



Unwanted Medicines and Educating our Communities: What Have we Learned, How are we Doing and What are the Next Steps?

Experiences from the Great Lakes States

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Photo Credit: Milwaukee Metropolitan Sewerage District





Pharmaceuticals and Personal Care Products (PPCPs)

- Prescription, OTC medications, Cleaning agents, Cosmetics, Nutritional supplements, and Skin care products
- Produced and used in larger volumes yearly
 - \$300.3 billion – spent in 2009 in the U.S.
 - 5% increase (2009)
 - UN projects a 3-fold increase in next 25 years

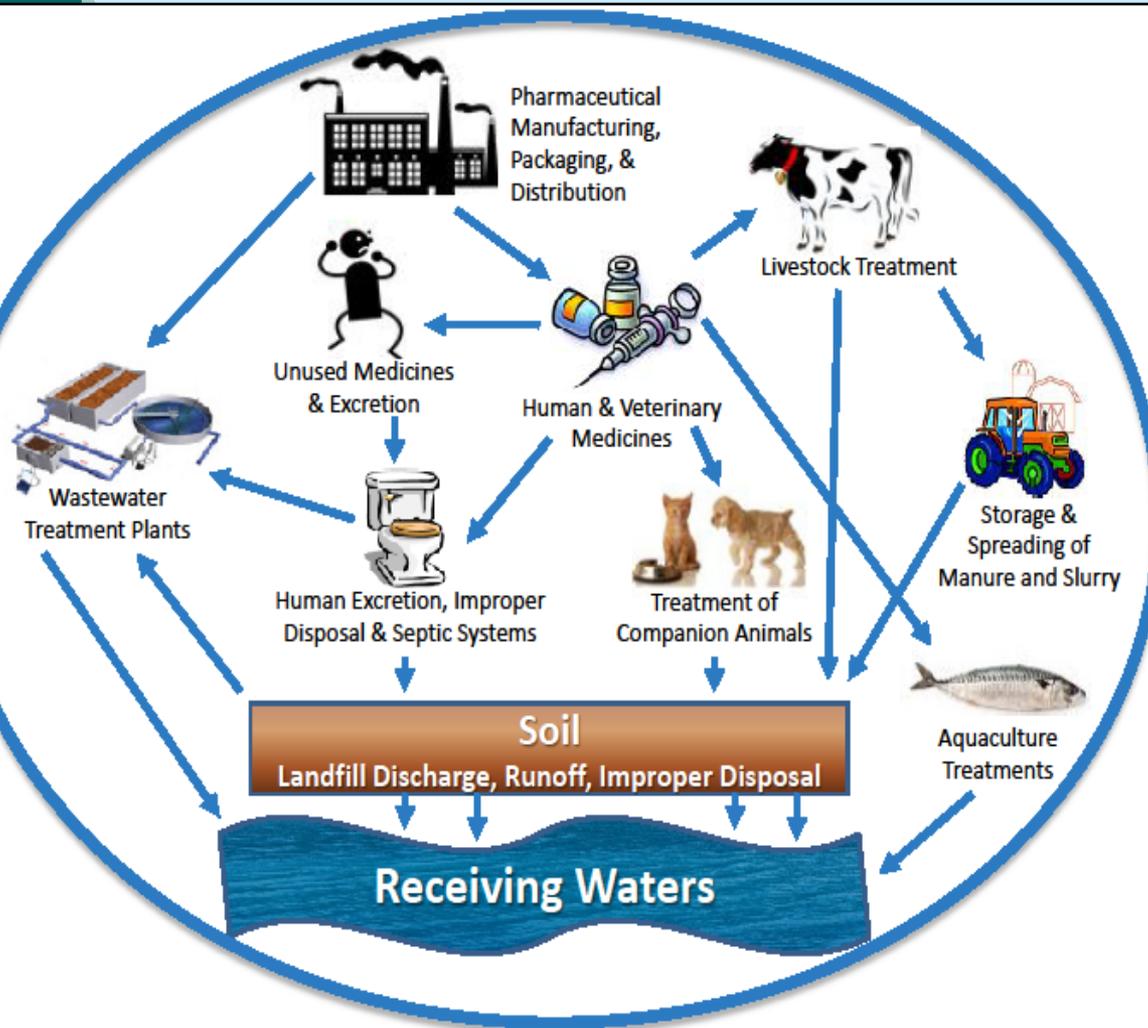




Risks of Improper Disposal Practices

- Environmental
 - Accumulation in waterways leads to potentially harmful effects on species
- Accidental Ingestion
 - 78,000 children (>5) treated for unintentional medication poisoning in U.S. (2003)
- Illegal Use or Theft
 - Appropriation by family, friends, workers in homes
 - Burglary and Identity theft

Pathways of Medicines into the Environment



- ▶ Wastewater
- ▶ Landfill leachate
- ▶ Application of manure and biosolids
- ▶ Confined Animal Feeding Operations
- ▶ Aquaculture
- ▶ Septic systems
- ▶ Human/Animal Excretion

What Are We Finding Out?

DISPATCHES



That says out a broad range of contaminants than a carbon filter alone. But reverse osmosis concentrations can be slow and costly. It's not thousands of dollars. Most do come with pumpkin-sized storage tanks. One exception is General Electric's Aclarix system, an elegant tankless device that can process more than 700 gallons a

TECHNOLOGY Pipe Dreams

THE OPTION FOR PURCHASING WATER IN AN IMPROPER WORLD
By Luke O'Neil

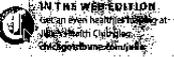
THE ANAEROBIC COMBUSTION W.C. FILTERS offered this rationale for not drinking tap water: tap water is full of lead. In it. Clearly, fields produced dairy. But there are reasons less likely to worry about the milk flowing from our faces than any contamination cysts, lead from corroding pipes, a slew of sex hormones and other drugs that people excrete down a toilet and into