

Dose of Reality

Remedies to keep everyday chemicals out of waterways



Look inside for:

Toxins

Everyday products contaminate waterways and drinking water

Problems

Inadequate laws, outdated waste treatment and health risks

Solutions

An ounce of prevention really is worth a pound of cure

Illustration by Gina Longstreet from Central Career and Technical School in Erie, PA



ANNA McCARTNEY/Pennsylvania Sea Grant

Did you know that your drugs and personal care products are getting into the Great Lakes, the source of drinking water for 42 million people in the U.S. and Canada? Scientists have found pharmaceuticals and toxins in personal care products in lakes, rivers, reservoirs, streams, groundwater and drinking water throughout our country and in Europe, Asia, Australia, Canada and even in the North Sea. Find out more about this problem and do something!

Everyday life contaminates environment

Are we changing the elixir of life into a poisonous chemical brew?

While almost every city in the world now treats drinking water with chlorine or other chemicals to kill any germs in the water, we still consume pollutants that aren't removed by current water treatment systems.

New emerging contaminants contained in pharmaceuticals and personal care products (PPCPs), as well as other products we use on a daily basis, are now accumulating in our environment. The potential for detrimental effects on our wildlife, children and future generations is one we should better understand. These chemicals are capable of disrupting the hormone and reproductive systems of humans, amphibians, fish and other wild-

life. Others can cause cancer and birth defects.

The U.S. Geological Survey (USGS) broadly defines "emerging contaminants" as any synthetic or naturally occurring chemical or any microorganism that is not commonly monitored in the environment but has the potential to enter the environment and cause known or suspected adverse ecological and/or human health effects.

Such contaminants have probably been present in the environment as long as humans have used them. However, the thousands of chemical substances found in prescription, over-the-counter medicines, veterinary drugs, fragrances, cosmetics and other products have not been measured. Until recently, we haven't considered how the products we

use for everyday activities, such as showering, using makeup or taking medicine, affect the environment.

New technology has allowed scientists to detect these chemicals at minute concentrations. And research by the USGS, the Environmental Protection Agency and others shows that these chemicals are accumulating in the soil and aquatic environments, causing harm to wildlife.

Water samples taken from 139 streams in 30 states between 1999 and 2000 by the USGS identified organic wastewater contaminants and pharmaceuticals in 80 percent of the sites. The drugs included antibiotics, hypertension and cholesterol-lowering drugs, antidepressants, analgesics, steroids, caffeine and reproductive hormones. Nearly a quarter of

the nation's groundwater tested by the federal agency also contained contaminants. The Associated Press reported in 2008 that pharmaceutical residues, including antibiotics, anticonvulsants and mood stabilizers, had been detected in the drinking water of 51 million people in the U.S.

Although there is no conclusive evidence to date of adverse human health effects from PPCPs in the environment, no human studies have been done to determine the long-term or combined effects of the chemicals, even at low doses, once they are in our drinking water or the environment.

Also unknown is what to do with all the unused PPCPs, which can be responsible for accidental poisoning and drug abuse. Disposal is a complicated issue. While PPCPs are considered haz-

ardous waste, no federal law dictates how they should be properly disposed.

But with all of these unknowns come opportunities for solutions, including education, collaboration, more research, best management practices and the will to place the good of future generations before short-term gains for drug and chemical companies.

This special Erie Times-NIE/Great Lakes Sea Grant Network supplement tells the story of these emerging contaminants; the importance of Great Lakes freshwater; the severe risks of taking freshwater for granted; and what some concerned people are doing to address the problems. But most importantly, it shares ideas that every citizen can implement, starting today, to tackle these serious issues.

We must protect our Great Lakes, freshwater resources

With so little usable freshwater, shouldn't we take better care of it?

Every human, hemlock, heron, herring, hyena and honeybee — every living thing — must have water for survival.

The quantity and quality of the world's water supply depend on how we choose to use water. How we treat our water affects every living thing and will affect every species on the planet, for generations to come.

The Great Lakes represent the largest surface freshwater system on Earth. If you are lucky enough to live near the more than 10,000 miles of coastline surrounding the Great Lakes, you live near one of the world's most valuable natural resources. The Great Lakes hold 20 percent of the world's surface freshwater and about 84 percent of North America's.

Shared by the U.S. and Canada, the Great Lakes are known for their beauty and wealth of resources, and they provide drinking water to millions of residents and tourists. The Great Lakes also support billions of dollars in food production, manufacturing, tourism, transportation and recreation in both countries.

However, these same benefits are responsible for many of the problems that continuously diminish the water quality. Many people are unaware of how their activities pollute and deplete



NASA

The water in the Great Lakes is used both for wastewater disposal and for drinking water. With 42 million people dependent on the Great Lakes, you can imagine the mounting problems this freshwater faces every day we allow contaminants to enter and accumulate in the environment. Photo by NASA.

our freshwater.

Wetlands have been drained for development and farming. Sewage, agricultural and in-

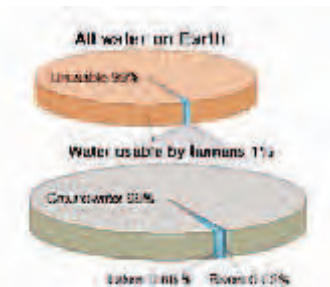
dustrial runoff, air pollution and erosion have choked and starved many streams, rivers and the lakes of oxygen. These

missteps and new emerging contaminants make aquatic habitats unliveable for fish and invertebrates that are important

species in the web of life.

