

SEWER AUTHORITY MID-COASTSIDE  
Staff Report

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**Subject / Title**

Discuss and Possibly Take Action on Recycled Water

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**Staff Recommendation:**

Discuss and Possibly Take Action on Recycled Water. This agenda item is regularly agendized to allow the Board to continue discussion on recycled water.

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**Fiscal Impact:**

None.

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**Discussion/Report:**

**Pilarcitos Creek Restoration Workgroup**

The Pilarcitos Creek Restoration Workgroup conducted its second public meeting on February 24, 2008 in Princeton-by-the-Sea. On March 3, the workgroup conducted a debriefing meeting. At that debriefing meeting, the workgroup agreed to conduct an all-day-if-necessary meeting on April 3 to discuss the project prioritization process and high priority/high profile projects. SAM will attend and participate.

**Half Moon Bay Review Article on Recycled Water**

On March 3, Manger Foley talked with the Half Moon Bay Review about recycled water. An article was published on March 5. A copy is attached.

Article From the Water Environment Federation:

***AP Reports on Pharmaceuticals in Drinking Water; Senate and House Leaders Respond***

*This week the Associated Press (AP) published a three-part series on pharmaceuticals in source water and drinking water. According to the AP, the articles were the result of a 5-month long investigation in urban and rural areas in all fifty states. The first article reported that the AP found "minute concentrations of a vast array of pharmaceuticals" in the drinking water supplies of 24 of the 28 tested major metropolitan areas. Subsequent articles in the series discussed potential harm to animals and aquatic life and the lack of a federal strategy or mandates to regulate pharmaceuticals in water. The AP cited wastewater treatment plant discharges as well as failing septic systems and feedlots as sources of pharmaceuticals. The AP reports led Rep. Allyson Schwartz (D-PA) to ask EPA to establish a national task force, and Senate Environment and Public Works Committee leaders Barbara Boxer (D-CA), the committee chair, and Frank Lautenberg*

*(D-NJ) announced they will hold oversight hearings in early April. After the first article, WEF released a media advisory listing resources for information on microconstituents, which is the term WEF uses to define substances like pharmaceuticals that are found at low levels in the environment. WEF has established a page on its website to share information on microconstituents at [www.wef.org/ScienceTechnologyResources/Microconstituents/](http://www.wef.org/ScienceTechnologyResources/Microconstituents/).*

SAM staff has included a variety of media articles on the topic of pharmaceuticals in water.



One hope among water officials is that customers who currently draw from the watershed could someday replace a portion of that supply with recycled water, thereby helping restore the watershed's health. If the golf course reduced the amount they pumped, then the creek would benefit, Foley said.

The big customers that are close by are the low-hanging fruit, Foley went on. You try to service them, set a contract with them first. Some big customers, however, such as Skylawn Memorial Garden near Skyline Boulevard, are just too far away to service with recycled water in the foreseeable future. The piping gets very expensive, Foley said.

At the moment, no specific timetable or decision has been finalized to start recycling water on the Coastside. But SAM and its consultants, Carollo Engineers, have conducted feasibility studies over the past few years that have sketched out plans and obstacles for such projects.

Foley said that recycled water for nonpotable use would be of excellent quality, and that it would meet state standards for some sort of reuse.

The idea got a little push in January when SAM's board reviewed an activity outline on water reclamation. That outline, which is available on SAM's Web site, suggests that SAM spend most of 2008 reaching out to potential customers and public entities and begin to prioritize some funding possibilities. Next year would consist of public involvement and education, project design and permitting, with construction of water recycling equipment at SAM's plant and pipeline construction possibly occurring in 2010.

Dickson noted that the wholesale cost of water could triple over the next few years, as the San Francisco Public Utilities Commission " which supplies more than two-thirds of the water provided to CCWD customers " conducts seismic improvements to its infrastructure. He also pointed to the benefits of water recycling, but immediately acknowledged the challenge of beginning the project on the Coastside

It seems for the moment that the concept of water reclamation enjoys pretty much universal support. What we're going to have to address as we go forward " as we do with every project " is, Does it induce growth?

Dickson and Foley both said that servicing customers with reclaimed water, whether to water fairways or drizzle orchids, will require the installation of purple pipes the industry-standardized color for pipes transmitting reclaimed water.

Foley said that a similar meeting to the one he conducted on Feb. 10 will occur with the San Mateo County Farm Bureau in the next few weeks.

## **Water woes could mean new dams**

Environmentalists urge conservation instead, but some officials weigh idea

**The Associated Press**

updated 1:10 p.m. PT, Mon., March. 3, 2008

SPOKANE, Wash. - The Western states' era of massive dam construction — which tamed rivers, swallowed towns, and created irrigated agriculture, cheap hydropower and environmental problems — effectively ended in 1966 with the completion of Glen Canyon Dam.