our water supply. An Associated Press investigation last year revealed that crude amounts of pharmaceuticals make their way into the drinking water of at least 11 million Americans. These chemicals, for example, could be major cholesterol-lowering (statins) or cancer-fighting (chemotherapy) compounds in the body, in a process that scientists don't fully understand. Fish may be sensitive to some of these, but studies to date suggest that many are not. Some, like estrogen-like compounds, are known to be toxic to aquatic life, such as Washington, D.C.'s Potomac River, where male fish have been found with immature eggs in their testes. Fish in Texas have been found with the active ingredient of Prozac in their brains. Only six, a health researcher would think, is this funny.

It's now the second most common illegal drug problem in the nation behind marijuana, and because it's so easy to get. More than 90 percent of the drug abusers say they get it from a friend or relative. For free. And Andre Vallance, spokeswoman for the White House Office of National Drug Control Policy. The top 100 cities, including 100 of the year's top 100 cities and several of the federal agencies, including the Environmental Protection Agency have a domestic. They're not as environmentally friendly as some would like.

The best way to destroy unwanted insects is to use them in a way that is not with the proper controls, but this requires a rapid or fast-paced program, something that isn't currently available in the U.S.

Some pharmaceuticals will take unwanted medicine off your hands, and contractors offer on-day collection services. You also can ship them to the nearby sewerage, but "there's no long-term solution to this growing and potentially dangerous waste stream," said Susan Wallace, a consultant with the Illinois-Indiana Sea Grant (IISG).

Throwing drugs in the trash means they have the potential to reach streams, lakes and other waterways through runoff and leachate. If they don't make it in landfills, they'll



AN THE WEREDITION
set an even higher standard for
the health of the planet.

