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PharmaWater II

EDITOR'S NOTE -- Second of a three-part series on drug traces in America's **drinking water** supplies -- and growing concerns about their effects. By JEFF DONN, MARTHA MENDOZA and JUSTIN PRITCHARD Associated Press Writers

LAKE MEAD, Nev. (AP) -- On this brisk, glittering morning, a flat-bottomed boat glides across the massive reservoir that provides Las Vegas its **drinking water**. An ominous rumble growls beneath the craft as its two long, electrified claws extend into the depths.

Moments later, dozens of stunned fish float to the surface.

Federal scientists scoop them up and transfer them into 50-quart Coleman ice chests for transport to a makeshift lab on the dusty lakeshore. Within the hour, the researchers will club the seven-pound common carps to death, draw their blood, snip out their gonads and pack them in aluminum foil and dry ice.

The specimens will be flown across the country to laboratories where aquatic toxicologists are studying what happens to fish that live in **water** contaminated with at least 13 different medications -- from over-the-counter pain killers to prescription antibiotics and mood stabilizers.

More often than not these days, the laboratory tests bring unwelcome results.

A five-month Associated Press investigation has determined that trace amounts of many of the **pharmaceuticals** we take to stay healthy are seeping into **drinking water** supplies, and a growing body of research indicates that this could harm humans.

But people aren't the only ones who consume that **water**. There is more and more evidence that some animals that live in or drink from streams and lakes are seriously affected.

Pharmaceuticals in the **water** are being blamed for severe reproductive problems in many types of fish: The endangered razorback sucker and male fathead minnow have been found with lower sperm counts and damaged sperm; some walleyes and male carp have become what are called feminized fish, producing egg yolk proteins typically made only by females.

Meanwhile, female fish have developed male genital organs. Also, there are skewed sex ratios in some aquatic populations, and sexually abnormal bass that produce cells for both sperm and eggs.

There are problems with other wildlife as well: kidney failure in vultures, impaired reproduction in mussels, inhibited growth in algae.

"We have no reason to think that this is a unique situation," says Erik Orsak, an environmental contaminants specialist with the U.S. Fish and Wildlife Service, pulling off rubber gloves splattered with fish blood at Lake Mead. "We find pretty much anywhere we look, these compounds are ubiquitous."

For example:

--In a broad study still under way, fish collected in waterways near or in Chicago; West Chester, Pa.; Orlando; Dallas; and Phoenix have tested positive for an array of **pharmaceuticals** -- analgesics, antibiotics, antidepressants, antihistamines, anti-hypertension drugs and anti-seizure medications.

--That research follows a 2003 study in northern Texas, where every bluegill, black crappie and channel catfish researchers caught living downstream of a wastewater treatment plant tested positive for the active ingredients in two widely used antidepressants -- one of the first times the residues of such drugs were detected in wildlife.

--In several recent studies of soil fertilized with livestock manure or with the sludge product from wastewater treatment

plants, American scientists found earthworms had accumulated those same compounds, while vegetables -- including corn, lettuce and potatoes -- had absorbed antibiotics. "These results raise potential human health concerns," wrote researchers.

--Blood and liver samples of bull sharks in Florida's Caloosahatchee River, a nursery area for juvenile bullsharks and home to six wastewater treatment plants, are being tested for the presence of an array of medications this winter. Of the first ten sharks sampled, nine tested positive for the active ingredient in an antidepressant.

--And in Colorado's Boulder Creek, 50 of the 60 white suckers collected downstream of Boulder's wastewater treatment plant were female, compared to about half of them upstream.

Elsewhere in the world -- from the icy streams of England to the wild game reserves of South Africa -- snails, fish, even antelope, are showing signs of possible **pharmaceutical** contamination. For example, fish and prawn in China exposed to treated wastewater had shortened life spans, Pacific oysters off the coast of Singapore had inhibited growth, and in Norway, Atlantic salmon exposed to levels of estrogen similar to those found in the North Sea had severe reproductive problems.

More than 100 different **pharmaceuticals** have been detected in surface **waters** throughout the world.

"It's inescapable," said Sudeep Chandra, an assistant professor at University of Nevada, Reno who studies inland **waters** and aquatic life. "There's enough global information now to confirm these contaminants are affecting organisms and wildlife."

While some researchers have captured wildlife and tested it for **pharmaceuticals**, many more have brought wildlife into their laboratories and exposed them to traces of human **pharmaceuticals** at levels similar to those found in **water**, aquatic plants and animals.

The results have been troubling.

Freshwater mussels exposed to tiny amounts of an antidepressant's active ingredient released premature larvae, giving the next generation lower odds of survival; in a separate lab study, the antidepressant also stunted reproduction in tiny fresh **water** mud snails.