Failing and outdated wastewater treatment plants and septic systems continue to be a source of raw sewage in the lakes. And now the discovery of trace PPCPs is one more concern, because more prescriptions (four billion in 2009) are written each year and new products containing toxins are introduced every day.

Shouldn't we learn more about these contaminants and prevent them from entering the lakes?



CONTRIBUTED ILLUSTRATION

Seventy percent of the planet is covered with water. Of that water, 97 percent is in the oceans. Only 3 percent is freshwater, but two-thirds of this is locked up in glaciers and icecaps and unusable by humans. That only leaves us 1 percent of freshwater available in groundwater and surface water. People and freshwater species rely on this water. Let's not take it for granted.



NASA GODDARD SPACE FLIGHT CENTER



CONTRIBUTED PHOTO

The water that makes all life possible today is the same water that kept the dinosaurs alive millions of years ago before man roamed the Earth. There will be no more water 100 years from now when the Earth's population could reach 10 billion, if it keeps increasing at current rates.

ACTIVITY

Keep a journal of all the medicines and personal care products and the amounts you and your family use every day for two weeks. How many include warnings like: "Keep out of reach of children"? If swallowed, get medical help or contact a Poison Control Center right away. How many of them warn about danger to the environment or drinking water? Do you know which of the ingredients are poisons?

Every raindrop, wetland, lake, underground river, stream and glacier is connected. The same water has continuously been recycled from the Earth to the air and back to the Earth, changing from a solid to liquid to gas over and over again. In just 100 years, we have added tons of toxins that are accumulating in our water and on land and can't be removed.

Drugs and other chemicals creep into our water supplies

No label or 60-second ad tells you that PPCPs are hazardous to the environment or to future generations!

You've probably read all the warning labels cautioning against taking a larger drug dose or to "keep out of reach of children." Of course you've heard the warnings about drug side effects on TV commercials. More than likely, you've used a myriad personal care products without knowing much about their toxic ingredients or their environmental effect.

First called "PPCPs" in an Environmental Protection Agency special report back in 1999, pharmaceuticals and personal care products belong to a group of compounds that are not commonly monitored and not regulated.

These bioactive chemicals (substances that have an effect on living tissue) have been around for decades. But people didn't start taking notice until the Associated Press investigated and published its first reports in 2008. The AP reported the presence of PPCPs in drinking water and noted their effects on the environment.

PPCPs are present in "any water body influenced by raw or treated sewage, including rivers, streams, lakes, groundwater, coastal marine environments and many drinking water sources," according to the EPA. There are no sewage treatment systems specifically engineered to remove many chemicals found in PPCPs. This includes septic systems used by homeowners. Cost and lack of regulation are cited as reasons.

The majority of U.S. sewage



CONTRIBUTED PHOTO

You and I generate some of the largest sources of PPCPs in the environment. There are about 6.5 billion of us on this Earth. Personal care products and drugs we use in our everyday lives contain a variety of unregulated toxins that go down the drain every time we shower, bathe or wash our hands. How many PPCPs do you use daily?

sludge, a by-product of wastewater treatment, is applied to land as a soil amendment. According to the Cornell University Waste Management Institute, many chemical compounds in the waste are not routinely tested before land application. The EPA requires testing for nine heavy metals, but not dangerous and long-lasting chemicals like DDT and PCBs. And there are no tests required for PPCPs

and other emerging chemicals of concern that have been introduced into the environment in higher concentrations over time; examples include endocrine-disrupting chemicals like flame retardants, phthalates, the antibacterial agent triclosan and certain pharmaceuticals.

Huge quantities of these chemicals are released from homes, hospitals, schools, businesses, industry and agribusiness every

day when billions of gallons of wastewater go down the drain.

Many people flush unused meds down the toilet or sink, or put them in their trash, because they don't know they're dangerous or they don't have other options.

Health care waste

An AP investigation on drug waste data kept by hospitals and

PPCPs INCLUDE

- Prescription, over-the-counter and illegal drugs
- Veterinary drugs
- Fragrances
- Cosmetics
- Sunscreen products
- Diagnostic agents or drugs used for tests
- Nutraceuticals (e.g., vitamins)
- Liquid soaps
- Hair products

long-term care facilities found most of the country's 5,700 hospitals and 45,000 long-term care facilities don't keep data. They found that the few that do keep data dump 250 million pounds of pharmaceutical waste they produce each year. While waste from these facilities is regulated, many of the people working there were not aware of the correct disposal procedures, and limited oversight is a problem. This additional toxic waste contains powerful oncology drugs and known carcinogens not likely found in home medicine chests.

Drug manufacturing waste

Drug companies are failing to properly treat their wastewater before dumping it into rivers. The same AP investigation that reported about pharmaceuticals in drinking water of millions of Americans also found that more than 270 million pounds of pharmaceutical compound residue is dumped every year into waterways nationwide, many of which provide drinking water.

Other waste comes from such sources as nursing homes, pharmacies, veterinary hospitals, physicians, humanitarian drug surplus and school nurses.



CONTRIBUTED PHOTO

When we take drugs, whether they are prescribed, over-the-counter or illegal, our bodies absorb some of them. But up to a whopping 95 percent of the dose is excreted (depending on the drug and the person taking it) and ends up in wastewater, according to scientists who study drugs in our waterways.