But the region's booming population and growing fears about climate change have governments once again studying construction of dams to capture more winter rain and spring snowmelt for use in dry summer months.

"The West and the Northwest are increasing in population growth like never before," said John Redding, regional spokesman for the U.S. Bureau of Reclamation in Boise. "How do you quench the thirst of the hungry masses?"

The population of the Western states grew nearly 20 percent in the 1990s, to more than 64 million, and continues to swell even as climate change poses new threats to the water supply.

Ironically, consideration of new dams comes even as older ones are being torn down across the country because of environmental concerns — worries that will likely pose big obstacles to new construction. In Oregon, a deal has been struck to remove four dams on the Klamath River to restore struggling salmon runs.

There are lots of other ideas for increasing water supplies in the West. They include conservation, storing water in natural underground aquifers, pipelines to carry water from the mountains, desalination plants to make drinking water from the ocean, small dams to serve local areas.

Most of those ideas are much more popular than big new dams.

Washington's Democratic Gov. Christine Gregoire put together a coalition of business, government and environmental groups to create the Columbia River Management Plan, which calls for spending \$200 million to study various proposals for finding more water for arid eastern Washington.

### **Smaller dams on tributaries?**

Jay Manning, director of the Washington state Department of Ecology, believes that huge new dams on the main stems of rivers are unlikely. But it is quite possible that tributaries will be dammed.

"It is inevitable we will take steps to increase water supply," Manning said. "Storage is part of that solution."

With demand for water already high, pressure is being increased by fears that climate change will produce rain instead of snow in winter, reducing the slow-melting snowpack that provides water in dry summer months.

Gregoire's plan drew the support of many environmentalists by including many ideas they prefer, including conservation measures and metering more uses of water.

But the state also is studying dams, drawing opposition from some environmentalists, particularly a group called the Center for Environmental Law and Policy.

"Our water future doesn't lie with new dams," said Dr. John Osborn, a Spokane physician and chairman of the Sierra Club chapter in Spokane. "It's water conservation."

Osborn contends dam boosters are pushing for new dams to benefit business, underplaying the costs and environmental destruction and ignoring the benefits of improving conservation.

In other states:

- Four major water storage projects are being studied in California, including a proposal for a new dam on the San Joaquin River, said Sue McClurg, of the Water Education Foundation in Sacramento. Republicans in the California Assembly say they will block any plan to improve water supplies that doesn't include new dams.
- The Southern Nevada Water Authority, which serves Las Vegas, is considering a reservoir to capture more Colorado River water before it flows into Mexico.
- In Colorado, there is a proposal to create two new reservoirs on the Yampa River.
- Some in Idaho still hope to rebuild the Teton Dam, which collapsed in 1976, killing 11 people.

A major barrier to new dams is cost, which runs into the billions, Manning said. It's uncertain how much the federal government would be willing to pay.

### **\$6.7 billion estimate for one dam**

A recent study of the Black Rock dam proposal in the Yakima River basin concludes the 600-foot-high dam would cost \$6.7 billion to build and operate, and would return just 16 cents for every dollar spent.

The explosive growth of the West is in part a product of a binge in dam construction that provided plentiful water and cheap electricity. The U.S. Bureau of Reclamation built more than 472 dams, including Shasta in California, Bonneville on the Oregon-Washington state line, Fort Peck Dam in Montana and Grand Coulee Dam in Washington.

But the era of giant dams essentially ended with the Glen Canyon Dam, just upstream from the Grand Canyon on the Arizona-Utah state line, which galvanized the environmental movement because its Lake Powell inundated a huge swath of scenic land, archaeological sites and places important to native Americans.

Lake Powell and its downstream cousin, Lake Mead — two of the nation's largest manmade reservoirs — provide water for millions of people in Nevada, Arizona and California.

However, both lakes are only half full after years of drought, and researchers at San Diego's Scripps Institution of Oceanography figure climate change and growing demand could drain them within just 13 years.

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## Tests find chemicals at reservoirs

### REGION'S WATER CALLED SAFE, BUT CRITICS CALL FOR MORE RESEARCH

By Paul Rogers

Mercury News

Article Launched: 03/18/2008 01:37:28 AM PDT

Water from San Francisco Bay's delta and from at least two Santa Clara County reservoirs contains trace amounts of pharmaceutical compounds, including ibuprofen, hormones found in birth control pills and a drug used to reduce cholesterol.

The Santa Clara Valley Water District released the information Monday in response to a request by the Mercury News. But the results raise more questions than they answer, including whether the chemicals pose any health risk at such low levels or whether they ever reached household taps.

The chemicals were discovered in 2002 and 2003 during the district's tests of water that had not yet been treated at the district's three treatment plants in San Jose.

