MERCOLA
Take Control of Your Health

Drugged Up Fish Supply

Analysis by Dr. Joseph Mercola | August 10, 2024

STORY AT-A-GLANCE

- Exposure to antianxiety medication causes behavioral changes in salmon
- Young salmon exposed to the drugs migrated nearly twice as fast as non-exposed salmon, which could be detrimental for their survival
- The salmon were given a low dose of the antianxiety drug oxazepam, similar to concentrations that have been found in effluent water

Editor's Note: This article is a reprint. It was originally published January 10, 2017.

According to compiled surveys from National Center for Health Statistics, 48.6% of Americans have used at least one prescription drug in the past 30 days. Nearly 24% used three or more during that timeframe and more than 12.8% used five or more.[1]

There are individual health repercussions of taking so many drugs, especially when unnecessary or inappropriately prescribed, but another often-overlooked consequence is turning up in the world's waterways in the form of pharmaceutical pollution.

When you take a medication, only a fraction of it is metabolized by your body. The rest gets excreted in your urine or feces where it enters wastewater (and most water treatment plants are not equipped to remove drugs from the water supply).

Medications applied topically (in the form of a cream or lotion) are also problematic when the unabsorbed portion gets washed down the drain. There's also the issue of

unused medications, which may be flushed down the toilet or drain (by individuals and also by health care facilities, like nursing homes).

Even the manufacture of pharmaceuticals may lead to higher drug contamination levels downstream from the factories (up to 1,000 times higher at some factories, according to the Harvard Health Letter).[2]

Once in waterways, these unnatural chemicals pose not only a risk to humans' drinking water supplies but also cause harm to marine life, in surprising and disturbing ways.

Antianxiety Meds Cause Young Salmon to Lose Their Inhibition

You may be surprised to learn that salmon get stressed, but if you think about it, it makes perfect sense. A juvenile salmon must leave its freshwater nest and venture out into the sea — a necessary migration, but one that can be deadly if taken too soon or without proper caution.

Stress in salmon is likely an adaptive response that helps them to minimize unnecessary risk-taking and maintain alertness, according to Gustav Hellström, a salmon biologist formerly at Umeå University in Sweden.[3]

When exposed to **antianxiety medications**, however, it changes their behavior, causing them to migrate nearly twice as fast as non-exposed salmon, according to research by Hellström and colleagues.[4]

The salmon were given a low dose of the antianxiety drug oxazepam (the most prescribed antianxiety drug in Sweden[5]), similar to concentrations that have been found in effluent water. According to the study:[6]

> *"Exposure to oxazepam is known to reduce anxiety in fish … resulting in increased risk-taking … Hence, the intensified migration seen in our study could be explained by a reduction in anxiety that otherwise would constrain the intensity of risky activities such as migration.*

> *Downstream migration behavior is crucial in the life cycle of salmon, and the timing and intensity of the migration is adaptive as it impacts survival and fitness of the fish … Any disruption in salmon migration behavior can have unforeseen and severe ecological consequences."*

Meanwhile, the use of antianxiety medications is on the rise globally, with some estimates suggesting the level of oxazepam in water near urban areas could more than double in the coming decades.[7]

Research has also shown that oxazepam persists in its therapeutic form for several decades after it's deposited into freshwater lakes, and levels build up in lakes due to past inputs and growing usage, the consequences of which are completely unknown.[8]

Psychiatric Drugs Alter Behavior of Wild European Perch

Research from around the world is showing the repercussions of pharmaceutical pollution, even in diluted concentrations. In one study on European perch, diluted concentrations of oxazepam in the water were found to alter fish behavior, leading to increased activity, reduced sociality and higher feeding rates.[9]

The fish stopped shoaling, which is a type of fish behavior used to keep schools of fish together and avoid predators. The fish also took more risks, venturing out to explore more often on their own.

Concerning concentrations of oxazepam have previously been detected in the River Fyris, which flows through Uppsala, Sweden. "In perch taken from the River Fyris, the team found concentrations of oxazepam up to six times higher in their muscle tissue than in the water," Science magazine reported.[10]

Further, the researchers noted that because oxazepam binds to GABA receptors, a cellular signaling mechanism found in many species, similar effects would likely be seen in other fish exposed to the drug.[11]

Antidepressants and Diabetes Drugs Detected in Puget Sound Fish

Puget Sound, which is located along the northwestern coast of Washington, is yet another body of water being inundated with contaminants from wastewater plant effluent.

A study by the National Oceanic and Atmospheric Administration (NOAA) Fisheries' Northwest Fisheries Science Center detected 81 chemical compounds in the water, including the **antidepressant Prozac** and the diabetes medication metformin.[12,13]

The researchers then examined fish native to the Sound (juvenile Chinook salmon and Pacific staghorn sculpin) and detected 42 of the chemical compounds in their tissue, some at levels high enough to affect growth, reproduction and/or behavior.

It's unknown whether consuming fish contaminated with these drugs poses risks to humans and, as lead study author James Meador, Ph.D., a NOAA Fisheries research scientist, noted, there may be additional risks because fish are exposed to complex chemical cocktails:[14]

> *"There's also the problem of not knowing how these chemicals act in fish when they are found together as a mixture … Mixtures such as these may result in responses that occur at lower concentrations than single compounds alone."*

Separate research has also linked exposure to the drug metformin to the occurrence of intersex fish, where male fish show evidence of feminization.[15]

While hormone-mimicking drugs such as birth control pills were previously blamed for intersex fish detected in Pennsylvania's Susquehanna, Delaware and Ohio river basins,[16] metformin is not a hormone-mimicking drug.

