



U.S.A.

Population: 300 million

Problem: Emerging contaminants

Up to his knees: Schoenfuss captures fish for study in the Grindstone River near Hinckley, Minn., looking for chemicals that mimic hormones



but very few answers," says environmental chemist Christian Daughton at the Environmental Protection Agency.

Scientists aren't worried about any one of these chemicals in isolation. Most are found in minute doses, if they're found at all. Toxicologist Amy Perbeck at the Michigan Department of Environmental Quality calculated that the levels of ibuprofen in Michigan drinking water were so low that a person would have to consume 17,000 gallons to get the amount in one pill. But new technology is allowing scientists to screen for mere traces of compounds, down to levels that were previously undetectable—and they find just about everything they look for. A 2002 study by the U.S. Geological Survey detected such compounds in 80 percent of the 139 streams it examined, many of which were downstream from urban areas. None of the chemicals on its own appears to be toxic at minuscule doses. "But what happens when a person is exposed to a whole cocktail of them?" asks Perbeck.

The emerging compounds of greatest concern to most scientists are the "endocrine disrupters." These are chemicals in the environment that mimic hormones when they get into the body. An astonishing array of chemicals fall into this category—not only natural and synthetic hormones, but also chemicals in certain cosmetics, shampoos, shaving lotions, skin creams, dishwashing liquids, pesticides, flame retardants, plastics and antibacterial soaps. Like actual hormones, "they have effects at exceedingly low levels," says Herb Buxton, coordinator of the Toxic Substances Hydrology Program at the USGS. Because so many of them bind to a certain type of receptor in the body—whether for estrogens, androgens or thyroid hormones—the effects add up.

Judging by fish populations, the result isn't good. Scientists have found "feminized" male fish in the Mississippi, Ohio, Allegheny, Monongahela, Shenandoah and Potomac rivers. Unlike the abnormal Boulder Creek fish, which had both ovaries and testes, most of these fish are clearly males. But their testes contain

RIVERS OF DOUBT

Minute quantities of everyday contaminants in our drinking supply could add up to big trouble.

BY ANNE UNDERWOOD

THE COMMON WHITE SUCKER is nobody's favorite fish. It's a bottom feeder that trout fishermen in Colorado happily toss back into the water. But it's also what scientists call a sentinel—a species whose health (or lack thereof) can warn us about problems in the environment. So imagine the reaction of environmental endocrinologist David O. Norris of the University of Colorado when he discovered some alarming changes in the sucker population of Boulder Creek. Upstream, where the water flows pure and clear out of the Rocky Mountains, the ratio of males to females is 50-50, just as nature intended. Downstream, below the wastewater-treatment plant in Boulder, the females outnumber the males by 5 to 1. Even more worrisome, Norris found that about 10 percent of the fish were neither clearly male nor female, but

had sexual characteristics of both. "On the one hand, we were excited [to make such a dramatic finding]," says Norris. "At the same time, we were appalled."

There's something fishy in the nation's water supply. True, its quality has improved dramatically since passage of the Clean Water Act in the 1970s. Toxic substances and pollutants are now routinely filtered out. But across the nation, something's causing disturbing effects on aquatic wildlife. In a search for culprits, scientists are zeroing in on a group of compounds they call "emerging contaminants," including pharmaceuticals, cosmetics and antibacterial soaps. Although we like to think that these compounds disappear when we wash them down the drain or flush them down the toilet, a lot of them are clearly ending up in water. Could they possibly affect human health? At this point, no one knows for sure. "We have lots of questions,

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PROJECT
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CHEMICALS FROM PESTICIDES, COSMETICS, PLASTICS, SKIN CREAM AND SOAP COULD BE HARMING FISH.

some ovarian tissue that produces immature eggs, and their livers are producing egg-yolk proteins. In lab studies, scientists have also shown that male fish exposed to estrogenic compounds during early development have lower sperm counts and worrisome behavioral changes. In one experiment, Heiko Schoenfuss, head of the aquatic-toxicology lab at St. Cloud State University in Minnesota, exposed male fathead minnows early in life to estrogenic chemicals called alkylphenols (which come from some common industrial and household cleaners)—and discovered that as adults, they failed to defend their territory. The result? They were unable to reproduce successfully because they allowed other males to invade their nesting areas and eat their offspring.

Put it all together, and scientists worry that endocrine disrupters could cause declines in fish populations. In a paper last week in the Proceedings of the National Academy of Sciences, a team of Canadian and American scientists reported the collapse of the fathead-minnow population in a Canadian test lake after low levels of a potent synthetic estrogen were intentionally introduced. In the first year, researchers saw the same kind of feminization of male fish observed in the United States. The next year, says lead author Karen Kidd of the University of New Brunswick, they documented the "near extinction of this species from the lake."

People, thankfully, are less vulnerable than fish, because we don't live and breathe in water. To date, there is no conclusive evidence linking emerging contaminants to human health problems. But scientists wonder if endocrine disrupters in the water are partially responsible for some well-documented trends, including earlier puberty in girls and reduced sperm counts in men. In fish, sperm problems have been linked to waterborne contaminants, including phthalates, which are used in many plastics, cosmetics, skin-care products and pesticides. Reproductive epidemiologist Russ Hauser at Harvard has found an association in men between certain

phthalates in their urine and low sperm counts—although he notes that there are multiple routes of exposure in people, including direct absorption through the skin from after-shaves and colognes. Water is only one of many sources. As Devra Lee Davis, director of the University of Pittsburgh's Center for Environmental Oncology, sees it, humans are exposed to so many things over a lifetime that it's hard to prove connections—but problems in wildlife should be a warning. "We have to stop treating people like lab rats in an uncontrolled experiment and start figuring out ways to reduce our exposures," she says.

So how can we keep these chemicals out of the water supply? No one is suggesting that we give up medicines or mascara. There are, however, a few common-sense



measures we could take. Look for phthalate-free deodorants and body lotions. The Environmental Working Group has a list on its Web site. Stop using antibacterial soaps. Numerous studies have found that washing with regular soap is just as effective. And learn how to dispose of drugs properly. Most shouldn't be flushed. Some municipalities will even dispose of them along with hazardous waste.

If you're truly worried about drinking water, the answer isn't bottled water, which in many cases is just bottled tap water—and requires large amounts of energy to transport. Consumer devices for removing contaminants include charcoal filters, tabletop water distillers and purification units that use reverse osmosis. They can all take out a wide variety of chemicals. The fish should be so lucky. ■