The agency tested for 14 pharmaceutical and endocrine-disrupting chemicals, and eight were found in detectable levels. All the readings were very low, with none reaching above 1 part per billion.

Officials at the district, a San Jose agency that provides drinking water to 1.8 million people in Santa Clara County, said Monday that the region's water is safe to drink. Studies conducted around the world have not documented a human health impact from trace levels of pharmaceuticals in water, they said.

"Just because you can find something doesn't mean it is harmful," said Bruce Cabral, water quality manager for the district.

Officials believe the chemicals came from cities like Sacramento and Stockton, whose treated wastewater empties to the delta. When people take prescription and over-the-counter drugs, some of the drugs are absorbed in their bodies and some pass through into their toilets. Most sewage treatment plants do not have the technology to filter out all such chemicals at minute levels, and they are discharged into rivers, oceans and bays in treated wastewater.

The district took the tests - which cost \$100,000 - to obtain background data on delta water so it could be compared to water from a proposed recycled water plant the district is considering building, Cabral said. The district did not test the "finished water" coming out of

its treatment plants. Those plants, two of which have state-of-the-art ozone treatment systems, would be expected to reduce the levels, although probably not eliminate them entirely.

The chemicals detected in water from the delta and Lexington and Calero reservoirs included ibuprofen and naproxen, found in Advil and Alleve; gemfibrozil, a cholesterol drug; the hormones estrone and 17B-estradiol; and nonylphenols, a chemical used in detergents, pesticides and contraceptives. Tests for other compounds, including testosterone and anti-convulsants, were negative.

Cabral said the district has no plans to do further tests, but is working on a project with the Contra Costa Water District to figure out ways to better filter delta water.

The Mercury News made the request for the data after the Associated Press reported last week that pharmaceuticals have been found in trace levels in the drinking water systems of 24 of America's largest cities. Philadelphia had the most, with 56 types found.

The AP found many water systems don't test for pharmaceuticals. Because such compounds in low levels have not been clearly linked to human health problems, there are no federal health standards for them in drinking water.

U.S. Sen. Barbara Boxer, D-Calif. said last week she plans to hold hearings in April on the issue.

Environmentalists said the findings highlight a need for more research and for new standards from the U.S. Environmental Protection Agency.

"Utilities tell us not to worry, that the levels of contaminants they're finding are too low to cause harm," said Bill Walker, a spokesman for the Environmental Working Group in Oakland.

"But the truth is that the health effects of this chemical and drug cocktail in our drinking water haven't been studied, leaving us concerned about the risk to infants and others who are most vulnerable."

A top Stanford water researcher said more study is needed.

"Historically we have thought a lot about industrial chemicals - DDT and that kind of stuff - but now we are finding chemicals that you and I buy in the checkout line at Safeway," said Richard Luthy, chair of Stanford University's Department of Civil and Environmental Engineering. "They are widely used. But we don't know what the effects are."

Monday, March 17, 2008

## **Pharmaceuticals in water: A problem we all can help solve**

**A guest column by Roger Faubel, president of the Santa Margarita Water District Board of Directors.**

By ROGER FAUBEL  
CONTRIBUTOR

[Comments 0](#) | [Recommend 1](#)

At Santa Margarita Water District (SMWD), our number one priority is to provide our customers with a safe, refreshing and reliable water supply, so when a national news story ran recently about trace amounts of pharmaceuticals in drinking water, we expected our customers to start asking questions.

We're proud that over the years we have been able to maintain an exemplary water quality record, achieving and exceeding all safe drinking water standards. Even so, we know that many have been troubled by the media reports and concerned about the trace levels of pharmaceuticals being present in drinking water.

Let me explain. For years, SMWD has been educating local residents about the importance of protecting local water quality through personal responsibility. We have made the pleas time and time again. "Don't dump motor oil and other hazardous materials down storm drains," we say. "Reduce runoff by limiting excessive irrigation."

We know that small acts of environmental sensitivity by community members have greatly reduced water pollution, beach contamination and ultimately have led to better water quality for all of us. While most of our customers "get it" when it comes to lawn chemicals, pet waste or motor oil going into storm drains, the concept of not flushing pharmaceuticals remains a new idea for most. That's why in the past few years, we've also been educating our customers about the proper disposal of pharmaceutical medications, discouraging residents from flushing their pills.

Due to improving technologies, environmental experts have been detecting previously imperceptible amounts of pharmaceuticals in regional supplies, which is why trace levels of pharmaceuticals were found in a 2006 survey of water at the Metropolitan Water District's (MWD) Joseph Jensen Water Treatment Plant in

the San Fernando Valley. Even though SMWD gets its water from MWD's Diemer Water Treatment Plant in Yorba Linda, we paid attention, closely following the issue.

