Dose of Reality
Remedies to keep everyday chemicals out of waterways

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Great Lakes Restoration
The National Sea Grant College Program includes 32 state Sea Grant programs located in every coastal and Great Lakes state and Puerto Rico. Administered by NOAA, Sea Grant focuses on economic and environmental issues in coastal communities.

**Focus Areas:**
- Sustainable coastal development
- Healthy coastal ecosystems
- Safe and sustainable sea food supply
- Hazard resilient coastal communities

What is Sea Grant?
Pennsylvania Sea Grant

Research, Education, Outreach
Two Intertwined Stories…

- Water quantity and quality
- Emerging contaminants and their impact on water quality
What do you really know about your water?

Water 101

In the Great Lakes regions we take it for granted...
WE ARE DRINKING THE SAME WATER DINOSAURS DRANK

The Earth's water circulates continuously in a closed loop—the hydrologic cycle.

1. Water in the atmosphere condenses into clouds and falls to Earth as precipitation.
2. Water flows into oceans through runoff and underground aquifers.
3. Water from the oceans evaporates and rises to the atmosphere.

So if the same amount of water goes around and around, what's the problem? US

We are wasting and polluting the finite supply of water at an alarming rate.

And there are 85 million more of us each year trying to get a share of it.

Likely effects of global warming on water:
- More evaporation from oceans
- Rain cycles heavier
- Middle latitudes get less rain
- Reservoirs evaporate faster
- Dry areas get drier
- Densely populated areas get drier
- Wet areas get wetter.
What % is fresh?
- a. 97%
- b. < 1%
- c. 3%

What % of freshwater is usable by humans?
Just less than one percent of the planet's water is available to meet the daily drinking water, sanitation, industrial, and food needs of seven billion people and millions of other species.
Emerging Contaminants

Chemicals found in the water are generally referred to as “contaminants of emerging concern” (CECs) because the risk to human health and the environment associated with their presence, frequency of occurrence, or source may not be known. (U.S. Environmental Protection Agency)

- PPCPs
- Pesticides
- PBDEs (flame retardants)
- Endocrine Disruptors
PPCPs: defined

- Prescription and over-the-counter (OTC) medications
- Personal hygiene products
- Cosmetics/Skin care products
- Nutritional supplements
Pharmaceuticals: your contribution
Drug consumption statistics:

**Seniors**
- 90.1% of people over 65 took one or more prescription drugs in the past month in 2008, up from 73.6 in ’94
- 65% seniors took 3 or more, up from 35.3 in ’94

**All ages**
- 47.2% of people took one or more prescription drug the past month in 2008, up from 39.1% in ‘94
- 20.8% of people took three or more, up from 11.8% in ‘94

*http://www.cdc.gov/nchs/data/hus/hus10.pdf#094*
70% of those who use prescription pain relievers non-medically get them from friends or family.¹

7,000 people use a prescription medication for the first time for non-medical purposes each day. 1/3 of these are psychotherapeutics ²

1 in 20 Americans over age 12 used prescription pain meds non-medically in 2010. ³

More people (12 and up) use psychotherapeutic drugs for non-medical reasons than those who abuse cocaine, heroin, and methamphetamine combined.

2. Substance Abuse and Mental Health Services. 2009 National Survey on Drug Use and Health
3. National Survey on Drug Use and Health
Nearly 15,000 people die in the U.S. every year of overdoses involving prescription painkillers.

Enough prescription painkillers were prescribed in 2010 to medicate every American adult around-the-clock for a month.

Poisonings are second only to motor vehicle accidents as a cause of unintentional injury death.

Nearly 70% of pediatric poisoning ER visits are due to medication overdoses.

Of those, 82% are from children accessing medications on their own.

http://www.cdc.gov/homeandrecreationalsafety/rxbrief
Disposal of Unwanted Medicines

3.9 billion prescriptions written in the U.S. in 2009*

Medicines may not be entirely consumed due to:

- Change in prescription due to adverse reaction
- Patient’s health improves so they discontinue meds
- Patient death
- Patient non-compliance, possibly because of confusing instructions
- Bulk “discount size” containers contain more than what is consumed before the expiration date
- Dispensing practices that lead to over abundance 90-day supplies, mail-order, VA and military, automatic refills

*Reutters.com
Improper Medicine Disposal

- Diversion 70%
- Drug Misuse safer?
- Environmental impacts
- Unintentional poisoning lethal dose = 1, seniors
How do YOU typically dispose of unwanted meds?

