic sewage treatment plants discharged to surface waters or re-injected into aquifers (recharge)
• Overflow of untreated sewage from storm events and system failures directly to surface waters

4 • Transfer of sewage solids ("biosolids") to land (e.g., soil amendment/fertilization)
• "Straight-piping" from homes (untreated sewage discharged directly to surface waters)
• Release from agriculture: spray drift from tree crops (e.g., antibiotics)
• Dung from medicated domestic animals (e.g., feed) - CAFOs (confined animal feeding operations)

5 • Direct release to open waters via washing/bathing/swimming

6 • Discharge of regulated/controlled industrial manufacturing waste streams
• Disposal/release from clandestine drug labs and illicit drug usage

7 • Disposal to landfills via domestic refuse, medical wastes, and other hazardous wastes
• Leaching from defective (poorly engineered) landfills and cemeteries

8 • Release to open waters from aquaculture (medicated feed and resulting excreta)
• Future potential for release from molecular pharming (production of therapeutics in crops)

9 • Release of drugs that serve double duty as pest control agents:
examples: 4-aminopyridine, experimental multiple sclerosis drug → used as avicide; warfarin, anticoagulant → rat poison; azacholesterol, antilipidemics → avian/rodent reproductive inhibitors; certain antibiotics → used for orchard pathogens; acetaminophen, analgesic → brown tree snake control; caffeine, stimulant → *coqui* frog control

10 Ultimate environmental fate:
• most PPCPs eventually transported from terrestrial domain to aqueous domain
• phototransformation (both direct and indirect reactions via UV light)
• physicochemical alteration, degradation, and ultimate mineralization
• volatilization (mainly certain anesthetics, fragrances)

Christian G. Daughton, U.S. EPA-Las Vegas

February 2001 (revised July 2002)

http://www.epa.gov/esd/esdl/chemistry/pharmaceuticals.htm