The survey revealed the presence of trace amounts (in the parts-per-*trillion* range) of several different pharmaceuticals and pesticides in the untreated water entering the Jensen plant. What does "trace" mean? To put it in perspective, in order to equal just one dose of the medication, one would have to drink the equivalent of 120 Olympic-sized swimming pools of water with the same level of pharmaceuticals as were detected at the Jensen plant.

So the facts are reassuring. Scientists do not consider current levels to be harmful to humans, though they continue to study the ecological and biological impacts of the medication in the water.

Together with MWD, we at SMWD can assure our customers that drinking water in our area is extremely safe, meeting all federal and state standards. But even so, we encourage our customers to do their part to reduce the level of pharmaceuticals and other contaminants found in the water supply.

Doing the right thing is simple. Refrain from flushing old and unused medications down the toilet. Instead, contact a local pharmacy to see if they will discard the pills for you, or simply seal the pharmaceuticals and deliver them to the nearest Household Hazardous Waste Collection Center. Call 1-800-CLEANUP for the location of the center nearest you.

Help us keep water supplies clean by doing your part to reduce water contamination.

Roger Faubel is president of the Santa Margarita Water District Board of Directors.

March 10, 2008, 10:07 am

## There Are Drugs in Drinking Water. Now What?

By [MIKE NIZZA](#)

There are traces of [sedatives in New York City's water](#). Ibuprofen and naproxen [in Washington, D.C.](#) Anti-epileptic and anti-anxiety drugs in southern California.

A [2,550 word article](#) from The Associated Press is drawing attention to the widespread problem of trace amounts of pharmaceutical chemicals turning up in the drinking water supply of millions of Americans, but no one seems to know how to react. The report itself culminated with a doctor offering a tried-and-true deduction for the Ages: "[That can't be good.](#)"

But how bad is it, exactly? The answers range in degrees of confidence and alarm, though no one was ready to predict imminent doom.

"We recognize it is a growing concern and we're taking it very seriously," said Benjamin H. Grumbles, the Environmental Protection Agency's water chief. But the government has not established any safety limits for pharmaceutical drugs in drinking water, as it has for many other chemicals; the agency is just learning how to detect low concentrations of drugs in water, let alone assess the risk posed by them.

The American Water Works Association, a trade group representing thousands of water utilities, seemed to suggest that the problem is the testing data, not the water. A California water official warned The A.P. before it published the article that that the public "doesn't know how to interpret the information" from the tests.

Tom Curtis, the deputy executive director of the association, explained. "Today's advanced technology has allowed scientists to detect more substances — at lower levels — than ever before," he said. He [called for calm](#), saying there was no research demonstrating "an impact on human health" from the detected levels of drugs in public water supplies.

So why has this burdensome fact of life been dropped on the shoulders on Americans? The lack of scientific proof of a threat

does not rule one out, of course. Little study has been devoted to the long-term effects of low-concentration exposure on humans. But as the A.P. relates, research on the effects on wildlife has yielded some scary examples: Pharmaceuticals in river and lake water are being blamed for “feminized” male fish and other changes observed in earthworms and zooplankton.

So how are all these drugs getting in the water in the first place? Some fraction of every dose a person takes passes through unmetabolized and is evacuated by the body and flushed into sewage systems. Sewage treatment plants are meant to remove the more familiar kinds of pollutants, and typically do not remove pharmaceuticals from waste water as it is cleaned up and released back into the environment, eventually to find its way into other water supply systems. In some places, [treated sewage water is reused directly for drinking water](#) after several filtration processes to make it safe, although none of the systems in wide use effectively remove pharmaceuticals.

That [Brita filter](#) in your kitchen is not likely to do the trick, either. As for bottled water, it, too, may come from a tap, rather than some remote mountain spring. And the trade group representing bottled-water sellers told The A.P. that they aren’t testing for the presence of trace drugs anyway.

*RELATED: Last April, Cornelia Dean covered drugs in the water in Science Times: [Drugs Are in the Water. Does It Matter?](#)*



## **Drug disposal examined as water purity issue**

It used to be simple. Consumers were told to flush their old medications down the toilet.

Now that is considered a serious mistake in light of reports of pharmaceuticals in drinking water.

So many people are left with a conundrum: What to do with their expired and unused drugs?

Answers can be hard to come by, but options for safe disposal do exist, including a handful of East Bay pharmacies with "take back" programs.

"I would sure like to know what to do with this stuff," said Ed Berman, a 78-year-old retired CPA who lives in Rossmore. "I'm sure half of Rossmore is faced with the same problem."

Berman has old antibiotics and diabetes medication that he wants to get rid of, but his garbage company told him not to put it in the Dumpster. He went to four pharmacies but none had programs to accept such medications.

"So you're stuck with them," he said.

