

Solving the Problem of Medicine Disposal: How the Great Lakes States are Protecting Public Health

Susan Boehme, Ph.D. and Elizabeth Hinchey Malloy, Ph.D.
Extension Agents, Illinois-Indiana Sea Grant

&

**Liaisons to the U.S. Environmental Protection Agency Great
Lakes National Program Office**



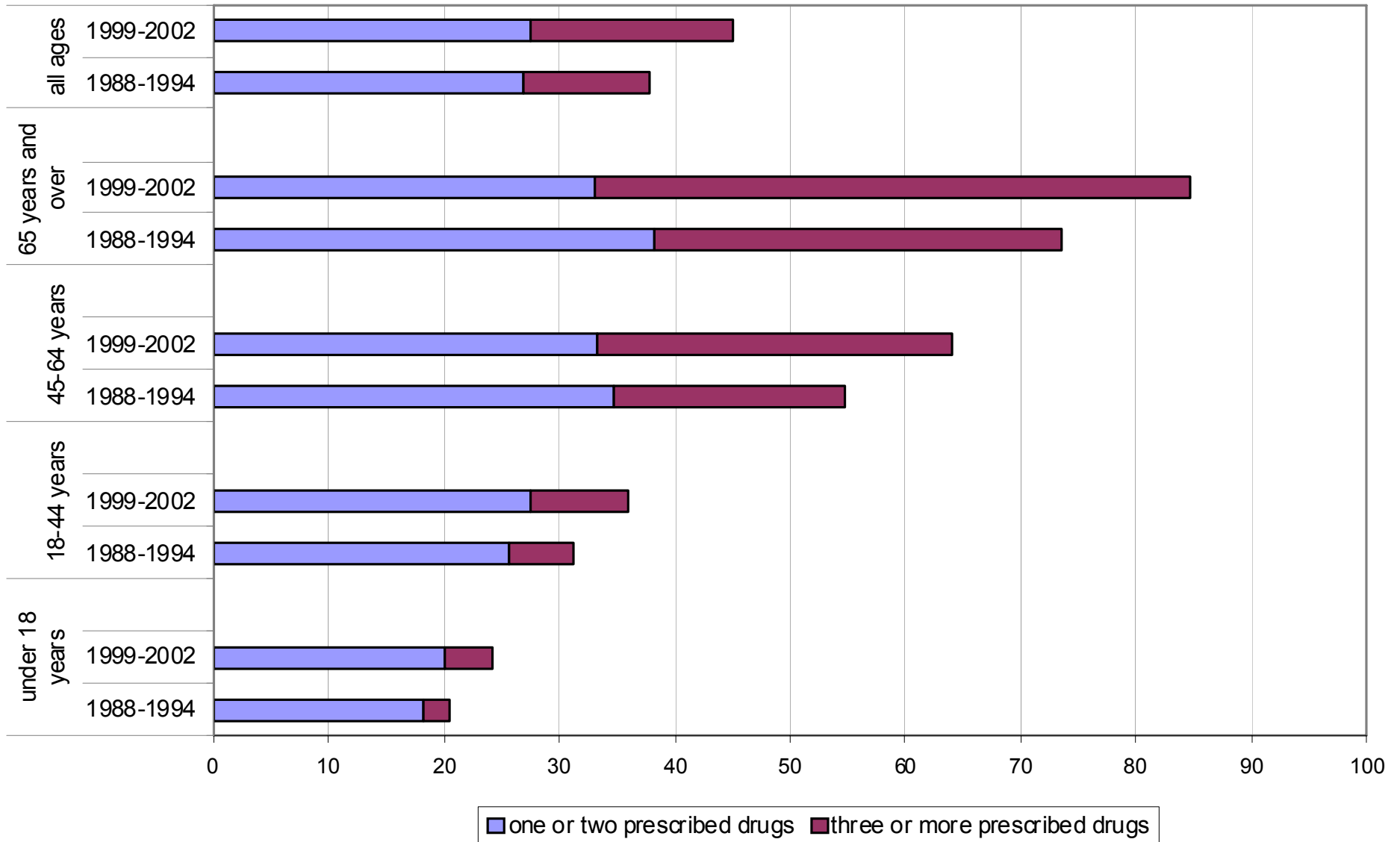


Pharmaceuticals and Personal Care Products (PPCPs)

Includes prescription and over-the-counter (OTC) medications, cleaning agents, cosmetics, nutritional supplements, & skin care products

- Produced and used in larger volumes yearly
- Designed to be biologically active
- Pharmaceuticals not typically evaluated for their environmental impacts

Percent of persons reporting prescription drug use in the past month by age



Source: U.S. Center for Disease Control and Prevention. National Center for Health Statistics. National Health and Nutrition Examination Survey.