Drugging the Waters

HOW AN AGING POPULATION AND OUR GROWING ADDICTION TO PHARMACEUTICALS MAY BE POISONING OUR RIVERS
by Elizabeth Royte

norman Leonard moved to Heritage Village, a sprawling retirement community in western Connecticut, 11 years ago. Its green-gabled condominiums and Cape were well maintained, and the landscapers hadn't skimped on the rhododendrons. A retired CPA, Leonard considers himself, at age 80, to be in pretty decent shape. He plays platform tennis on the grounds and hikes often in nearby forests and reserves. But still, he takes five different drugs a day to manage his blood pressure, acid reflux, and high cholesterol. Heritage Village is home to about 4,000 residents with similar medical profiles, who take an average of six drugs a day.



And that's a healthy population. In a convalescent home a few miles away, Patricia Reilly, age 88, whacks herself each morning toward a low shelf. With a glass of water and small cups of applesauce at the ready, she prepares to take her morning medicines: nine different types that treat heart disease, acid reflux, renal stones, a chronic urinary-tract infection, chronic constipation, migraine headaches, depression, allergic rhinitis, degenerative arthritis, and intermittent vertigo. The 120 residents of River Glen Health Care Center, where the average age is 90, take an average of eight drugs a day; the most common among them target high cholesterol, high blood pressure, depression, and diabetes. Once swallowed, Reilly's medications will bring her some relief, but their biological activity won't stop once they leave her body.

When residents of Heritage Village and two other nearby retirement communities flush their toilets, wastewater laced with traces of prescription drugs rushes through a series of

photographs by Masood Kamandy

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Hormones and Hormone Mimics in the Aquatic Environment

By Karen Kidd
Over a decade ago, fishermen first reported developmental abnormalities in fish from rivers in the United Kingdom. Follow-up investigations revealed that up to 100% of the males in 17 reaches of the rivers had become feminized (jobbing et al. 1998). These fish had both male and female structures in gonads, and in the worst cases, had developed eggs. Wild male fish and males caged in the river were also producing precursors of egg yolk proteins called vitellogenin when fed to the river water for only short periods of time. These fish are produced by the liver in response to estrogen in food stream and are used to mature eggs in the ovaries to spawning.

Laboratory studies have been conducted to determine the substances responsible for the feminization of male fish in rivers in the United Kingdom. It is now accepted that the estrogens produced naturally by women and the synthetic estrogen women consume in birth control and hormone replacement therapies are mainly responsible for the feminization of male fish (Desbrow et al. 1998).

The hormones that control reproduction and development in humans are very similar or identical to the hormones used by women with



endocrine system impacts male fish normally only provide vitellogenin during the reproductive season in response to a rise in food estrogen levels—the appearance of vitellogenin in males is a sign that these fish were being fed to something in the water was mimicking an estrogen. If

AN AP INVESTIGATION : Pharmaceuticals Found in Drinking Water

	DAY 1	DAY 2	DAY 3
DAY 1	PharmaWater I PharmaWater-IVC Water PharmaWater-Research PharmaWater-Matros-A to Z PharmaWater-Small Cities PharmaWater-Waterbeds PharmaWater-Metabolism		
DAY 2	PharmaWater II PharmaWater-Secrecy		
DAY 3	PharmaWater III PharmaWater-Philadelphia Drugs PharmaWater-Treatments PharmaWater-Bottled Water		

Drugs in the drinking water

Tests have detected minute concentrations of pharmaceuticals in the drinking water supplies of at least 46 million people in two dozen major American metropolitan areas, an Associated Press investigation has found. The federal government does not regulate prescription drugs in water.

Drug control on a bad trip with the environment



Julie Dearnoff
Tobacco health and fitness reporter

If you're loading left or right, the kind that would be used to get high, the federal government has some advice. ■ Remove the pills by their original containers. ■ Mix them with an unpalatable substance, such as ketchup or coffee grounds and put them in a paper or sealed bag so they are eaten by children, pets or other animals. ■ Then, throw them in the trash.

Most drugs are particularly powerful if addictive substances or stimulants. Push the pills down the drain, instead of disposing them. This may sound like a lot of trouble, but for a good reason. Accidental poisonings of prescription drug abuse are on the rise, and misuse is increasingly prevalent among young adults.