Not quite. The non-profit Teleosis Institute in Berkeley began a Green Pharmacy program last June. It credits that program with diverting more than 900 pounds of unused and expired medications from local waterways.

People can bring unwanted medications to 14 Bay Area pharmacies and health offices, including the Elephant Pharmacy on California Boulevard in Walnut Creek, and Pharmaca pharmacies in Berkeley and Monterey.

The drugs should be returned in their original containers with personal information blacked out.

The unwanted medications will then be incinerated considered the most environmentally safe disposal method.

Program manager Evin Guy said 40 percent of prescription medications go unused either because they expire, people don't like the side-effects, or doctors decide to prescribe something else.

Teleosis has been encouraging local health care providers to prescribe small starter packs of drugs instead of starting people off with a full 90-day supply.

The organization also asks those who return medications to fill out a form listing the drug's name, dosage, quantity and where it was obtained.

The goal is to figure out what is generating the most waste and attempt to reduce it at the beginning of the process, Guy said.

Alta Bates Medical Center has been tackling the program for more than a year through its Peralta outpatient pharmacy on Telegraph Avenue in Oakland.

When customers pick up their medications, a flier is attached to each bag with information about the take-back program. The pharmacy will accept medications from everyone, regardless of where the drugs were purchased.

"The service to the community greatly outweighs the nominal cost," pharmacist Sharon Leaf said. "I think we all need to be more responsible for our environment. This is something that the industry as a whole is becoming much more aware of."

Leaf estimates that her pharmacy has handled 400 to 500 pounds of unwanted medications since the program began.

Teleosis is working to expand its network of participating pharmacies.

Other groups, including the East Bay Municipal Utility District, sponsor periodic drop-off days, often in connection with other events such as a mercury thermometer exchange.

On a state level, legislation signed into law last year requires the Board of Waste Management to develop a pilot program for pharmacies to take back medications, similar to the one Teleosis is sponsoring.

"The ultimate end is incineration," said Virginia Herold, executive officer of the state Board of Pharmacy. State officials hope to have the pilot program designed by the end of the year.

In the meantime, the Board of Pharmacy's Web site advises consumers to keep pills or capsules in their original containers, add water and something nontoxic such as sawdust, kitty litter, charcoal or powdered spices, seal the container with duct tape, put it in a cardboard box and place it in the trash.

But Guy of Teleosis and others disagree with this approach, arguing that incineration is best to avoid contaminating landfills and, eventually, the water supply.



Rossmoor resident Ed Berman 78, holds some of the medication he know longer needs. Berman, has asked everyone and gotten no answers, concerning how to dispose of his old medications. Berman, knows your not supposed to flush old medication down the toilet and garbage companies don't want them going to the landfills and pharmacies don't want them. He would like to know the proper way of disposing of old medications, so they don't get in our water supply. (Doug Duran/Contra Costa Times)

Reach Sandy Kleffman at 925-943-8249 or [skleffman@bayareanewsgroup.com](mailto:skleffman@bayareanewsgroup.com).

# AP Water Probe Prompts Senate Hearings

By MARTHA MENDOZA – 8 hours ago

Two veteran U.S. senators said they plan to hold hearings in response to an Associated Press investigation into the presence of trace amounts of pharmaceuticals in the drinking water supplies of at least 41 million Americans.

Also, U.S. Rep. Allyson Schwartz, D-Pa., has asked the EPA to establish a national task force to investigate the issue and make recommendations to Congress on any legislative actions needed.

Sen. Barbara Boxer, who heads the Senate Environment and Public Works Committee, and Sen. Frank Lautenberg, chairman of the Transportation, Safety, Infrastructure Security and Water Quality Subcommittee, said Monday the oversight hearings would likely be held in April.

Boxer, D-Calif., said she was "alarmed at the news" that pharmaceuticals are turning up in the nation's drinking water, while Lautenberg, a New Jersey Democrat who said he was "deeply concerned" by the AP findings, both represent states where pharmaceuticals had been detected in drinking water supplies, but not disclosed to the public.

"I call on the EPA to take whatever steps are necessary to keep our communities safe," said Boxer in a statement.

Added Lautenberg, whose subcommittee has jurisdiction over drinking water issues: "Our families deserve water that is clean and safe. Our hearing will examine these problems and help ensure the EPA and Congress take the steps necessary to protect our residents and clean up our water supply."

EPA spokesman Timothy Lyons said the agency is "committed to keeping the nation's water supply clean, safe and the best in the world. We encourage all Americans to be responsible when disposing of prescription drugs."

The Lautenberg-Boxer announcement came just 24 hours after the AP's release of the first installment of its three-part series, titled PharmaWater.

The five-month-long inquiry by the AP National Investigative Team found that while water is screened for drugs by some suppliers, they usually don't tell their customers that they have found medication in it, including antibiotics, anti-convulsants, mood stabilizers and sex hormones.