Main Risks of Improper Disposal Practices

- Environmental impact
 - Accumulation in waterways → potentially harmful effects on wildlife
- Accidental ingestion (children & elderly)
 - 78,000 children/year under 5 treated for unintentional medication poisoning in U.S.
- Illegal use or theft
 - Appropriation of pharmaceuticals by family and friends, workers in homes, and burglars
- Unnecessary accumulation & waste of health care \$\$\$

Medicines in the Environment

U.S. Geological Survey monitoring study

- 139 streams analyzed in 30 states
- Contaminants identified in 80% of these streams
- 82 contaminants identified (many were pharmaceuticals)
- Co-occurrence common; average 7 distinct contaminants identified per stream

Kolpin, D.W. et al. 2002. "Pharmaceuticals, hormones, & other organic wastewater contaminants in U.S. streams, 1999-2000: A national reconnaissance." *Environmental Science & Technology*. 36(6):1202-1211.

Medicines in the Environment

USGS/CDCP study of drinking water facility

- Analyzed for 106 contaminants in 24 water samples from locations within a drinking-water-treatment facility and the 2 streams serving the facility
- 40 contaminants detected in 1 or more samples of stream water or raw-water supplies in the plant
- 34 contaminants detected in >10% of these samples
- Some prescription and non-prescription drugs and their metabolites were detected in finished water

Stackleberg, P.E. et al. 2004. "Persistence of pharmaceutical compounds and other organic wastewater contaminants in a conventional drinking-water-treatment plant." *Science of the Total Environment*. 329:99-113.

Effects on Aquatic Organisms: Cause for Concern

Aquatic exposure – chemicals in the aquatic environment can result in continuous, multigeneration exposure.



- **Feminization of fish - link to estrogen exposure?**

Ex: Boulder Creek, CO: female white suckers outnumber males by > 5 to 1; 50% of males have female sex tissue
(David Norris, Univ. of Colorado at Boulder)

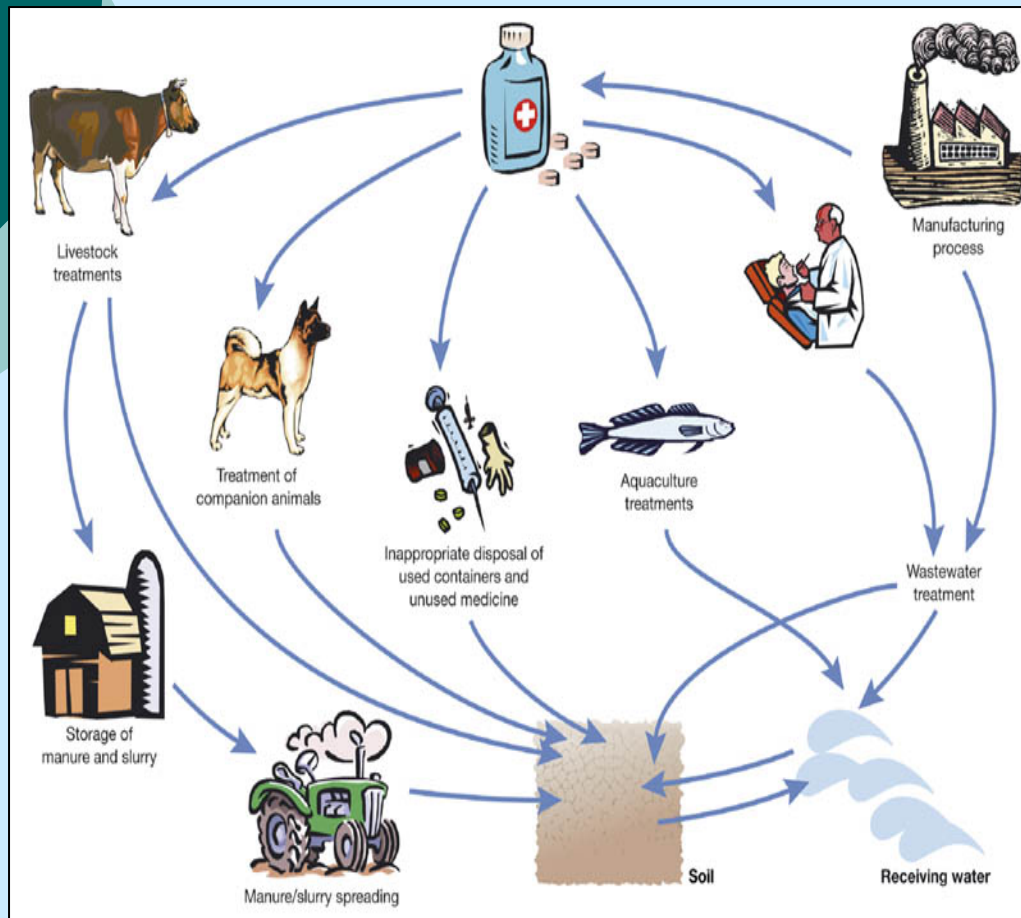
- **Effects of antidepressants on fish and frog development?**