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better way than only drinking with waste at the end of the life cycle."

■ *E-mail: Julie Dearnoff@enr.com or jrd@enr.com. Send health and fitness news to jrd@enr.com.*

Effects on Aquatic Organisms: Cause for Concern

- Aquatic exposure - can result in continuous, multi-generation exposure.
- Feminization of fish - link to estrogen exposure?
- Effects of antidepressants on fish and frog development?



Medicines in the Environment

U.S. Geological Survey monitoring study

- 139 streams analyzed in 30 states
- 82 contaminants identified
- Contaminants identified in 80% of these streams



- Average 7 distinct contaminants identified per stream

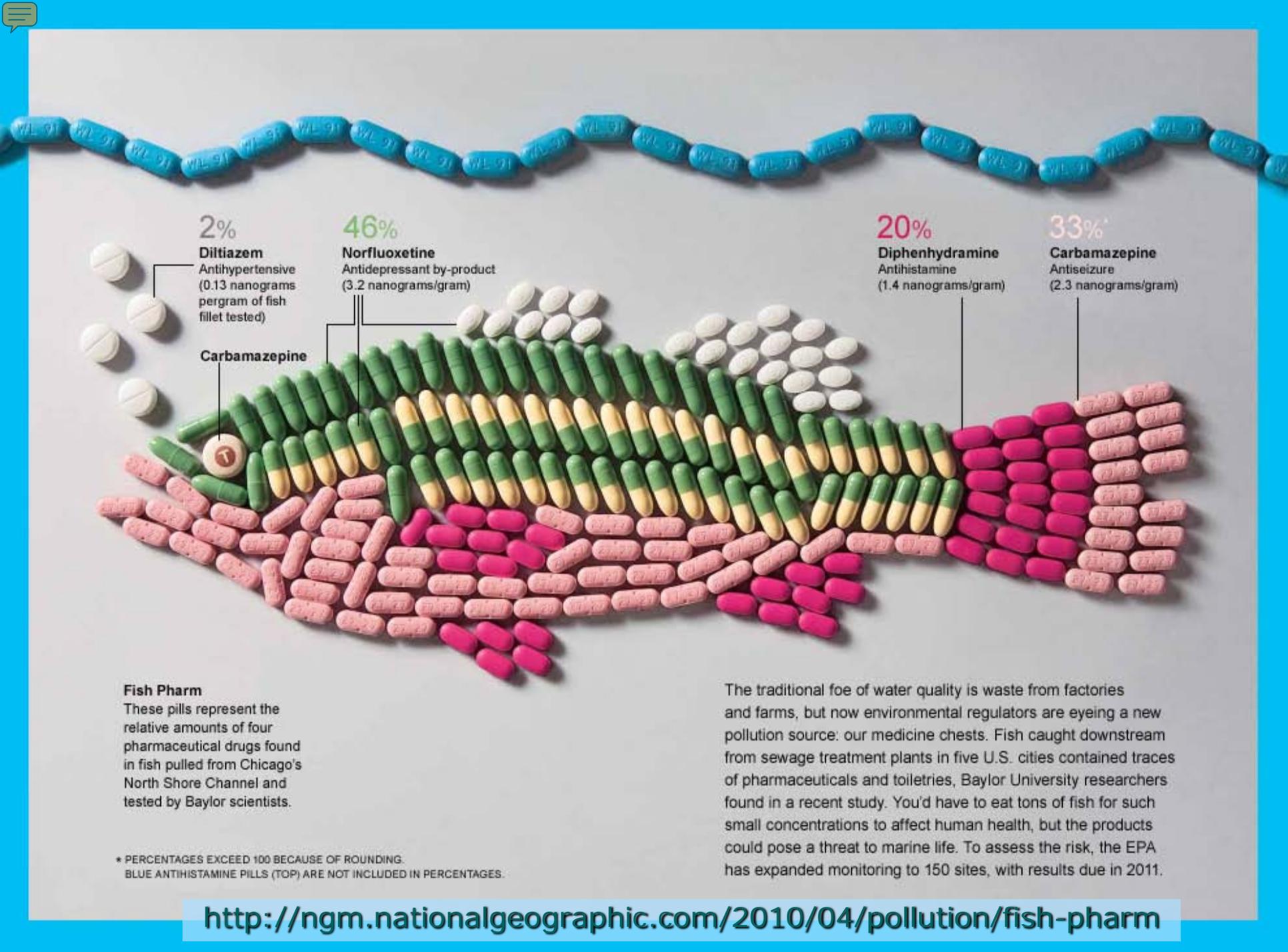


Pharmaceuticals Found in Drinking Water

2008 Associated Press Investigation:

- Antibiotics, anti-convulsants, mood stabilizers & hormones in drinking water of 41 million Americans
- Detected in the drinking water of 24 major metropolitan areas
- State monitoring programs for pharmaceuticals





2%

Diltiazem
Antihypertensive
(0.13 nanograms
pergram of fish
fillet tested)

46%

Norfluoxetine
