# Removing Pharmaceuticals From Water Doesn't Come Cheap Or Easy

**FOUNTAIN VALLEY, Calif.** — Shivaji Deshmukh drinks water extracted from raw sewage. He knows the water is clean because his job is to help make it so as an engineer at the Orange County Water District.

"It's an efficient, cheap water supply — and it's the best quality," says Deshmukh, amid the hiss of machines at the state-of-the-art facility.

Performing the recycling transformation requires a battery of treatments.

Wastewater strained and disinfected at an adjacent sewage treatment plant is first filtered through tiny straws. Then, in a process called reverse osmosis, the water is forced across a spiraled sheet of plastic with holes so small that little else can slip through. In the final phase, the water is zapped with ultraviolet light.

The three-step operation is one of the most sophisticated cleansing systems anywhere. While the incoming water contains minuscule levels of prescription drugs, tests for any traces of a half-dozen pharmaceuticals, conducted as the treated water leaves the plant, detect nothing.

The end product supplies more than 500,000 Orange County residents for a year, nearly one-quarter of the district's potable water needs.

The cleansing procedure illustrates how difficult — and expensive — it is to scrub virtually every iota of contaminant from our supplies.

The standard ways of cleaning water are not designed to snare the tiny amounts of prescription drugs that survive digestion, and then, with a flush of the toilet, begin their journey toward America's taps.

It's not an academic exercise: According to an Associated Press investigation, scientists have found that water piped to tens of millions of people nationwide contains minute concentrations of dozens of pharmaceuticals from tranquilizers to painkillers to antibiotics.

While scientists have not definitively established that people are harmed by these drugs, laboratory tests have shown tiny amounts can have ill effects on human cells. And the fact that they are being consumed in combination, over many years — at any level — worries some researchers.

If those fears are borne out by future studies, it could lead communities and water providers to spend hundreds of millions of dollars on more advanced treatments to improve on the commonplace regimen of filtration and disinfection with chlorine.

A large-scale reverse osmosis system is expensive. It costs Orange County about one-eighth of a penny per gallon — or $15 month for the 12,000 gallons used by a typical family of four, a price that doesn't include overhead charges, such as construction, salaries and maintenance.

Officials at the Greater Cincinnati Water Works say their granular activated carbon filtering system costs 93.6 cents per month for the typical family of four.



Following a parasitic outbreak, the Southern Nevada Water Authority in Las Vegas — which processes up to 900 million gallons daily at two treatment plants — invested millions of dollars in a different advanced system that dissolves ozone gas into water to destroy micro-organisms.

The cheaper ozonation process isn't designed to remove pharmaceuticals, though it does take care of many compounds.

Tests at the Nevada authority have shown that tiny concentrations of the tranquilizer meprobamate and an anti-epileptic drug regularly resist the treatment, as on occasion has carbamazepine, another anti-convulsant.

At the Metropolitan Water District of Southern California, which serves 18.5 million people, tests at one of its five plants show that ozonation failed to remove a tranquilizer and an anti-epileptic drug from the finished drinking water, according to an ongoing study.

That district and the Southern Nevada Water Authority both draw from the Colorado River, which, tests show, can contain several hundred parts per trillion of pharmaceuticals, including the

active ingredients in medicines to treat depression and anxiety.

The drugs get there because wastewater plants that drain into the river use basic treatments designed to remove microbes and industrial contaminants, not pharmaceuticals — the same scenario in many rivers nationwide.

Even in Europe, where governments have gone much further in addressing trace levels of pharmaceuticals in the environment, there's scant political will to invest broadly in advanced wastewater treatment.
"The cost isn't acceptable right now," Yves Levi, a pharmacist and professor of public health at Paris-South 11 University, said in an interview in French. "No one knows if the risk is considerable or not."

Another advanced process at drinking water treatment plants, the use of carbon filters, also lets some pharmaceuticals through.

Some of the most detailed testing was done at the Passaic Valley Water Commission in Northern New Jersey, where a drinking water treatment facility downstream from numerous sewage treatment plants chemically removes sediments from water, then disinfects it with chlorine and runs it through the extra filtering step.

Although the treatment decreased pharmaceutical concentrations, some samples heading into drinking water pipes contained all or some of the following: the painkiller codeine, an anticonvulsant drug, the remnants of a drug to reduce chest pains and caffeine.

Lead researcher U.S. Geological Survey hydrologist Paul Stackelberg said he expected tests at the same type of treatment plant anywhere in the nation would produce similar results.

"It's very easy to use all of the products that we use in our daily lives and not think twice about it," Stackelberg said.

Stackelberg also raised an X-factor: Rather than obliterating some pharmaceuticals, chlorination could chemically transform them into compounds that are even more toxic.

In one lab study, scientists found that acetaminophen, after undergoing chlorination, reacted to form tiny amounts of two known toxic compounds — 1,4-benzoquinone and N-acetyl-p-benzoquinone imine, the latter being associated with acetaminophen overdoses.

Source: The Associated Press. Daily News-Miner. March 18, 2008.