Ex: Lab studies show low levels of common anti-depressants, including Prozac, Zoloft, Paxil and Celexa, cause development problems in fish, and metamorphosis delays in frogs

(Marsha Black, Univ. of Georgia)



Entry Pathways of Medicines 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
- Septic systems

Source: www.york.ac.uk/.../gsp/esm/images/pharma1.jpg



Proper Disposal of Prescription Drugs

Office of National Drug Control Policy February 2007

Federal Guidelines:

- ❶ Take unused, unneeded, or expired prescription drugs out of their original containers and throw them in the trash.
- ❷ Mixing prescription drugs with an undesirable substance, such as used coffee grounds or kitty litter, and putting them in impermeable, non-descript containers, such as empty cans or sealable bags, will further ensure the drugs are not diverted.
- ❸ Flush prescription drugs down the toilet *only* if the label or accompanying patient information specifically instructs doing so (see box).
- ❹ Take advantage of community pharmaceutical take-back programs that allow the public to bring unused drugs to a central location for proper disposal. Some communities have pharmaceutical take-back programs or community solid-waste programs that allow the public to bring unused drugs to a central location for proper disposal. Where these exist, they are a good way to dispose of unused pharmaceuticals.

The FDA advises that the following drugs be flushed down the toilet instead of thrown in the trash:

Actiq (fentanyl citrate)
Daytrana Transdermal Patch (methylphenidate)
Duragesic Transdermal System (fentanyl)
OxyContin Tablets (oxycodone)
Avinza Capsules (morphine sulfate)
Baradude Tablets (entecavir)
Reyataz Capsules (atazanavir sulfate)
Tequin Tablets (gatifloxacin)
Zerit for Oral Solution (stavudine)
Meperidine HCl Tablets
Percocet (Oxycodone and Acetaminophen)
Xyrem (Sodium Oxybate)
Fentora (fentanyl buccal tablet)

Note: Patients should always refer to printed material accompanying their medication for specific instructions.

Focus on theft and improper use

<http://www.whitehousedrugpolicy.gov/news/press07/022007.html>

Office of National Drug Control Policy
ONDCP, Washington, D.C. 20503
p (202) 395-6618 f (202) 395-6730





The American Pharmacists Association and the U.S. Fish and Wildlife Service jointly recommend the following (2/14/07):

- **DO NOT FLUSH** unused medications
- **When tossing unused medications, protect children and pets from the potentially negative effects:**
 - crush or dissolve solid medications
 - mix with kitty litter or a solid kitchen substance
 - place in a sealed plastic bag to reduce the poisoning risk
 - remove and destroy **ALL** identifying personal information
 - check for approved state and local collection programs or with area hazardous waste facilities
- **Talk To Your Pharmacist**

Medicine Waste Management Issues and Barriers

- Communicating the issue
- Lack of conclusive research
- Safe disposal
- Controlled substances - Drug Enforcement Administration
- Convenience
- Funding for staff, disposal & publicity
- Privacy of medical information
- Misinformation





IL-IN Sea Grant Resource Kit: Disposal of Unwanted Medications A Resource for Action in Your Community

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

Purpose: Guide for communities who are looking for a solution for their drug disposal problem

Use: Solid waste officials, county and state officials, community groups, environmental and community organizations, pharmacists, researchers

Sucesses: Educated 100's of individuals on the issue, supported several outreach campaigns for communities holding events, created new networking groups

IL-IN Sea Grant Resource Kit:

Disposal of Unwanted Medications

A Resource for Action in Your Community

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

Content

1. Introduction and Background
2. Case Studies of Take-Back Programs
3. How to Hold a Collection Event
4. Materials for Public Outreach and Education
5. Pharmaceutical Donation/Take-Back Legislation
6. International Policy on Medicine Donations
7. Bibliography on Pharmaceuticals, the Environment, and Human Health
- ★ 8. Information for Nursing Homes and Assisted Living Facilities
9. PowerPoint Presentation



What's the Issue?