Antidepressant by-product
(3.2 nanograms/gram)

20%

Diphenhydramine
Antihistamine
(1.4 nanograms/gram)

33%

Carbamazepine
Antiseizure
(2.3 nanograms/gram)

Carbamazepine

Fish Pharm

These pills represent the relative amounts of four pharmaceutical drugs found in fish pulled from Chicago's North Shore Channel and tested by Baylor scientists.

The traditional foe of water quality is waste from factories and farms, but now environmental regulators are eyeing a new pollution source: our medicine chests. Fish caught downstream from sewage treatment plants in five U.S. cities contained traces of pharmaceuticals and toiletries, Baylor University researchers found in a recent study. You'd have to eat tons of fish for such small concentrations to affect human health, but the products could pose a threat to marine life. To assess the risk, the EPA has expanded monitoring to 150 sites, with results due in 2011.

* PERCENTAGES EXCEED 100 BECAUSE OF ROUNDING.
BLUE ANTIHISTAMINE PILLS (TOP) ARE NOT INCLUDED IN PERCENTAGES.

What can we do



Disposal of Unwanted Medicines

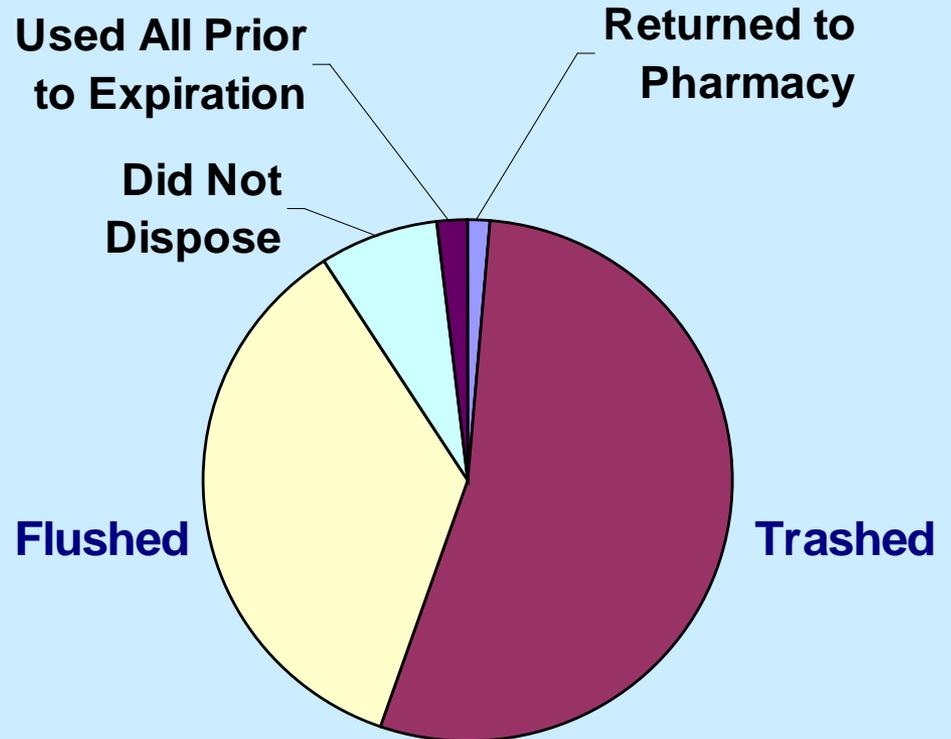
Medicines are not always entirely consumed:

- Change in prescription
- Patient's health improves
- Patient death
- Patient non-compliance
- Expiration dates
- Bulk "Economy Size" containers



1996 Pennsylvania Survey: Medication Disposal Habits

- **54%** Disposed of medications in the trash
- **35.4%** Flushed drugs down the toilet or sink
- **7.2%** Did not dispose of medications
- **2%** Used all medication prior to expiration
- **1.4%** Returned medications to the pharmacy



500 patients surveyed



2009 Chicago Survey: Medication Disposal Habits

<u>Throw Away</u> unused or expired meds in household garbage (<i>n</i>=444)	59.0%
<u>Flush</u> unused or expired medications down the toilet or sink (<i>n</i>=443)	31.3%
Never dispose of unused or expired medications (<i>n</i> =444)	17.1%
Return unused or expired medications to a pharmacy (<i>n</i> =444)	10.7%
<u>Take unused or expired medications to a Hazardous Waste Collection Facility or Collection Event</u> (<i>n</i>=443)	8.4%
Give unused or expired medications to someone else who would use them (<i>n</i> =444)	5.8%
Dispose of unused or expired medications in some other way (<i>n</i> =444)	5.4%
Return unused or expired medications to a physician (<i>n</i> =444)	5.1%

Collection Events & Take-back Programs



Why is IISG Involved with Community Collections?

- Communities asking for assistance and education materials
- Decrease amount of PPCP to the environment





IL-IN Sea Grant (IISG) Toolkit:

Disposal of Unwanted Medications A Resource for Action in Your Community

<http://www.iisgcp.org/unwantedmeds/>

Purpose: Guide to establish safe, legal, successful collection programs for unwanted medicines

Who:

- Solid waste officials
- County and state officials
- Community groups
- Pharmacists
- Researchers
- Environmental and community organizations

Successes:

- Educated 1000s of individuals
- Supported outreach campaigns for community events
- Created new networking groups





Components of a Successful Collection

- Drug Enforcement Administration Goal
 - Avoid diversion/follow regulations
- Comply with State Regulations
 - Board of Pharmacy
 - Dept. of Health
- Educate the Public, Health Professionals, & Pharmacists
- Involve Pharmacists/Police
- Collect data



Challenges of Stewardship Programs

- Safe & legal disposal
- Controlled Substances Act (currently under revision)
- Convenience
- Funding for staff, disposal & publicity
- Education and Advertising
- Privacy of medical information
- Responsibility is taken off the manufacturer



What's Happening in the Great Lakes?

Illinois EPA

- **102,075 lbs** of unwanted pharmaceutical waste
- 30 counties in IL have disposal programs

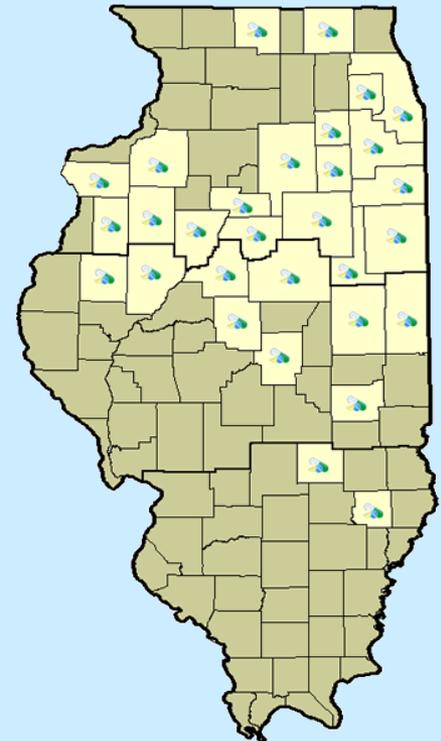
Chicago

- 5 Chicago Police Stations have disposal containers
- Metropolitan Water Reclamation District: "Medication Disposal Survey Final Report" December 2009