Flush them?
Trash them?
Return them? Where?
Drop off at Collection Events?
Other?
Federal Guidelines for Disposal

- Do not flush prescription drugs unless the label specifically instructs you to.
- Take advantage of community drug take-back programs. Inventories...
- Ask your pharmacy to take back unused meds
- If a collection program is not available: take drugs out of container, mix with undesirable substance, put into disposable container, place in trash.
Survey of 100 pharmacies and 500 patients:
- 54% disposed of medications in the trash
- 35.4% flushed drugs down the sink or toilet
- 7.2% did not dispose of medications
- 2% used all medication prior to expiration
- 1.4% returned medication to the pharmacy
What is YOUR daily contribution?
Times 300,000,000
Times 7 billion?

$6t \times 300,000,000 \text{ divided by } 768 \text{ to get gallons } = 2,343,750 \text{ gals per day.}$
Then and Now...
Drugs and personal care products that are excreted from or washed off the body end up in the waste that flows into sewer systems and septic tanks. These waste systems are not created to remove many chemicals, they focus on bio solids.

Scientists are finding that PPCPs leach from septic tanks and escape intact through sewage treatment processes. Some of these substances end up back in our drinking water.
How do prescription drugs get into the environment?

- Direct disposal from flushing unused meds down the sink or toilet

Metabolic excretion-
Other ways drugs get into the environment:

- Outflow from wastewater treatment plants
- Surface application of manure and biosolids
- Commercial animal feeding operations and aquaculture
- Landfill leachate sent to wastewater treatment plants

Source: www.york.ac.uk/.../gsp/esm/images/pharma1.jpg
Do you know where the waste water from your home and property goes?
Treatment facilities do not remove many of these contaminants, they end up back in our water.
Drugging our bodies inevitably drugs our environment, as many medications can pass through our bodies and waste treatment facilities virtually intact.
This inflow of PPCP chemicals is ongoing, everyday, 24/7
PPCP chemicals are water soluble for the most part and break down with time but are constantly being replenished.
Pharmaceutical manufacturers spend more money on marketing than Research and Development. (You can’t pick up a magazine or watch tv without being bombarded by ads).
Personal care product marketing is also pervasive; “this product will make you look younger, smell better, be more attractive”, etc.

graphic courtesy of Milwaukee Metropolitan Sewerage District
Many PPCP chemicals are not regulated in the U.S.

In the European Union and other countries they’ve banned chemicals we continue to use in the U.S even though evidence suggests they are dangerous.

Shouldn’t all chemicals be considered toxic to humans unless proven otherwise?
The Precautionary Principle

States: an action should not be taken if the consequences are uncertain and potentially dangerous.
Impacts on the environment

Some PPCP chemicals disrupt hormone levels and act as feminizers. US Geological Survey research shows that frogs and fish in many areas are starting to exhibit both male and female sex characteristics.

A study of cane toads in Florida finds that those living in agricultural areas are more likely to be feminized, and even intersex, than those not near agricultural areas.

Science News
Scientists have found evidence that Prozac tinkers with a shrimp’s brain chemistry, making them more vulnerable to being eaten by other fish and birds.

These same common anti-depressants (Prozac/Paxil) caused metamorphosis delays in frogs.
PA Sea Grant sponsored research

Mercyhurst: Dr. Steve Mauro
EE2, Fluoxetine, Triclosan
What’s in the PCP products we use?

The FDA has a long list of "grandfathered" chemicals that are used in products we use on our kids and ourselves. Some of these have been associated with brain and nervous system damage, hormone disruption, allergies and cancer.

They are common ingredients in baby shampoo, lotion, diaper cream, and sunscreen.
One example: Triclosan

The chemicals triclosan and triclocarban are suspected endocrine disruptors linked to reproductive and developmental harm in laboratory studies.
U.S.G.S. studies show triclosan is among the top 10 persistent contaminants in U.S. rivers, streams, lakes, and aquifers.

Animal studies show altered hormone regulation, these hormones guide normal development and reproduction.