Safe methods of disposal are needed for expired or unwanted medicines. Products of concern include prescription and over-the-counter medications. Improper disposal of medicines presents both a public safety and environmental hazard and wastes millions of health care dollars annually.¹

Why is Medicine Disposal a Concern?

The three main hazards are:

1. Possible poisoning from accidental ingestion, particularly among young children and pets, if medicines are thrown in the trash
2. Illegal use or theft, including identity theft, from discarded containers providing personal patient information.
3. Contamination of water resources, which can result in reproductive and developmental problems in fish and other aquatic wildlife if medicines are flushed or placed in the trash.

¹ Doughton, C. (2003). "Credits to Cradle Stewardship of Drugs for Minimizing Their Environmental Disposition While Promoting Human Health—Rationale for and Advances Toward a Green Pharmacy". *Environmental Health Perspectives*, 111 (5): 757-774.

Other Resources

- *Disposal of Unwanted Medicines* resource kit from IL-IN Sea Grant www.iisgcp.org/unwantedmeds
- U.S. Environmental Protection Agency the potential environmental impacts of pharmaceuticals: www.epa.gov/ppcp
- U.S. Geological Survey research on the presence of pharmaceuticals in the environment: <http://toxics.usgs.gov/regional/emc/>



Additional Contacts:

For General Information:

- Susan Boehme
Illinois-Indiana Sea Grant Program
(312) 353-4383
boehme.susan@epa.gov

For Advice on Organizing Collections:

- Lieutenant Jeff Hoffmann
Chicago Police Department
(312) 747-5140
Jeff.Hoffmann@chicagopolice.org

Unused and Expired Medicines

How to reduce pollution and prevent poisoning



www.iisgcp.org/unwantedmeds

The Resource Kit

Received the 2007 "Best Education Program" award from the North American Hazardous Materials Management Assoc.

Written several newsletter articles

~15 presentations nationally

Provided financial support for outreach materials

found primarily in discharge from wastewater treatment plants and surface waters. Pharmaceuticals are also released into waterways via runoff from commercial animal feeding operations and aquaculture, and from fields where manure and biosolids have been applied.

How Can Medications Impact the Environment?

Expired or unwanted medicines, if flushed down the toilet or drain, are a source of pollution in wastewater. Because sewage treatment plants are not designed to deal with drugs, these chemicals can be released into streams, lakes, and groundwater and affect fish and other aquatic wildlife.

You might imagine that any substance safe enough for humans and pets to ingest as medication can't cause environmental harm. But that may not be the case. If our medicines are reaching streams, rivers, and lakes, organisms living in these habitats may be continuously exposed to these drugs. Some aquatic organisms living in waters downstream from wastewater treatment plants are showing signs of developmental and reproductive problems. Researchers are working to determine whether pharmaceuticals are causing these effects.

How Can I Reduce the Quantity of Unwanted Medications in my Home?

How Can I Reduce the Quantity of Unwanted Medications in my Home?

1. Purchase only as much as you need and take the medication as prescribed by your physician.
2. Centralize all medications in one location secured from children and pets. This may help to limit inadvertent over-purchasing of products you already have.
3. In order to preserve the quality of your medicines, store medications at proper temperature and humidity as recommended on the label. This is sometimes NOT in the bathroom medicine cabinet.
4. Say "No" to physician samples if you are not going to use them.

Disposal Dos and Don'ts

Do:

1. Return unwanted/expired medicines to pharmacies and other locations participating in take-back programs.
2. Take to household hazardous waste collection sites, if permitted in your state.
3. Ask your physician and pharmacist for advice on how to dispose of your unwanted or expired medicines.
4. Check your state's guidelines on medicine disposal.



Do Not:

1. Flush down the sink or drain.
2. Place in the trash.
3. Give or sell to others.



Great Lakes States: What's Happening in Illinois?