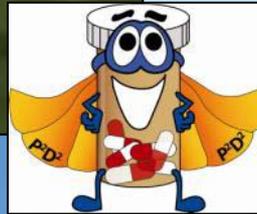
Illinois and Other States

- IL, WI, IN all have state level task forces

Great Lakes Restoration Initiative



Education & Outreach



Get Rid of Stuff Sensibly

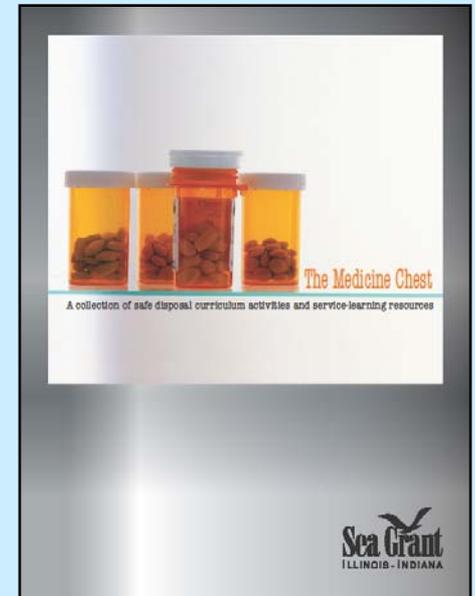
<p>Medicines</p> <p>The Problem: Medicines that are flushed down the toilet can end up in lakes and rivers, potentially affecting fish and drinking water.</p> <p>The Solution: DON'T FLUSH! The simplest medicine is a pharmacy, or find a collection center or collection event.</p>	<p>Electronics</p> <p>The Problem: Electronic waste contains toxic metals and chemicals that can end up polluting soil and waterways.</p> <p>The Solution: Find your old electronics in new homes, recycle them through the manufacturer, or find a collection event.</p>	<p>Aquarium Fish and Plants</p> <p>The Problem: Fish or aquatic plants that end up in lakes and rivers can push out native species and impact fishing and boating.</p> <p>The Solution: Find a new home for your pets and plants, or contact a vet or reseller for humane and safe disposal options.</p>
<p>Motor Oil</p> <p>The Problem: Motor oil can pollute drinking water if it ends up on the ground or in lakes or rivers.</p> <p>The Solution: Pour used motor oil into a container with a screw-top lid. Then recycle it at a gas station or quick-lube business.</p>	<p>Household Trash</p> <p>The Problem: Burning trash releases many harmful pollutants that can impact people as well as nearby rivers and lakes.</p> <p>The Solution: Recycle metal, glass and paper. Compost yard and food waste. Donate useful things. Have the rest picked up by a waste hauler or take it to a landfill.</p>	<p>Dog Poop</p> <p>The Problem: Leaving your dog poop can wash down into streams. These germs can be harmful to water, fish, and other human health.</p> <p>The Solution: Pick up after your dog! Bag the poop, and throw it in the trash.</p>

www.iiscagrants.org 

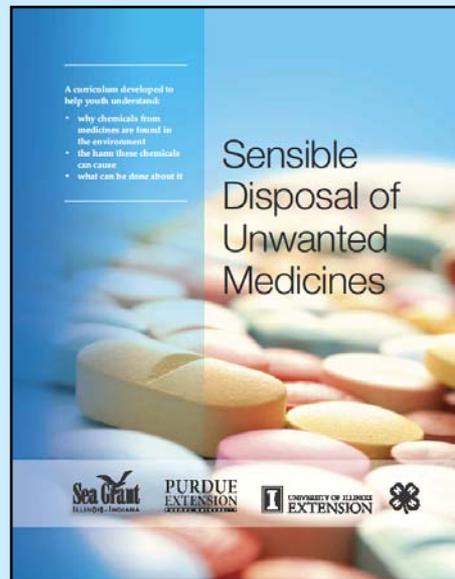


The Medicine Chest – Curriculum

- High school teachers: Prescription Pill and Drug Disposal Program (P²D²)
- Supplemental activities to encourage students to become actively engaged
- Support community stewardship by offering models, resources, and guidance