CONTRIBUTED PHOTO

Unlike the small family farms, concentrated animal feeding operations (CAFOs) generate industrial-scale, toxic pollution, including large amounts of antibiotics, hormones and steroids that can contaminate nearby water supplies. Of the antibiotics used in the U.S., 30 percent are administered to people; 70 percent are administered to animals.

ACTIVITY

Investigative reporters at the Associated Press and the New York Times wrote the important articles that educated citizens about problems with drinking water. Thanks to their reports, we can now work on solutions. However, many news organizations have eliminated investigative reporters or cut back on resources. What can we do to make sure we continue to get accurate information like this? Write a letter to the editor to convince readers we need this type of reporting.

Changes in wildlife populations act as wake-up call

If you're like many anglers, you probably readily toss common white suckers back into the water. However, these fish are valuable for scientists like David O. Norris. As bottom feeders, these fish warn about problems in the environment.

When a University of Colorado environmental endocrinologist compared suckers he caught upstream in Boulder Creek to those that he caught downstream, below the wastewater treatment plant in Boulder, he discovered alarming changes in the sucker population. Upstream, where the water flows pure and clean, Norris found the ratio of males to females was 50-50, as nature intended. But downstream, the females outnumbered the males by 5 to 1. Even more disturbing, 10 percent were neither clearly male nor female, but had sexual characteristics of both (intersex).

Anglers who fish for smallmouth and largemouth bass will be more disturbed to know that this same problem has been found around the country in populations of bass and other fish.

Of the 16 fish species examined by U.S. Geological Survey researchers from 1995 to 2004, the condition was most common in smallmouth and largemouth bass. But additional work by the USGS found the prevalence of females to males more widespread than anticipated. Researchers also found intersex fish in about one-third of all sites examined from the Apalachicola, Colorado, Columbia, Mobile, Mississippi, Pee Dee, Rio Grande, and Savannah River basins.

This problem could lead to a total collapse of a population, and has done just that in an experiment conducted by U.S. and Canadian government scientists with minnows that were intentionally exposed to similar concentrations of synthetic hormones.

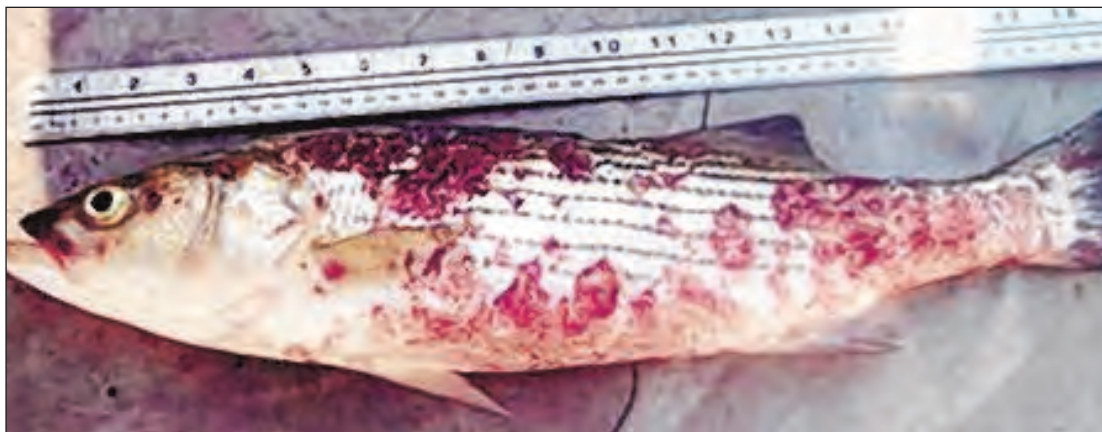
Changes like these have been documented in several aquatic species that inhabit waters containing these chemicals. Studies in frogs, shrimp, freshwater mussels, zooplankton and other species show they are also suffering from the effects of these toxins.

Pesticides, birth control pills, hormone replacements, hormones used for livestock operations, veterinary products, pharmaceuticals, and personal care products are all possible sources of estrogen and estrogen-mimicking chemicals. These chemicals are found in treated and untreated wastewater. Wastewater



USGS

USGS researchers documented the severity of the intersex condition in fish in the Potomac and Shenandoah rivers. More than 80 percent of the male smallmouth bass were found to be growing eggs, including all of the fish caught at four of the seven survey sites. The outward appearance of the fish doesn't change, but the condition can be detected under a microscope. USGS research visit: <http://toxics.usgs.gov/regional/emc/>



CONTRIBUTED PHOTO

Researchers in a USGS lab found that exposure to estrogen does not stop with the intersex problem. It is likely that fish lesions and bass fish kills in the same area as the intersex fish in the Potomac and Shenandoah rivers are not coincidence, but instead due to the effect of endocrine disruptors on hepcidin. By blocking the production of hepcidin and other immune-related proteins that help protect fish against disease-causing bacteria, endocrine disruptors also make them more susceptible to disease.

treatment facilities don't remove them during the normal sewage treatment processes, so they end up in rivers and lakes.

However, much of our knowledge about the negative effects on wildlife comes from research in the aquatic environment. Aquatic wildlife spend all or important developmental times of their life in water. Because fish

continually take in compounds through their gills, their exposure to drugs is constant.

More proof that fish are ingesting secondhand PPCPs comes from research released in 2009 by Baylor University researcher Bryan Brooks. He reported that fish caught near wastewater treatment plants serving five major U.S. cities

had residues of pharmaceuticals, including those used to treat high cholesterol, allergies, high blood pressure, bipolar disorder and depression. These findings of this first nationwide study of human drugs in fish tissue prompted the EPA to significantly expand similar ongoing research to more than 150 different locations.