The series shows how drugs — mostly the residue of medications taken by people, excreted and flushed down the toilet — have gotten into the water supplies of at least 24 major metropolitan areas, from Southern California to northern New Jersey. The stories also detail the growing concerns among scientists that this pollution has adversely affected wildlife, and may threaten human health.

In a letter to EPA administrator Stephen Johnson, Schwartz said, "Like many Pennsylvanians, I was especially taken aback by the finding of 56 different pharmaceuticals discovered in the drinking water for the City of Philadelphia. . . . The Associated Press report raises serious questions about the safety and security of America's water system."

## **AP Probe Finds Drugs in Drinking Water**

By JEFF DONN, MARTHA MENDOZA and JUSTIN PRITCHARD,  
Associated Press Writers

Sunday, March 9, 2008

(03-09) 14:03 PDT , (AP) --

A vast array of pharmaceuticals — including antibiotics, anti-convulsants, mood stabilizers and sex hormones — have been found in the drinking water supplies of at least 41 million Americans, an Associated Press investigation shows.

To be sure, the concentrations of these pharmaceuticals are tiny, measured in quantities of parts per billion or trillion, far below the levels of a medical dose. Also, utilities insist their water is safe.

But the presence of so many prescription drugs — and over-the-counter medicines like acetaminophen and ibuprofen — in so much of our drinking water is heightening worries among scientists of long-term consequences to human health.

In the course of a five-month inquiry, the AP discovered that drugs have been detected in the drinking water supplies of 24 major metropolitan areas — from Southern California to Northern New Jersey, from Detroit to Louisville, Ky.

Water providers rarely disclose results of pharmaceutical screenings, unless pressed, the AP found. For example, the head of a group representing major California suppliers said the public "doesn't know how to interpret the information" and might be unduly alarmed.

How do the drugs get into the water?

People take pills. Their bodies absorb some of the medication, but the rest of it passes through and is flushed down the toilet. The wastewater is treated before it is discharged into reservoirs, rivers or lakes. Then, some of the water is cleansed again at drinking water treatment plants and piped to consumers. But most treatments do not remove all drug residue.

And while researchers do not yet understand the exact risks from decades of persistent exposure to random combinations of low levels of pharmaceuticals,

recent studies — which have gone virtually unnoticed by the general public — have found alarming effects on human cells and wildlife.

"We recognize it is a growing concern and we're taking it very seriously," said Benjamin H. Grumbles, assistant administrator for water at the U.S. Environmental Protection Agency.

Members of the AP National Investigative Team reviewed hundreds of scientific reports, analyzed federal drinking water databases, visited environmental study sites and treatment plants and interviewed more than 230 officials, academics and scientists. They also surveyed the nation's 50 largest cities and a dozen other major water providers, as well as smaller community water providers in all 50 states.

Here are some of the key test results obtained by the AP:

\_ Officials in Philadelphia said testing there discovered 56 pharmaceuticals or byproducts in treated drinking water, including medicines for pain, infection, high cholesterol, asthma, epilepsy, mental illness and heart problems. Sixty-three pharmaceuticals or byproducts were found in the city's watersheds.

\_ Anti-epileptic and anti-anxiety medications were detected in a portion of the treated drinking water for 18.5 million people in Southern California.

\_ Researchers at the U.S. Geological Survey analyzed a Passaic Valley Water Commission drinking water treatment plant, which serves 850,000 people in Northern New Jersey, and found a metabolized angina medicine and the mood-stabilizing carbamazepine in drinking water.

\_ A sex hormone was detected in San Francisco's drinking water.

\_ The drinking water for Washington, D.C., and surrounding areas tested positive for six pharmaceuticals.

\_ Three medications, including an antibiotic, were found in drinking water supplied to Tucson, Ariz.

The situation is undoubtedly worse than suggested by the positive test results in the major population centers documented by the AP.

The federal government doesn't require any testing and hasn't set safety limits for drugs in water. Of the 62 major water providers contacted, the drinking water for

only 28 was tested. Among the 34 that haven't: Houston, Chicago, Miami, Baltimore, Phoenix, Boston and New York City's Department of Environmental Protection, which delivers water to 9 million people.

Some providers screen only for one or two pharmaceuticals, leaving open the possibility that others are present.

The AP's investigation also indicates that watersheds, the natural sources of most of the nation's water supply, also are contaminated. Tests were conducted in the watersheds of 35 of the 62 major providers surveyed by the AP, and pharmaceuticals were detected in 28.

Yet officials in six of those 28 metropolitan areas said they did not go on to test their drinking water — Fairfax, Va.; Montgomery County in Maryland; Omaha, Neb.; Oklahoma City; Santa Clara, Calif., and New York City.