When researchers slid hydras -- a tiny polyp that under a microscope looks like a slender jellyfish -- into **water** tainted with minute amounts of **pharmaceuticals**, their mouths, feet and tentacles stopped growing. While the hydras are minuscule, the implications are grave: Chronic exposure to trace levels of commonly found **pharmaceuticals** can damage a species at the foundation of a food pyramid.

Tiny zooplankton, another sentinel species, died off in the lab when they were exposed to extremely small amounts of a common drug used to treat humans suffering from internal worms and other digesting parasites.

In a landmark, seven-year study published last year, researchers turned an entire pristine Canadian lake into their laboratory, deliberately dripping the active ingredient in birth control pills into the **water** in amounts similar to those found to have contaminated aquatic life, plants and **water** in nature.

After just seven weeks, male fathead minnows began producing yolk proteins, their gonads shrank, and their behavior was feminized -- they fought less, floating passively. They also stopped reproducing, resulting in "ultimately, a near extinction of this species from the lake," said the scientists.

While the Canadian study was prompted by human intervention, similar die-offs have occurred in the wild.

In Pakistan, the entire population of a common vulture virtually disappeared after the birds began eating carcasses of cows that had been treated with an anti-inflammatory drug. Scientists, in a 2004 study, said they eventually determined that the birds' kidneys were failing.

"The death of those vultures -- the fact that you could get a complete collapse of a population due to **pharmaceuticals** in the environment -- that was a powerful thing," said Christian Daughton, an EPA researcher in Las Vegas. "It was a major ecological catastrophe."

In November, at the annual Society of Environmental Toxicology and Chemistry meeting in Milwaukee, 30 new studies

related to **pharmaceuticals** in the environment were presented -- hormones found in the Chicago River; abnormalities in Japanese zebra fish; ibuprofen, gemfibrozil, triclosan and naproxen in the lower Great Lakes.

Many of those studies refer to the heralded research at Lake Mead. There, on a recent morning, Steven Goodbred struggled to hold a large wriggling carp with both hands. On the outside, the carp looked fine, vibrant and strong, but the U.S. Geological Survey scientist assumed the worst.

"Typically we see low levels of sex steroids, limited testicular function, low sperm count, that kind of thing," he said slipping the fish into a holding tank and closing the lid. "We'll have to wait and see about this fellow."

These carp live, eat, reproduce and die at the mouth of what amounts to a 30-mile-long drainage system that starts within the toilets and sinks of the casinos, hotels and homes of Sin City.

Some 180 million gallons of effluent are discharged into the channel each day from three wastewater treatment plants. The daily sewage discharge is expected to increase to 400 million gallons a day by 2050.

The USGS and U.S Fish and Wildlife Service tracked the channel from its origins, before the inflow from the sewage plants, to where it empties into Las Vegas Bay in the lake. Their findings: The amount of endocrine-disrupting compounds (including hormone treatments and other chemicals affecting reproduction) increased more than 646 times.

Not far from the mouth of the drainage channel -- amid the fishing boats and sightseeing tours -- **water** is sucked into a long pipe, destined for a **drinking water** treatment plant, then Las Vegas -- thus beginning the cycle all over again.

Other communities in Nevada, as well as locales in California and Arizona, also draw on Lake Mead.

"Lake Mead is a fortuitous worst-case scenario" for study, said environmental toxicologist Greg Moller, holding a bottle of Lake Mead **water** he planned to take back to his lab at the University of Idaho. "You've got the wastewater, you've got the documented impact on wildlife, and you have **drinking water** uptake."

Although more than eight million tourists, including 500,000 anglers, visit the reservoir annually, there are no warnings about the contaminants. No signs. No advisories.

That's not unusual. Scientists have been finding **pharmaceuticals** in hundreds of other public waterways across the nation and throughout the world -- almost always without public fanfare, as documented in the AP investigation.

At the same time, scientists are looking for remedies. In Las Vegas, just off the Strip at the Desert Research Institute, microbial biologist Duane Moser optimistically held a tray of increasingly murky test tubes.

"We put a little bit of estrogen in here, and then we added a particular bacteria, and guess what? The bacteria are consuming the estrogen," he said. Someday, perhaps, scientists will be able to use these special bacteria to clean estrogen out of contaminated **water**.

"It's early, but it's promising," he said.

National Writer Martha Mendoza reported from Lake Mead, while writers Jeff Donn, based in Boston, and Justin Pritchard, based in Los Angeles, also contributed. The AP National Investigative Team can be reached at investigateap.org

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