CONTRIBUTED PHOTO

Problems from exposure to PPCPs are not limited to aquatic wildlife. In just 10 years, the use of an anti-inflammatory drug in cattle killed millions of vultures in Asia, bringing three species to the brink of extinction. The impact on other organisms may be less obvious and therefore not reported.

There are many questions yet to be answered and more research is clearly needed. The survival of fish and other aquatic wildlife may depend on finding answers to these questions.

Anglers can help by sharing this information with fellow anglers and family members and by being more mindful of their own use of PPCPs.

Taking steps to reduce the amounts of these chemicals that end up in the water is a proactive solution we all can take.

ACTIVITY

Find out whether your wastewater goes to a septic system on your property or to a municipal wastewater treatment plant and whether your drinking water comes from a well or a municipal drinking water plant. Arrange a field trip to visit these facilities or talk with an official who works there about the problems caused by PPCPs and other contaminants and the safety precautions their facility uses to avoid environmental and human health risks.



ANNA McCARTNEY/Pennsylvania Sea Grant

When it comes to chemical exposure, children aren't just miniature adults. Their developing bodies are more vulnerable, even from exposure to small doses, when received at the wrong time or over long periods of time. Doses as low as one part per trillion, applied at specific times in development, can yield countless permanent physical and mental abnormalities that may not be recognized until after puberty. To learn more visit Women's Health & Environmental Network — www.when.org.

Exposure to toxins starts even before birth

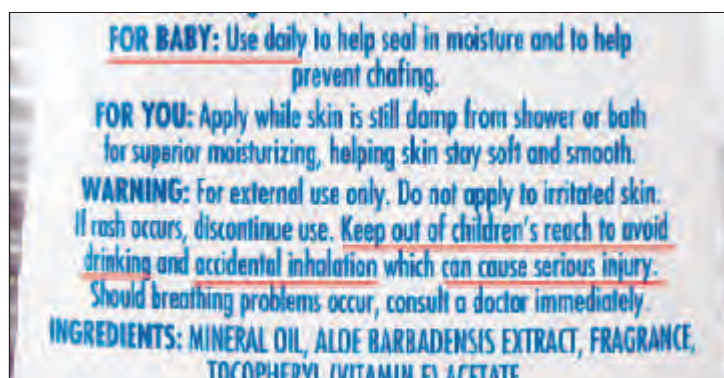
Babies today are born pre-polluted.

Nearly 300 synthetic chemicals were found in the umbilical cord blood of newborn babies, including industrial chemicals used in fragrances and other everyday products.

A strong body of scientific work suggests that fetal exposure to industrial chemicals is contributing to human health problems. Yet toxicologists have not studied the long-term effect caused by exposure to these chemicals or those found in drinking water.

There are many reassurances that the minuscule amounts of PPCPs, measured in parts per million or parts per billion, reported in drinking water pose little danger to people. The thinking is we would need to drink gargantuan amounts of water before getting even one dose.

Yet we have added countless manufactured chemicals to our environment that shouldn't be



ANNA McCARTNEY/Pennsylvania Sea Grant

If a product contains toxins as dangerous as this warning label cautions, why are they used in baby products? Federal law does not require premarket safety testing or approval for hundreds of items infants come in contact with every day. Industrial trade secrets keep consumers in the dark about toxins in products that children chew on, eat, and play with, or ones we apply on their bodies. Industries argue that the secrets protect "commercially sensitive information." Visit: storyofcosmetics.org to learn more.

there. The Centers for Disease Control has measured 212 chemicals in people's blood or urine — 75 of which have never before

been measured in the U.S. population.

Chemotherapy drugs are powerful poisons; hormones and the

chemicals that mimic them hamper reproduction or development; depression and epilepsy drugs can damage the brain or change behavior.

One dose may not hurt us, but how does a smaller amount of combined chemicals delivered continuously in something we drink every day affect us — during childhood, during pregnancy or even over half a century?

For the first time since 1971, the President's Cancer Panel concluded that "the true burden of environmentally induced cancers has been grossly underestimated." In 2009 alone, approximately 1.5 million new cancer cases were diagnosed, including an increase in children.

Laboratory studies on human cells show that even at low levels, these pollutants make cancer cells multiply too quickly; kidney cells grow too slowly; and blood cells show biological activity associated with inflammation. Can we afford to ignore them?



Chemicals to avoid

Environmental Working Group highlights 20 common ingredients to avoid. Those to "always avoid" cause significant, well-documented health effects, so they are unsafe in children's products. Those to "avoid when possible" are also linked to serious health risks, although the evidence is considered preliminary. For more about these ingredients and for a copy of a parent's buying guide, visit: ewg.org/childrenshealth. For more about human exposure: cdc.gov/nceh/hsb

ALWAYS AVOID THESE:

- **2-BROMO-2-NITROPROPANE-1,3-DIOL:** Allergen that forms cancer-causing chemicals
- **BHA:** Causes skin depigmentation
- **DMDM HYDANTOIN:** Allergen that forms cancer-causing chemicals
- **OXYBENZONE:** Allergen; forms free radicals to damage skin
- **TRICLOSAN:** May disrupt growth hormones from the thyroid
- **BORIC ACID & SODIUM BORATE:** Unsafe for infants according to industry experts
- **DIBUTYL PHTHALATE & TOLUENE:** Found in nail polish/play makeup; hormone disruption, cancer concerns