Chicago Collections - May 2006

- 3rd annual event, 25 Chicago sites
- Spearheaded by Chicago Police
- Targeted older citizens
- One-day event: 1,330 citizens turned in 1,600 lbs of medications



Sangamon County – Apr 2007

- Flyers (Sea Grant) circulated to all nursing, senior living, and pharmacies
- ~3000 residents participated
- 7 fifty-gallon barrels of meds were diverted from waterways and landfill
- The unwanted/expired medications were properly disposed of by incineration

Solid Waste Agency of Northern Cook County (SWANCC)

SWANCC's Disposal Program



This program is for residents that live in one of SWANCC's 23 member communities. No prescription drugs or sharps from businesses, schools or hospitals will be accepted. ID's will be checked for verification of residency.

General tips:

- Prescription drugs that are more than a year old should be disposed of properly.
- Turn in non-prescription medicines without an expiration date that are more than six months old.
- Keep pharmaceuticals in their original containers with labels to identify contents.
- All sharps need to be placed in a rigid container with a sealed lid. Put the container in a zippered plastic bag prior to dropping off. A new sharps container will be provided.

Acceptable Items:

Unused prescription medications
Expired prescription medications
Prescription cough syrup
Prescription eye drops
Expired over-the-counter medications
Residential sharps (needles/syringes)

Unacceptable Items:

Institutional or business waste
Non-prescription liquids
Latex gloves
Household Chemical Waste

For Your Information

Dangers of medicine in the water system



Recent research conducted by the U.S. Environmental Protection Agency and the U.S. Geological Survey found substantial amounts of antibiotics and steroidal hormones in rivers, lakes and wells from samples analyzed in 36 states. For more information, visit www.epa.gov/nereisd/chemistry/pharma.

Dangers of needles in trash



According to the US Environmental Protection Agency, each year, 8 million people use more than 3 billion needles, syringes, and lancets, also called sharps, to manage medical conditions at home. Some sharps users throw their used needles in the trash or flush them down the toilet. Used sharps left loose among other waste can hurt sanitation workers during collection rounds, at sorting and recycling facilities and at landfills, or become lodged in equipment, forcing worker to remove them by hand.

Children, adults and even pets are also at risk for needle-stick injuries when sharps are disposed improperly at home or in public settings. For more information, visit www.epa.gov/osw.

Personal Sharps Containers



Any resident that lives in a SWANCC-member community and administers home-injections is eligible to receive a 1 quart sharps container. They need to go to the designated prescription drug drop-off site in their community to request one.

For sources of facts and information, visit www.swancc.org.

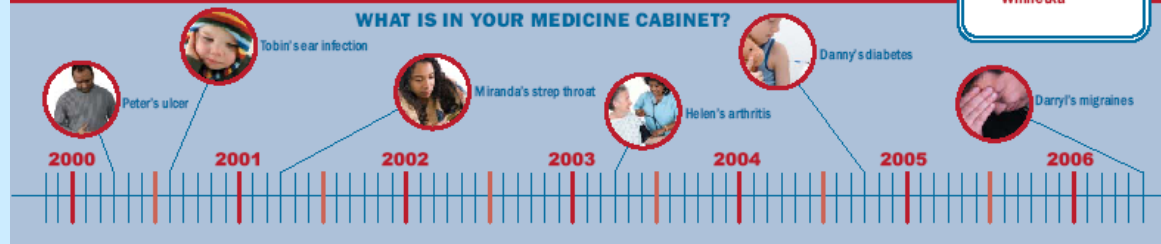
SWANCC Communities

Arlington Heights
Barrington
Buffalo Grove
Elk Grove Village
Evanston
Glencoe
Glenview
Hoffman Estates
Inverness
Kenilworth
Lincolnwood
Morton Grove
Mount Prospect
Niles
Palatine
Park Ridge
Prospect Heights
Rolling Meadows
Skokie
South Barrington
Wheeling
Wilmette
Winnetka

Pilot Program

- Serving about 23 municipalities and 1 million northern Cook County Residents
- Collecting meds and sharps at City Halls
- Paid for by revenue from transfer station
- Disposal costs expected to be about ~\$100K for program (\$0.10 per person)

WHAT IS IN YOUR MEDICINE CABINET?



What's Happening in Michigan?

Coalition of Religious Groups

- State & SG planning a workshop in 2008
- Targeting a wide audience
- Considering State Regulatory changes



EARTH KEEPER'S
PHARMACEUTICAL COLLECTION

Saturday, April 21, 2007
9:00am - 12:00 noon
at participating Earth Keeper churches
across the Upper Peninsula

FREE AND OPEN TO THE PUBLIC

Do you have unwanted medications around your home? Help protect your family, community, and the environment by properly disposing of them.