Researchers believe it may, however, be a "nontraditional endocrine-disrupting chemical," and it's believed to be one of the most common pharmaceuticals in wastewater (not only because it's so commonly used but also because it is not metabolized by the human body, and gets extracted unchanged).[17]

Prozac Leads to Mellower Fighting Fish

Antidepressants are another group of drugs all-too-commonly found in water supplies. Researchers from the University of New England in Maine tested one antidepressant, Prozac, on fighting fish using two concentrations (one similar to what's been found in waterways and one higher).[18]

After being exposed to the drug, the fish became less bold. They were less likely to explore their environment, stayed in one place more and were more hesitant to approach other fish. They also displayed more erratic behaviors, and the behavioral effects only increased with the dose of the drug.

Prozac exposure caused behavioral changes after a day and a week of exposure. Even after the fish were allowed to swim in clean water for one week, those exposed to Prozac still had lingering behavioral effects. Such changes, should they occur in the wild, could affect the fishes' odds of survival significantly.

How Many Drugs Are in Your Fish Dinner?

A report by U.K.-based environmental charity CHEM Trust further highlighted the issues of pharmaceutical pollution contaminating marine life.[19]

They noted that 613 pharmaceuticals have been found in the environment globally, but this is likely a vast underestimate, since analytical detection methods aren't available for most medications in use.

Still, rivers throughout the world have been found to be contaminated with pharmaceutical pollution. In addition, the report found:[20]

- 23 pharmaceuticals, including antidepressants, sedatives, antibiotics, painkillers and anticancer drugs, were detected in perch fish in Sweden
- Ethinylestradiol from birth control pills has been detected in Baltic Sea salmon

- Several medications have been shown to harm animals at levels found in the environment, but there is little monitoring of wildlife for such effects

Report author Gwynne Lyons, director of policy at CHEM Trust, said:[21]

> *"Most people would probably be surprised that in general they excrete between 30% to 90% of any medicine they take. With so many medicines now being found in our rivers, action on all fronts is needed to protect wildlife and drinking water.*
>
> *The long-term implications of many highly active medicines in our environment may come back to haunt us. The current situation is mind-boggling with fish contaminated with the birth control pill, antidepressants (such as Prozac), sedatives, antibiotics, painkillers, anticancer drugs and goodness knows what else."*

Reducing Your Pharmaceutical Footprint

One of the most foundational ways to reduce pharmaceutical pollution on an individual level is to use medications only when absolutely necessary. Taking control of your health can go a long way in this regard. When you do take medications, do not flush unused drugs down your toilet or pour them down the drain.

Instead, many areas offer drug take-back programs that allow you to dispose of medications at designated spots in your community (sometimes a local law enforcement agency or pharmacy). If such a program is not available in your area, you can dispose of medication in your trash.

It's recommended that you remove pills from packaging, crush them and seal them in a plastic bag with some water and sawdust, cat litter or coffee grounds (this is to discourage any animals or a child from consuming the contents).[22]

On a larger scale, environmental groups have called upon drug companies to manufacture "eco-friendly" drugs that are easily broken down in the environment once

excreted. Stopping the unnecessary use of pharmaceuticals in food animals is also an urgent issue.

Which Fish Are Safe to Eat?

It's unknown how consuming seafood contaminated with pharmaceuticals affects human health, but it's always wise to seek out food sources that are pure and not contaminated. Unfortunately, most seafood no longer falls into this category.

Among the safest in terms of contamination, and the highest in healthy omega-3 fat, is wild-caught Alaskan and sockeye salmon. Neither are allowed to be farmed so they are therefore always wild-caught. The risk of sockeye accumulating high amounts of toxins is reduced because of its short life cycle, which is only about three years.

Additionally, bioaccumulation of toxins is reduced by the fact that it doesn't feed on other, already contaminated, fish. The two designations you want to look for on the label are "Alaskan salmon" (or wild Alaskan salmon) and "Sockeye salmon."

Canned salmon labeled "Alaskan salmon" is also a good choice and offers a less expensive alternative to salmon fillets. A general guideline is that the closer to the bottom of the food chain the fish is, the less contamination it will have accumulated, so other safer choices include smaller fish like sardines, anchovies and herring.

No matter what type of fish you're considering, look for varieties that have received the Marine Stewardship Council (MSC) certification. This certification assures that every component of the manufacturing process — from how the raw materials are harvested to how the product is manufactured — has been scrutinized by MSC and has been independently audited to ensure it meets sustainable standards.

Lastly, a word of caution before adding wild-caught fish to your diet — be sure to moderate your consumption. While it may seem tempting to consume lots of fatty fish to boost your omega-3 intake, it's actually a recipe for disaster, as omega-3s are also polyunsaturated fatty acids (PUFAs). When consumed in excess quantities, PUFAs can

cause metabolic damage when it breaks down to advanced lipoxidation end products (ALEs).

Sources and References

- RT February 25, 2016
- Discover March 23, 2016 (Archived)
- [1] U.S. CDC, Therapeutic Drug Use
- [2, 22] Harvard Medical School, Harvard Health Letter
- [3, 7] Hakai Magazine December 29, 2016
- [4, 6] Nature Communications December 6, 2016
- [5, 8] Environ. Sci. Technol., 2015, 49 (17), pp 10406-10412
- [9] Science. 2013 Feb 15;339(6121):814-5
- [10, 11] Science February 14, 2013
- [12, 14] NOAA Fisheries, Northwest Fisheries Science Center
- [13] Environmental Pollution June 2016
- [15] Chemosphere September 2015
- [16, 17] Scientific American, April 28, 2015
- [18] The Journal of Experimental Biology March 2016
- [19, 21] CHEM Trust December 2014 (Archived)
- [20] CHEM Trust December 7, 2014 (Archived)