AVOID WHEN POSSIBLE

- **FRAGRANCE:** Allergen; neurotoxic (affects brain and nervous system), hormone disruption concerns
- **DYES:** Some cause cancer and are banned outside the U.S.
- **CETEARETH & PEG compounds:** Can contain cancer-causing impurities
- **PARABENS:** Hormone disruption, cancer concerns
- **TRIETHANOLAMINE (TEA):** Allergen that forms cancer-causing chemicals
- **BENZYL & ISOPROPYL ALCOHOL:** Skin irritation and neurotoxicity concerns
- **METHYLCHLOROISOTHIAZOLINONE & METHYLISOTHIAZOLINONE:** Allergens with neurotoxicity concerns
- **IODOPROPYNYL BUTYLCARBAMATE:** Chemically similar to neurotoxic pesticides

U.S. needs tighter rules for using, disposing chemicals

Our system of public health protections fails to require proof that all chemicals are safe for children or the environment.

Some countries, including those in the European Union, have laws that place the burden of proof on manufacturers; they must demonstrate that their chemicals can be used safely in baby products, cosmetics, soaps, lotions and other products. The U.S. Environmental Protection Agency and the Food and Drug Administration have no such laws. Water quality reports are not even required to include the levels of pharmaceuticals and other toxins found in tap water. No federal law dictates proper disposal of unused PPCPs, either. This task, left to the states, has resulted in many different approaches but no clear solutions.

Lack of economic support for regulatory activities and loopholes in current laws mean they are not enforced and companies can use dangerous toxins in their products.

The Toxic Substances Control Act of 1976 exempts about 62,000 chemicals from regulation that were already in commercial use and it deprives the EPA of the most basic regulatory tools. Because companies are asked to volunteer information on health effects of these chemicals, insufficient data is available to assess chemical safety, particularly for unborn babies and young children. There are no requirements to test for the effect of the combination of drugs or chemicals, or the effect of exposure of low doses over long periods or the environmental effect.

Since 1938, the U.S. has only banned eight ingredients out of the 12,000 used in personal care products while the E.U. bans over 1,300. The Safe Chemicals Act in the U.S. Senate could reform our nation's broken toxics laws, but it needs co-sponsors and citizen support to keep it moving. This strong bill requires chemical manufacturers to prove their products are safe before they reach store shelves. The Kid-Safe Chemicals Act would require that all chemicals be proven safe for children before they can be sold. But even this bill needs to be strengthened since it makes it too hard to get known dangerous chemicals off the market, including "Persistent Bioaccumulative and Toxic" chemicals (PBTs) like brominated flame retardants.

There's also evidence that laws that should protect our waterways and drinking water are under attack. The New York Times



ANNA McCARTNEY/Pennsylvania Sea Grant

Many fragrances include known endocrine-disrupting chemicals that affect reproduction and thyroid function. While companies are required to list ingredients on the product label, fragrance is exempted due to a loophole in the Federal Fair Packaging and Labeling Act of 1973. The Safe Cosmetics Act of 2010 is a huge opportunity to pass legislation that would eliminate harmful chemicals from the products women, men and children put on their bodies every day, including those hidden in fragrance.

ACTIVITY

In 1962, American biologist Rachel Carson wrote "Silent Spring." The book cataloged the environmental impacts of DDT use in the U.S. and questioned the logic of releasing large amounts of chemicals into the environment without fully understanding their effects on the environment or human health. The book suggested that DDT and other pesticides cause cancer and that their agricultural use was a threat to wildlife. Its publication was a signature event in the birth of the environmental movement. It produced a large public outcry that led to a 1972 ban in the U.S. DDT was subsequently banned for agricultural use worldwide. Along with the Endangered Species Act, the U.S. DDT ban is cited by scientists as a major factor in the comeback of the bald eagle. Read Rachel Carson's book and discuss similarities between today's PPCPs problems and those caused by DDT. Write a persuasive article about banning toxins in PCPs or requiring pharmaceutical take-back programs.

collected records from every state and the EPA for its reports, published in 2009 and 2010, about worsening pollution in American waters and regulators' response (www.nytimes.com/water). The newspaper found that:

- The Clean Water Act was violated by chemical companies more than 500,000 times in the last five years. Most of the violations went unpunished. Sixty percent were considered to be in "significant noncompliance," including dumping cancer-causing chemicals or failing to measure or report pollution.
- Forty percent of the nation's community water systems vio-

lated the Safe Drinking Water Act at least once, exposing over 23 million people to potential danger.

- Government and independent scientists have identified hundreds of chemicals linked to diseases in small concentrations but they are unregulated in drinking water, or policed at limits that still pose serious risks. Bottled water is no safer because it is often repackaged tap water.

- Currently, the Safe Drinking Water Act only regulates 91 contaminants, and none have been added since 2000, although more than 60,000 chemicals are used within the United States.



ANNA McCARTNEY/Pennsylvania Sea Grant

Triclosan and triclocarban, widely used antibacterial agents, have been discovered in our rivers, lakes, in our drinking water and even in our bodies. While these chemicals have been used for decades, the Food and Drug Administration and the Centers for Disease Control (CDC) say they are no more effective at preventing disease than regular soap and water. At the urging of Rep. Edward Markey, D-Mass, in April, both the FDA and the EPA are taking a fresh look at triclosan. The CDC data shows that the level of triclosan in Americans increased, on average, by more than 40 percent from 2004-2006. These ingredients are endocrine-disrupting chemicals.