- Bring in expired or unused prescriptions or over-the-counter medications
- Keep medications in original containers if possible

HELP KEEP OUR WATERS SAFE AND CLEAN

For a list of drop-off sites go to www.superiorwatersheds.org

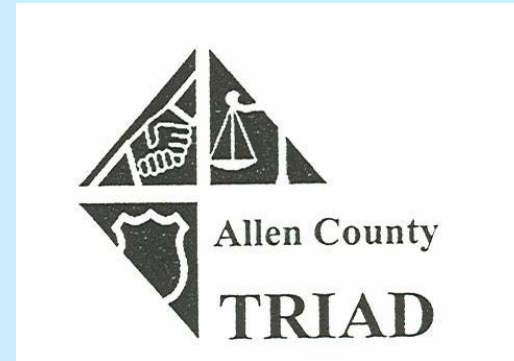
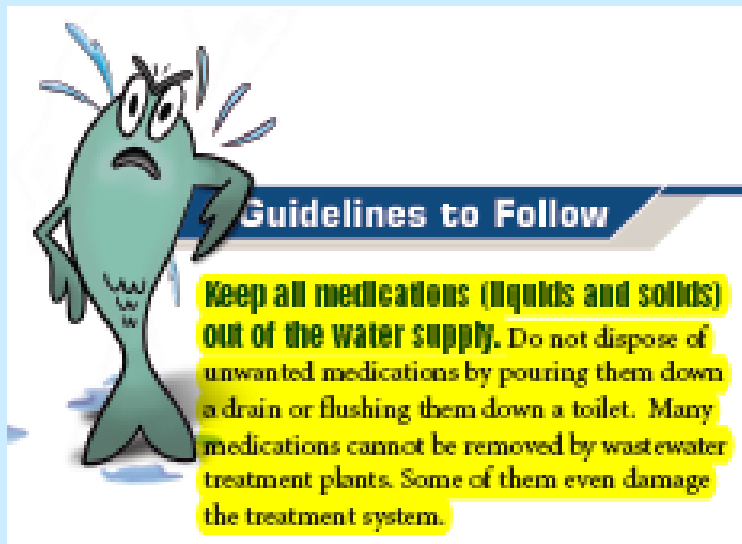
For more information contact
Superior Watershed Partnership
906-228-6095

Funded in part by the
U.S. Environmental Protection Agency
and
Thivent Financial for Lutherans



What's Happening in Indiana?

Indiana DEM has created a brochure to advise residents on medicine disposal (excerpt below).



Numerous medicine collections have been organized locally by the TRIAD programs, partnerships between law enforcement and senior citizens' organizations.

What's happening in....

- Wisconsin: several presentations being given at this conference
- Ohio: ??
- Iowa: local collection events
- Pennsylvania: PA Sea Grant
- New York:
 - Westchester county working with pharmacists
 - NYC Dept. of Sanitation
 - NY Dept. of Environmental Conservation

What is Still Needed?

Research:

- Excretion vs. disposal (Daughton study); veterinary vs. human-feedlots (CAFOs), farms may be largest source
- Humans, pets, livestock will always be taking meds, so solutions at the WWTP are needed for the long run
 - Impact of designer medications
- Curb medicine waste and over-prescribing
- Education and
- Outreach
 - Provide simple solutions for individuals, MDs, Pharmacies, Hospitals (VA), hospices, Rehab centers, schools, etc.



Resource Kit Impacts: Short- and Long-Term Goals

Short-Term (2006):

- Form advisory group for review of resource kit ✓
- Give presentations on topic widely ✓

Long-Term (2007- 2017):

- 1 year → wider distribution of educational materials (clearer, more direct, more accessible); “educate the educator” (e.g. ILCSWMA) ✓
- 2 years → public able to “1-stop shop” for info re: mgmt. of household pharmaceutical waste & disposal
- 2 years → change disposal habits of public = shift away from flushing, disposing in trash, etc.
- 5 years → sustainable collection program established in 5 large Great Lakes cities
- 10 years → measurable decrease of pharmaceuticals in local water supplies/watersheds

To Learn More

www.iisgcp.org/unwantedmeds

Susan E. Boehme, Boehme.susan@epa.gov
&
Elizabeth Malloy, Hinchey.elizabeth@epa.gov

More info: <http://www.epa.gov/ppcp/>

Thank you to: U.S. EPA GLNPO, Joanie Burns, WIDNR, Bart Hagston, Illinois Counties Solid Waste Management Association, Lara Polansky, NOAA Hollings Scholar, Scott Morgan, Indiana Solid Waste Management