Sensible Disposal of Unwanted Medicines — 4-H Guide

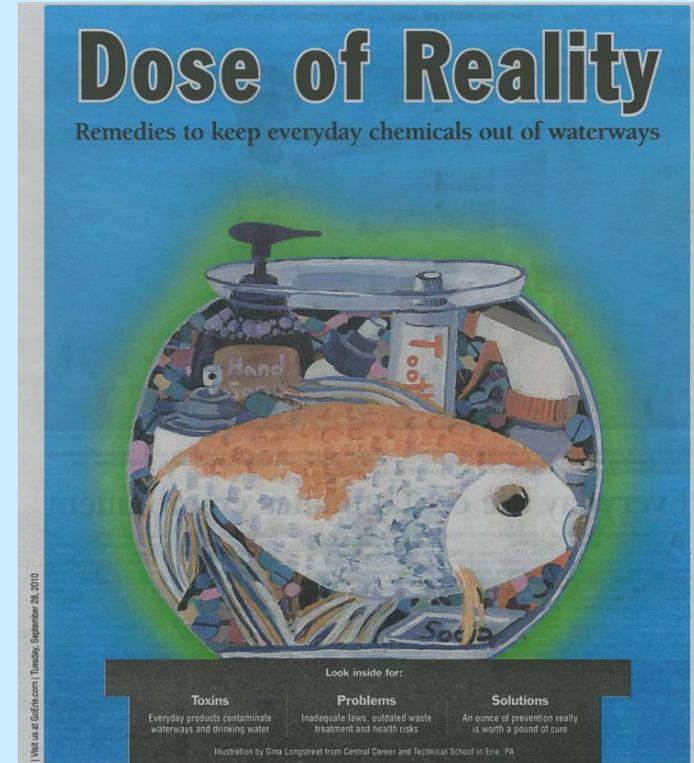


- Increase environmental stewardship, knowledge and engagement
- Share knowledge with others – parents, siblings, and friends
- Incorporate reflection activities
- Provide sample stewardship project ideas
- National 4-H mandate
Increasing science, engineering, and technology learning



IISG Education and Marketing

- Great Lakes Regional Initiative funding
- Newsletters, media, articles
- Integration of “do not flush” message into displays, games, brochures, billboards, mailboxes



IISG and unwanted medicines

- Started with first toolkit 4 years ago
- Workshops to community leaders, solid waste and water treatment professionals, etc. in GL states
- Expertise to USEPA R5 during 2008 Earth Day
- Speaking on this issue locally and nationally
- Distribute toolkits – engaged IISG educators and GL SG Network
- Integration of messages throughout IISG

IISG and unwanted medicines

- Continue to support community programs
- Continue to work on education initiatives
- Help communities bring the waste minimization message to their programs
- New potential partner – American Veterinary Medical Association
- Work with DEA

Partnership with AVMA

Action Items:

- Define audience (vet practitioners and their clients)
- Establish a collaboration agreement with IISG or National Sea Grant
- Define long-term goal (unified message):
 - Every AVMA practitioner provides their clients with advice about the proper disposal of human and vet meds; source reduction
- Define steps to reach goal:
 - Outreach materials for practitioners, techs and clients
 - Identify specific audiences – vet offices, booths at conferences, flyers, YouTube videos, giveaways, etc.
 - Identify funding streams to conduct outreach and measure success

For more information

www.iisgcp.org/unwantedmeds

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