High school students find safe way to dispose of drugs

A not-so-simple question by Paul Ritter, a Pontiac, Ill., high school ecology teacher, to his students led to the largest collection program in the nation for unused drugs.

The question actually was posed to Ritter by his wife, Jodee. It's the same question you probably ask yourself: "What do we do with unused pharmaceuticals in our medicine chest?"

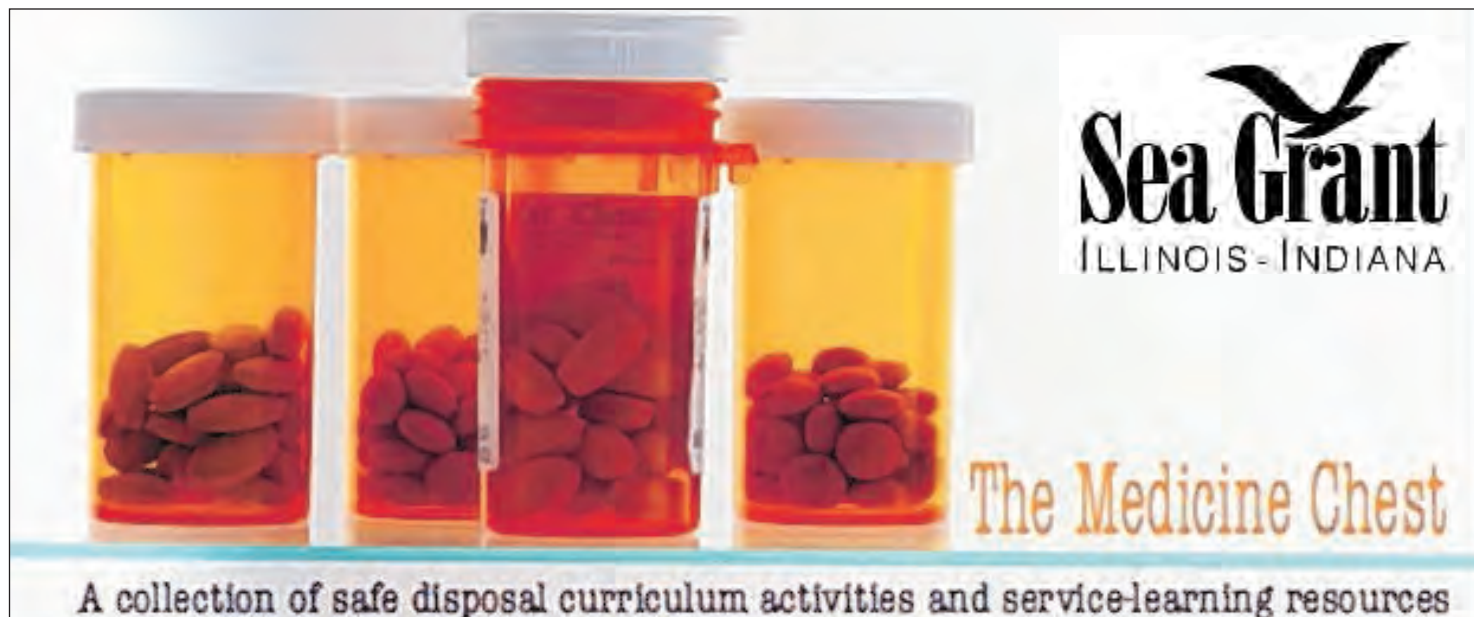
The young ecologists in Ritter's class did their research and enlisted local officials before creating presentations for their local pharmacies. The goal was for pharmacy customers to return unused drugs for proper and safe disposal. Students from other classes were inspired to lead a letter-writing campaign asking federal, state and local officials to educate citizens about proper disposal.

The collaborative Prescription Pill and Drug Disposal Program — P2D2 — involved pharmacies, officials, students in Ritter's ecology class as well as students from Eric Bohm's Illinois Studies class at the same school.

The program's philosophy that "an ounce of prevention is worth a pound of cure" keeps unused medicines out of wastewater and landfills while keeping them from falling into the wrong hands. The program has kept more than 120,000 pounds of drugs out of streams, lakes and ultimately from our drinking water.

Ritter credits the program's success to his students and students across the country who started local branches. He also acknowledges the support of the Illinois-Indiana Sea Grant Program, the Illinois Environmental Protection Agency, and the U.S. Environmental Protection Agency's environmental education program for spreading P2D2 to 11 states. Five more states will initiate the program soon.

Ritter and Bohm's innovative P2D2 program is also the centerpiece for the Illinois-Indiana Sea Grant Medicine Chest, which provides curriculum activities and service-learning resources to teach about safe disposal of pharmaceuticals.