By killing most bacteria it leaves the most resistant behind which leads to anti-bacterial resistance.

Hand washing with regular soap for 30 seconds is JUST AS EFFECTIVE-
Undo the Great Lakes Chemical Brew: Proper PPCP Disposal

Great Lakes Restoration Initiative funded, runs 10 ‘10 – 9’12, 3 lakes, 5 states

Goal #1: Reach one million people around the Great Lakes basin in two years.
Education and Outreach - six main audiences

Goal #2: Properly dispose one million unwanted pills in two years
Education and Outreach

Newspaper inserts

Factsheets and posters

Billboards

Teacher Workshops and Presentations

Anglers, service learning, 4-H and public school teachers and students, medical professionals, general public
Results to date: people reached

Partnerships exponentially increase number of people reached

- 700,000+ in year one, how??
Partnerships: some examples

Medical communities
- LECOM
- AVMA

Educator/student Service Learning

Media

Law enforcement

Same end goal
Results to date:
Unwanted pills collected

- 2,052,504 pills
PA SEA Grant/LECOM takebacks

2 PASG/LECOM, 3 with DEA

Why we inventory:

- Provides *picture of what is available* in the community as a source for poisonings, abuse/diversion, and misuse
- Provides *data to justify changes needed* in prescribing practices and marketing of meds

What we’ve learned through inventories:

- Non-compliance
- **Incredibly large** #’s sit in people’s homes (102,775), (DEA = 997,000 #’s in 12 hours)
- Waste thru over prescription of pain meds for outpatient surgery (26 out of 30)
- Anecdotal stories re: pain meds addiction
- Eye-opening experience for pharm students
Collection events are end-of-pipe solutions. How can we minimize waste further up the chain?

Example: Maine’s 15 day prescription law

Your suggestions as a consumer???
Who are the Players?

- Drug companies
- Doctors
- Pharmacists
- Consumers
- EPA/DOH/DEP/DEA
- Municipal Waste/Water
- Researchers
Partnering for an equitable solution

- **Drug companies** - take responsibility for the products they develop, market and profit from
- **Doctors** - do medication reviews, help patients maintain good health as opposed to using drugs to treat disease
- **Consumers** - take all medicines as prescribed and look into proactive lifestyles as an alternative to drugs
- **Local, state and federal agencies** - craft a uniform message, pool resources
- **Municipal facilities** - make this a priority
- **Researchers** - identify which chemicals are most harmful and develop removal methods
Interim solutions: Pharmaceuticals

Collection events
DEA, PA Sea Grant, LECOM

Pharmacy returns

Mailbacks
Long term solutions: Pharmaceuticals

Consumers:
- Better compliance
- People being more proactive in their health care
- Maintaining good health rather than treating poor health

Prescribers:
- More mindful prescribing
- Regular medicine reviews of patients to ensure they are taking meds as prescribed and that meds are having desired effects. Maintaining good health rather than treating disease and illness

Manufacturers:
- Less marketing
- Extended Producer Responsibility
Current Extended Producer Laws

PPCP’s 5 states

Source: Product Stewardship Institute, Inc. (2010)

Number of Product Categories Covered by EPR Law

- Zero
- One
- Two
- Three
- Four
- Five
- Six

* Other laws authorizing agencies to require EPR, including Framework laws.
Interim solutions: PCPs

Become a label reader! Changing habits and products is safest and the least expensive cure!

INGREDIENTS TO AVOID

- DMDM hydantoin
- Fragrance and dyes
- Parabens or "-paraben"
- “PEG” and “-eth”
- Sodium lauryl or laureth sulfate
- Triclosan and triclocarban
- Synthetic musks
- Phthlates

http://safecosmetics.org
Long term solutions: PCPs

- Better FDA regulation (regulates what goes into the product—WE need to insist on this)
- Better EPA regulation (regulates what goes into the environment—WE need to insist on this too)
- Use your purchasing power
- Contact state and federal legislators, consumers should speak as loudly as lobbyists if we expect change

Eliminate dangerous chemicals from products we use.
For more information:

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Environmental Protection Agency
www.epa.gov/ppcp
USGS research -
http://toxics.usgs.gov/regional/emc/
For more about cosmetics -
http://storyofstuff.org/cosmetics/
Women's Health & Environmental Network - www.when.org