

## How to Dispose of Your Medicine Cabinet Contents

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The Alameda County Board of Supervisors recently approved an ordinance requiring pharmaceutical companies to establish programs to dispose of expired and unused drugs. Predictably, pharmaceutical industry representatives object to the requirement. They site the lack of evidence that drug take-back programs deliver any benefit to the environmental or humans.

They are correct – there is a lack of evidence that take-back programs work, but not because studies have been negative: There just aren't good studies yet, because they are very difficult studies to do. In spite of the companies' disingenuous criticism, the pharmaceutical industry is voluntarily paying for a similar program in San Francisco to test its effectiveness.

Alameda County's is the latest effort to help people dispose of expired or unused medications. Unfortunately, proper disposal methods are not common knowledge and some people just don't care. As my Aunt Gussie used to say, if she didn't use something in the first 100 years, she might need it in the next 100.

However, the Environmental Protection Administration (EPA), Drug Enforcement Administration (DEA) and Food & Drug Administration (FDA) don't have that philosophy. **And at least some people care about discarding unused or expired medications and minimizing the chance that toddlers and pets might suffer from toxic, inadvertent ingestion.**

People have wondered about proper pharmaceutical disposal for a long time. **The FDA helps with its 2010 guidelines.** They first recommend delivering unused or expired medications to a medicine take-

back program for disposal. See a list of locations at the end of this article. Private waste management companies typically deal only with bodily waste and syringe and lancet disposal. California law does not include pharmaceuticals in hazardous household waste, but most of the official waste disposal centers accept them. Some pharmacies take back medications, so give yours a call. Take-back collection facilities incinerate drugs, which certainly keeps them out of the environment. Some criticize the environmental effect of fire and of cars driving to and from the facility. Carpool...

**The DEA has scheduled a fourth National Prescription Drug Take-Back Day on Saturday, September 29, 2012 from 10AM to 2PM. The last national take-back day was hugely successful, with citizens delivering 552,161 pounds of unwanted or expired medications to 5659 take-back sites on April 28<sup>th</sup> of this year. Take-back sites in all 50 states and U.S. territories participate. The DEA's collection site locator database will be available in late August, or you could call 800-882-9539.**

The take-back option sometimes doesn't work for controlled substances like narcotics, however, since the DEA strictly regulates those. Federal law does not permit take-back programs to accept controlled substances unless they get specific permission from the Drug Enforcement Administration, and they arrange for full-time law enforcement officers to receive the controlled substances directly from the member of the public who seeks to dispose of them.

**If no take-back center is available, the FDA suggests mixing medicines with an unpalatable substance**, such as kitty litter or used coffee grounds, placing the mixture in a sealed plastic container or bag and throwing the container in the household trash. Since plastic never degrades, so long as the container isn't popped open when the trash is compacted, the contents don't spill out and mix with the environment.

Controlled substances pose a conundrum, since the DEA worries more about diversion to people who might abuse them than it does contamination of ground-water and a population-wide high. **It is illegal, according to the Controlled Substances Act of 1970 (CSA), for a person with a valid prescription to give unused narcotic medication to another person or entity**, without first obtaining permission to do so from the local DEA Special Agent in Charge. To do so, you can file DEA Form 41 online or by mail, in triplicate.

**So the FDA suggests that drugs that can kill with a single dose (like narcotics) should be flushed down the toilet** if there is no take-back program available and you don't feel like donation to your neighbor via DEA Form 41. The list of should-flush medications includes those containing fentanyl, morphine, methylphenidate, meperidine, diazepam, hydromorphone, methadone, tapentadol, oxycodone, oxycodone and sodium oxybate.

**Deceased people's meds are a problem.** One scientist estimates that 17.9 million kilograms of their unused medications are flushed into the sewage system annually. Or they are left in nursing homes, and the staff, who has no legal right to the drugs, has to deal with unused medication. The coroner's office is supposed to receive medications from the home of dead people to help determine cause of death, but not all cases are coroner's cases. The coroner's office flushes 92% of medications they receive. Less than 1% are incinerated and 7% go into the decedent's household trash.

Hazardous pharmaceuticals deserve special mention. The Resource Conservation and Recovery Act (RCRA) (which amended the Solid Waste Disposal Act) defines a hazardous waste as one with the potential to cause or significantly contribute to

mortality or serious illness and that poses a substantial threat to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed. The Act specifies dangerous medications in its P and U lists (don't ask me, I couldn't find the reason for these monikers).

The P list includes warfarin (Coumadin), arsenic trioxide, epinephrine, phentermine, nicotine, physostigmine. The U list includes various chemotherapeutic drugs, chloral hydrate, chloroform, diethylstilbestrol, lindane, PhisoHex, mercury, paraldehyde, phenacetin, phenol, reserpine, resorcinol, selenium sulfide (in shampoos), streptozotocin and warfarin. A separate "Toxicity" list includes drugs containing arsenic, barium, chromium, mercury, selenium, silver, lindane and M-cresol (in some insulins).