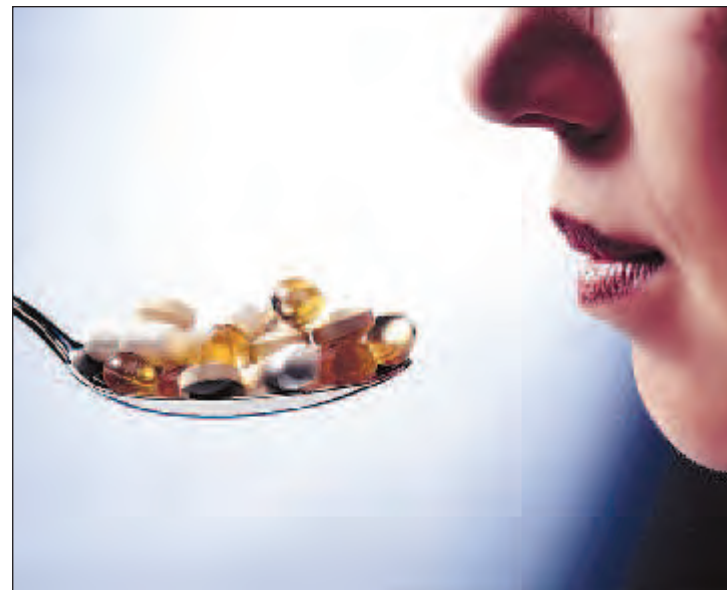


CONTRIBUTED PHOTO

The Medicine Chest includes problem-based learning scenarios that educate young people and their teachers about the problems of improper disposal and misuse of medicines and involves them in solutions. The curriculum can be used as a classroom resource or for informal educational settings to teach decision-making, teamwork, communication and leadership skills that will help protect and improve water quality. The 253-page Medicine Chest program can be downloaded as a complete document or by section, or ordered as a CD. The Medicine Chest is available at: www.iisgcp.org/education/safe_disposal_curriculum.html.



ANNA McCARTNEY/Pennsylvania Sea Grant



CONTRIBUTED PHOTO

If you remember life before drug ads, drugs were not so pervasive. Drug companies didn't market to consumers until 1981 when the first Drug To Consumer ad appeared for a prescription drug. Between 1995 and 2005, DTC drug ad revenues mushroomed from \$12 million to \$4.1 billion. Since then, it seems like drug ads air all the time, prompting consumers to tell their doctor what to prescribe. Yet with all the new drugs, including many for children, many have been tested on only a small number of people in clinical trials before entering the market. And while more are added to the environment each year there are no requirements to test for the effect of combined drugs.

With so many prescription drugs in homes, it's not surprising that they have become the drug of choice for many teens and adults. Childproof caps didn't stop more than 2.1 million teens ages 12 to 17 from abusing these drugs in 2006, according to the National Survey on Drug Use and Health. The Substance Abuse and Mental Health Services Administration (SAMHSA) reported in 2008 that about 3.1 million people age 12 to 25 had used over-the-counter cough and cold medications to get high. More people die from prescription drug abuse/misuse each year than from heroine, cocaine and methamphetamine combined. Many become addicted to painkillers.

ACTIVITY

■ Young people like those in Paul Ritter's classes play a huge role in educating and involving people in solutions to serious problems like PPCPs in the environment. Look for articles to see what problems young people are solving

in your community. How many are environmental problems?

■ Use the information you collected on the activity on page 3 and find out more about the products you and your family use at www.ewg.org. Which products could you eliminate altogether or find a

substitution that would help protect the environment and yourself?

■ Create a public relations campaign to promote your proposed lifestyle changes. Include ideas for ads and ways to get the media involved. Take your ads home and share them with your parents

and family and talk about how your family can change both lifestyle and shopping habits.

■ As a class, discuss how you can change your behaviors to lessen your impact on the problem of PPCPs in the environment.

Collection events help but they don't solve the problems

Isolated collection events to help consumers properly dispose of unused meds have grown to ongoing, dependable collections at places like Wegmans and County Sheriff's Office substations in Rochester, N.Y., and at other sites in more U.S. cities.

But these events don't prevent pharmaceuticals from becoming waste in the first place. And they don't address the fact that the majority of PPCPs end up in waterways when the drugs are eliminated from our bodies, or washed down the drain and that wastewater treatment plants aren't equipped to remove them.

A group of representatives from government, academia, the pharmaceutical industry and insurance companies, with a grant from the New York Pollution Prevention Institute headquartered at the Rochester Institute of Technology, is taking a new approach that could cut down on the unused drugs.

This group will analyze data from collection events to determine which medications are disposed of more frequently than others. This data will be used to educate decision-makers including doctors, pharmacies, health insurance companies and patients to eliminate unnecessary medications. When more people are aware of the problems, they can insist on alternatives.

Don't flush

Everyone agrees: Don't flush PPCPs since they go directly to your septic system or wastewater treatment plant, which aren't equipped to remove the toxins. Federal guidelines recommend using community drug take-back programs instead of flushing. This keeps the toxins out of the environment, and keeps unused drugs from getting into the wrong hands since they will be disposed of safely.

So what do you do if your community doesn't have a take-back program or you don't have access to collection events?

According to the Office of National Drug Control Policy, you should mix unwanted drugs with cat litter or some other undesirable substance, put them into a sealed container and put it in the trash.

But a study in Maine found tiny amounts — measured in parts per trillion — of discarded drugs in water at three landfills in the state. This confirmed suspicions that PPCPs in household trash end up in water that drains through the waste. This water,



ANNA McCARTNEY/Pennsylvania Sea Grant

Data from collection events like this one conducted by PA Sea Grant in Erie could answer questions such as: "Are people getting rid of more short-term medications like pain pills, rather than longer-term maintenance medications like blood pressure pills?" Educational efforts based on the results could be beneficial for doctors that prescribe them, the pharmacies that dispense them and the health insurance companies and patients that ultimately pay for them.



ANNA McCARTNEY/Pennsylvania Sea Grant

By law, those holding collection events must hire a hazardous waste removal company to dispose of the products under very strict guidelines. Pharmacists identify and sort the medications and collect data. Law enforcement officials take care of controlled substances.

called leachate, eventually ends up in rivers and other bodies of water.