The New York state health department and the USGS tested the source of the city's water, upstate. They found trace concentrations of heart medicine, infection fighters, estrogen, anti-convulsants, a mood stabilizer and a tranquilizer.

City water officials declined repeated requests for an interview. In a statement, they insisted that "New York City's drinking water continues to meet all federal and state regulations regarding drinking water quality in the watershed and the distribution system" — regulations that do not address trace pharmaceuticals.

In several cases, officials at municipal or regional water providers told the AP that pharmaceuticals had not been detected, but the AP obtained the results of tests conducted by independent researchers that showed otherwise. For example, water department officials in New Orleans said their water had not been tested for pharmaceuticals, but a Tulane University researcher and his students have published a study that found the pain reliever naproxen, the sex hormone estrone and the anti-cholesterol drug byproduct clofibric acid in treated drinking water.

Of the 28 major metropolitan areas where tests were performed on drinking water supplies, only Albuquerque; Austin, Texas; and Virginia Beach, Va.; said tests were negative. The drinking water in Dallas has been tested, but officials are awaiting results. Arlington, Texas, acknowledged that traces of a pharmaceutical were detected in its drinking water but cited post-9/11 security concerns in refusing to identify the drug.

The AP also contacted 52 small water providers — one in each state, and two each in Missouri and Texas — that serve communities with populations around

25,000. All but one said their drinking water had not been screened for pharmaceuticals; officials in Emporia, Kan., refused to answer AP's questions, also citing post-9/11 issues.

Rural consumers who draw water from their own wells aren't in the clear either, experts say.

The Stroud Water Research Center, in Avondale, Pa., has measured water samples from New York City's upstate watershed for caffeine, a common contaminant that scientists often look for as a possible signal for the presence of other pharmaceuticals. Though more caffeine was detected at suburban sites, researcher Anthony Aufdenkampe was struck by the relatively high levels even in less populated areas.

He suspects it escapes from failed septic tanks, maybe with other drugs. "Septic systems are essentially small treatment plants that are essentially unmanaged and therefore tend to fail," Aufdenkampe said.

Even users of bottled water and home filtration systems don't necessarily avoid exposure. Bottlers, some of which simply repackage tap water, do not typically treat or test for pharmaceuticals, according to the industry's main trade group. The same goes for the makers of home filtration systems.

Contamination is not confined to the United States. More than 100 different pharmaceuticals have been detected in lakes, rivers, reservoirs and streams throughout the world. Studies have detected pharmaceuticals in waters throughout Asia, Australia, Canada and Europe — even in Swiss lakes and the North Sea.

For example, in Canada, a study of 20 Ontario drinking water treatment plants by a national research institute found nine different drugs in water samples. Japanese health officials in December called for human health impact studies after detecting prescription drugs in drinking water at seven different sites.

In the United States, the problem isn't confined to surface waters. Pharmaceuticals also permeate aquifers deep underground, source of 40 percent of the nation's water supply. Federal scientists who drew water in 24 states from aquifers near contaminant sources such as landfills and animal feed lots found minuscule levels of hormones, antibiotics and other drugs.

Perhaps it's because Americans have been taking drugs — and flushing them unmetabolized or unused — in growing amounts. Over the past five years, the

number of U.S. prescriptions rose 12 percent to a record 3.7 billion, while nonprescription drug purchases held steady around 3.3 billion, according to IMS Health and The Nielsen Co.

"People think that if they take a medication, their body absorbs it and it disappears, but of course that's not the case," said EPA scientist Christian Daughton, one of the first to draw attention to the issue of pharmaceuticals in water in the United States.

Some drugs, including widely used cholesterol fighters, tranquilizers and anti-epileptic medications, resist modern drinking water and wastewater treatment processes. Plus, the EPA says there are no sewage treatment systems specifically engineered to remove pharmaceuticals.

One technology, reverse osmosis, removes virtually all pharmaceutical contaminants but is very expensive for large-scale use and leaves several gallons of polluted water for every one that is made drinkable.

Another issue: There's evidence that adding chlorine, a common process in conventional drinking water treatment plants, makes some pharmaceuticals more toxic.

Human waste isn't the only source of contamination. Cattle, for example, are given ear implants that provide a slow release of trenbolone, an anabolic steroid used by some bodybuilders, which causes cattle to bulk up. But not all the trenbolone circulating in a steer is metabolized. A German study showed 10 percent of the steroid passed right through the animals.

Water sampled downstream of a Nebraska feedlot had steroid levels four times as high as the water taken upstream. Male fathead minnows living in that downstream area had low testosterone levels and small heads.

Other veterinary drugs also play a role. Pets are now treated for arthritis, cancer, heart disease, diabetes, allergies, dementia, and even obesity — sometimes with the same drugs as humans. The inflation-adjusted value of veterinary drugs rose by 8 percent, to \$5.2 billion, over the past five years, according to an analysis of data from the Animal Health Institute.

