

Waterborne drugs a growing concern

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Our Stolen Future: Are We Threatening Our Fertility, Intelligence, and Survival?--A Scientific Detective Story

**Male Bass in Potomac Producing Eggs
Pollution Suspected Cause of Anomaly in River's South Branch**



More Waters Test Positive for Drugs

"National Reconnaissance of Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in Streams" Named as One of the Top 100 Science Stories of the Year



Endocrine Disruption Found in Fish Exposed to Municipal Wastewater



Frogs, fish and pharmaceuticals a troubling brew

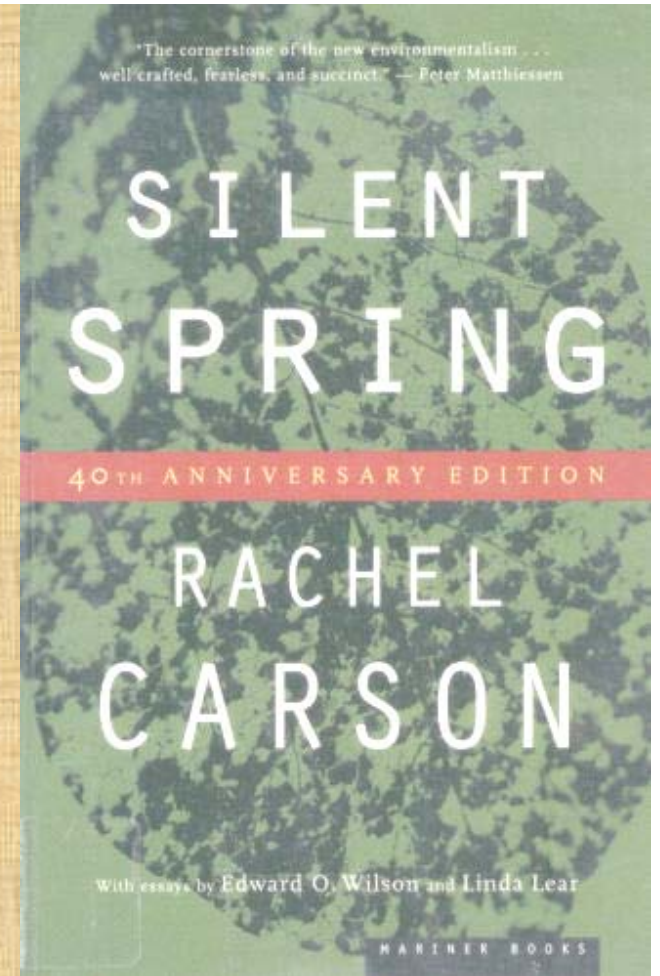
Excreted Drugs: Something Looks Fishy

Florida's Wild Rivers Increasingly Polluted, Experts Say

Why the Attention Now?

(Didn't we learn our lessons?)

- Accelerated development of chemical products;
- Improvements in analytical measurement tools and techniques;
- Developments in biomonitoring and bioindicator tools and techniques;



2007 Press from Chemical Abstract Service (CAS)

"It took 30 years for CA to publish its first million abstracts. And now, more than a million records are expected to be indexed each year."

"In its 100th year of existence, Chemical Abstracts Service (CAS) has logged the largest number of records added ...in a single week"

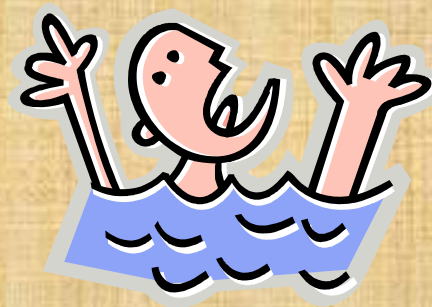
By mid-2007, almost 32 million records of organic and inorganic substances had been catalogued by Chemical Abstract Service. The Service lists more than 19 million as commercially available;

The State of Measurement Science

- The Clean Water Act focused on 126 'priority pollutants'; Several dozen other non-priority pollutants are monitored or regulated;
- Accepted analytical methodologies applicable to environmental media exist for perhaps a thousand chemicals (order of magnitude estimate);
- The recent application of highly sensitive techniques such as LC/MS/MS, High Res. GC/MS and immunoassay screening methods to environmental media can reveal chemicals at levels previously undetected;
- EPA is working to draft new methods for number of new chemical categories (hormones, pharmaceuticals, alkylphenols, PBDEs)

Seemingly awash in 'new' chemicals

Where should we focus analytical resources?



- High volume chemicals;
- Chemicals (and degradants) and concentrations exhibiting biological effects;
- Persistent (or pseudo-persistent) chemicals;
- Bioaccumulative chemicals;
- Development and application of appropriate analytical tools and methods, including biomarkers, bioindicators and screening techniques;

Draft 1600 Series EPA Methods to Address Selected Compounds

- 1614 for polybrominated diphenylethers (PBDEs) – high resolution, isotope dilution GC/MS;
- 1626 for nonylphenol and alkylphenol ethoxylates – GC/MS proposed;
- 1694 for Prescription and Personal Care Products (PPCPs) – LC/MS/MS;
- 1698 for steroids and hormones – GC/MS;
- 1699 for pesticides and metabolites – high resolution GC/MS



Method Application Challenges

- Some of the proposed methods are highly sensitive, highly selective – and require high levels of skill and expensive equipment;
- Many of the methodologies being developed for measuring ECs may not be readily applicable to routine discharge monitoring in the *near* future because of limited availability and high initial cost;
- Chemists need to know what compounds and levels to target (i.e., what concentration ranges are relevant) and what level of uncertainty is acceptable;
- Pharmaceuticals especially cover a broad range of chemical functional groups which may require many different method approaches; Screening and ‘fingerprinting’ methods may need to be developed;

What Else Can We Do?

- **Develop an EC Information Clearinghouse**
- **Investigate cost-effective wastewater treatment strategies to remove problematic classes of chemicals;**
- **Develop disposal strategies for unlisted chemicals and drugs; Engage in public education**
- **The EU Approach – REACH (Registration, Evaluation, and Authorization of Chemicals)**
- **California Green Chemistry Initiative**

<http://www.dtsc.ca.gov/PollutionPrevention/GreenChemistryInitiative/index.cfm>