More needs to be done to address the problems of unused PPCPs. In the meantime, contact



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Until consumers can return unused pharmaceuticals to the source and unnecessary toxins are eliminated from everyday products, you'll want to keep them out of your environment and out of the hands of young people. Participate in a collection event in your community.

your local Sea Grant program or community recycling coordinator for information about take-

back programs or collections before improperly disposing of PPCPs and other products.



ANNA McCARTNEY/Pennsylvania Sea Grant

Eliminating our reliance on drugs as easy fixes for preventable illnesses would greatly reduce their use and keep both the environment and people healthy. Prevention really is the best cure and it will certainly be less expensive than trying to remove all the drugs and toxins from the environment! Let's make exercise facilities more plentiful than drugstores.

Changing habits and products is least expensive cure

You might think there is little one person can do to remedy the problems caused by emerging contaminants, but you would be wrong.

Our sheer numbers and our purchasing power could turn things around tomorrow.

The good news is you don't have to wait to take action because the best solutions lie not in the hands of the chemical companies, drug companies and manufacturers who make the products; or the businesses that sell them; or the health-care providers that prescribe and dispense them; or the politicians who make the laws; or the agencies that enforce those laws. As consumers, we have lots of influence.

If we don't buy products with toxic chemicals and insist on safer alternatives, companies will be forced to provide more environmentally friendly choices. If we insist, health-care providers will stop prescribing unnecessary medications and instead focus on prevention. If millions of us were adamant about better laws and enforcement, don't you think we would see faster results there, too?

To further expedite change,

learn about your lake or river and your water supply and food production. Set an example for your family and friends. Share what you learned and your concern with elected representatives and others. Join forces to protect and improve your environment by joining a local watershed group or other organization that works to improve water quality. Become part of the solution.

Prevention really is the best strategy. Read the labels and ask questions before making any purchases or decisions about your health care. If you don't buy toxins, there's no need to worry about disposing unused toxins. If you cut down on unnecessary prescription medications, you won't need to worry about whether they get into the wrong hands. Get more involved. There are safer alternatives available for you and your family.

The next time you need to purchase shampoo, aftershave, soap, cosmetics, over-the-counter medicines, prescription drugs, or even the food you eat, first ask lots of questions. And make sure you get answers.

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Just think how fast triclosan could be eliminated from the environment if the 42 million people in the Great Lakes basin stopped buying antibacterial soaps and shared their knowledge with five family members and friends across the country about the ingredients (dangerous toxins that don't work any better than regular soap). This is a perfect example of how knowledge and purchasing power can remove dangerous toxins.



USDA

What can you do to improve your health to avoid preventable diseases? Join others in your community to improve and protect water quality and health for our children and future generations.



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Ask yourself if you exercise enough. Ask your doctor to prescribe a healthy diet and exercise regimen. Take proactive steps to avoid prescription medicines on a "maintenance" basis.



WIKIPEDIA COMMONS

Ask yourself if you eat enough vegetables. Ask your grocer if the vegetables and fruits were raised without dangerous toxins and if they sell organic alternatives.

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Ask ...

Yourself or the person who does the buying in your home:

- Do these products contain toxic chemicals?

- Are there safe alternatives I can buy? www.ewg.org has a list of chemicals to avoid and safe alternatives

Your doctor:

- Is this medicine necessary if I change my eating, smoking, exercise habits?

- Do you consider environmental impact when prescribing?

- Is there a safer alternative?

- Do you eliminate waste by providing trial packs before writing a full prescription?

Your pharmacist:

- Which drugs have the highest eco-toxicity?

- Do you take back unused and expired drugs? If not, why not?

- Do you sell safe personal care products that don't contain toxins?

Your insurance company:

- Do you invest and pay for "proactive health care" like fitness center visits?

Your butcher and grocer or the manager where you shop:

- Do you sell meat products without artificial hormones and antibiotics?

- Do you stock cosmetics and other personal care products that don't contain toxins?

Your local, state, and federal agencies responsible for managing water quality and fisheries:

- What do you know about PPCPs and other emerging contaminants?

Your local, state, and federal elected officials:

- What are you doing to enforce current laws?

- Have you introduced new laws to keep these toxins out of our environment?

- When will we have guidelines and take-back programs to dispose unused PPCPs and other toxic products safely?

- What are you doing to support green solutions to eliminate toxins?

- Are you supporting research and enforcement with adequate funding?

- How are you supporting wastewater treatment facilities upgrades to eliminate raw sewage and other toxins from our waterways?

- What are you doing to control problems caused by CAFOS (factory farms)?

Your family and friends:

- Do you know about the toxins contained in products we use every day and the dangers they pose for wildlife and people?

- What are you doing to keep toxins out of the environment?



CONTRIBUTED PHOTO

Ask your doctor and pharmacist to review your total medication consumption to eliminate unnecessary ones. Keep a list of all medications you take, including over-the-counter ones.



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Ask water quality and fisheries managers if they test for PPCP toxins and if they report their findings to the state and federal government and their customers.



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Ask your veterinarian if he or she promotes a healthy diet and exercise instead of pharmaceuticals to treat your pet. Ask the vet how he or she disposes unused medication.

Elixir of life or dangerous chemical brew — it's up to you! Stop adding manufactured poisons to the environment so the water that has sustained life on Earth for millions of years can keep future generations alive.



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