Ignitable drugs deserve special caution. Believe it or not, some common drug formulations meet the definitions of ignitability. Erythromycin gel, Texacort solution and Taxol all contain more than 24% alcohol by volume and these, as well as amyl nitrite inhalers, silver nitrate applicators and Primatene aerosol may be flammable. Dilution (down the toilet) would dissipate ignitability. Or take them to a take-back program and let them worry about blowing up.

The RCRA does not specifically say how we should dispose of P-list, U-list and ignitable drugs. It merely requires that we and the manufacturers dispose of them in a way that won't endanger health. Is it oxymoronic to say that making sure we ingest the entire container of toxic drugs as directed, so that there is none to discard, is the least toxic disposal method? A take-back program is probably the best option.

**How bad are drugs in the environment?** While scientists have found trace amounts of these medications in the water supply, the FDA states that "the majority of medicines found in the water system are a result of the body's natural routes of drug elimination (in urine or feces). Luckily, the body has metabolized most of the dangerous medications to less- or inactive substances prior to

excretion. Even opiates eventually oxidize to inactive substances.

It's not so simple though. The human body alters many drugs to inactive forms prior to excretion in urine and stool. Others, excreted by humans in an unaltered form, are degraded by sewage treatment or exposure to water, bacteria and air. A few, like the anti-seizure drug carbamazepine, which the body inactivates before excretion in urine, are turned *back* into the active form upon contact with water. Others, which the body attaches to chemical blockers, become re-activated when the blocker is cleaved off in sewage treatment.

Medications and their by-products that have a charged surface don't significantly attach to the subsoil, and leach readily into groundwater aquifers. Non-charged drugs, like steroids, attach well to soil and are found in very low levels in ground or drinking water. That doesn't necessarily predict safety: Estrogen metabolites bind to the subsoil and disperse into water in very small quantities, but enough to feminize some fishes and frogs and change the ecosystem.

**Thus, to predict levels of active pharmaceuticals and by-products in the environment, and specifically drinking water, one must know their biodegradability, metabolic pathways including attachment to other substances, and adsorption characteristics.** A Berlin water study found disappearance of 99.9% of caffeine with sewage treatment, but removal of only 8% of carbamazepine (Tegretol) and none of clofibrac acid (a cholesterol-lowering medication). The class of drug doesn't predict clearance uniformly: Of the NSAIDs, indomethacin remains intact and only 17% of diclofenac and 23% of ketoprofen are degraded, but almost all naproxen disappears with sewage treatment.

**If you are totally frustrated at this point, I have a few other suggestions:**

- Box them up with fancy paper and a bow and "re-gift" them.
- Use larger pills for Mankala stones or Go pieces.

- Since the most effective and least utilized disposal method is incineration, perhaps Burning Man can incorporate a public service component to their get-together, combining a take-back program and incineration. Just don't inhale.

**Take-Back locations:  
Many Walmart and CVS stores.**

**North Area Recovery Station Household Hazardous Waste Collection Facility, 4450 Roseville Rd, North Highlands, CA 95660. 916-875-555.**

**City of Folsom Household Hazardous Waste Collection Program, Folsom, CA 95630.**  
[www.folsomhazmat.com](http://www.folsomhazmat.com) or call 916-355-8350 to schedule a pick-up.

**Yolo County Household Hazardous Waste Collection Facility, 44090 County Rd 28H, Woodland, CA 95776. 530-666-8729.**

**WPWMA Household Hazardous Waste Collection Facility, 3195 Athens Ave, Lincoln, CA 95648. 916-645-5230.**

**El Dorado Hills Fire Station. 3670 Bass Lake Rd, El Dorado Hills, CA 95762. 916-933-6692.**

References:

- 1) Heberer, T. Tracking persistent pharmaceutical residues from municipal sewage to drinking water. *J Hydrology*. 2001;266:175-189.
- 2) Ruhoy IS & Daughton CG. Types and quantities of leftover drugs entering the environment via disposal to sewage – Revealed by coroner records. *Sci Total Environ*. 2007;388:137-148.
- 3) FDA website:  
<http://www.fda.gov/Drugs/ResourcesForYou/Consumers/BuyingUsingMedicineSafely/EnsuringSafeUseofMedicine/SafeDisposalofMedicines/ucm186187.htm#MEDICINES>
- 4) DEA website and  
[http://www.deadiversion.usdoj.gov/drug\\_disposal/non\\_registrant/s\\_3397.pdf](http://www.deadiversion.usdoj.gov/drug_disposal/non_registrant/s_3397.pdf)