Ask the pharmaceutical industry whether the contamination of water supplies is a problem, and officials will tell you no. "Based on what we now know, I would say we find there's little or no risk from pharmaceuticals in the environment to

human health," said microbiologist Thomas White, a consultant for the Pharmaceutical Research and Manufacturers of America.

But at a conference last summer, Mary Buzby — director of environmental technology for drug maker Merck & Co. Inc. — said: "There's no doubt about it, pharmaceuticals are being detected in the environment and there is genuine concern that these compounds, in the small concentrations that they're at, could be causing impacts to human health or to aquatic organisms."

Recent laboratory research has found that small amounts of medication have affected human embryonic kidney cells, human blood cells and human breast cancer cells. The cancer cells proliferated too quickly; the kidney cells grew too slowly; and the blood cells showed biological activity associated with inflammation.

Also, pharmaceuticals in waterways are damaging wildlife across the nation and around the globe, research shows. Notably, male fish are being feminized, creating egg yolk proteins, a process usually restricted to females.

Pharmaceuticals also are affecting sentinel species at the foundation of the pyramid of life — such as earth worms in the wild and zooplankton in the laboratory, studies show.

Some scientists stress that the research is extremely limited, and there are too many unknowns. They say, though, that the documented health problems in wildlife are disconcerting.

"It brings a question to people's minds that if the fish were affected ... might there be a potential problem for humans?" EPA research biologist Vickie Wilson told the AP. "It could be that the fish are just exquisitely sensitive because of their physiology or something. We haven't gotten far enough along."

With limited research funds, said Shane Snyder, research and development project manager at the Southern Nevada Water Authority, a greater emphasis should be put on studying the effects of drugs in water.

"I think it's a shame that so much money is going into monitoring to figure out if these things are out there, and so little is being spent on human health," said Snyder. "They need to just accept that these things are everywhere — every chemical and pharmaceutical could be there. It's time for the EPA to step up to the plate and make a statement about the need to study effects, both human and environmental."

To the degree that the EPA is focused on the issue, it appears to be looking at detection. Grumbles acknowledged that just late last year the agency developed three new methods to "detect and quantify pharmaceuticals" in wastewater. "We realize that we have a limited amount of data on the concentrations," he said. "We're going to be able to learn a lot more."

While Grumbles said the EPA had analyzed 287 pharmaceuticals for possible inclusion on a draft list of candidates for regulation under the Safe Drinking Water Act, he said only one, nitroglycerin, was on the list. Nitroglycerin can be used as a drug for heart problems, but the key reason it's being considered is its widespread use in making explosives.

So much is unknown. Many independent scientists are skeptical that trace concentrations will ultimately prove to be harmful to humans. Confidence about human safety is based largely on studies that poison lab animals with much higher amounts.

There's growing concern in the scientific community, meanwhile, that certain drugs — or combinations of drugs — may harm humans over decades because water, unlike most specific foods, is consumed in sizable amounts every day.

Our bodies may shrug off a relatively big one-time dose, yet suffer from a smaller amount delivered continuously over a half century, perhaps subtly stirring allergies or nerve damage. Pregnant women, the elderly and the very ill might be more sensitive.

Many concerns about chronic low-level exposure focus on certain drug classes: chemotherapy that can act as a powerful poison; hormones that can hamper reproduction or development; medicines for depression and epilepsy that can damage the brain or change behavior; antibiotics that can allow human germs to mutate into more dangerous forms; pain relievers and blood-pressure diuretics.

For several decades, federal environmental officials and nonprofit watchdog environmental groups have focused on regulated contaminants — pesticides, lead, PCBs — which are present in higher concentrations and clearly pose a health risk.

However, some experts say medications may pose a unique danger because, unlike most pollutants, they were crafted to act on the human body.

"These are chemicals that are designed to have very specific effects at very low concentrations. That's what pharmaceuticals do. So when they get out to the

environment, it should not be a shock to people that they have effects," says zoologist John Sumpter at Brunel University in London, who has studied trace hormones, heart medicine and other drugs.

And while drugs are tested to be safe for humans, the timeframe is usually over a matter of months, not a lifetime. Pharmaceuticals also can produce side effects and interact with other drugs at normal medical doses. That's why — aside from therapeutic doses of fluoride injected into potable water supplies — pharmaceuticals are prescribed to people who need them, not delivered to everyone in their drinking water.

"We know we are being exposed to other people's drugs through our drinking water, and that can't be good," says Dr. David Carpenter, who directs the Institute for Health and the Environment of the State University of New York at Albany.

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*<http://sfgate.com/cgi-bin/article.cgi?f=/n/a/2008/03/09/national/a091634D19.DTL>*

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