Mercury Rising explores the growing debate over mercury contamination in fish and its effects on human health worldwide.

Dried, fried, baked, stewed, smoked, boiled, or raw - fish is delish. And it’s one of the most nutritious foods we can eat. But in the last half century, mercury contamination in this vital protein source has been rising steadily, putting the health of those who consume it at risk.

It’s a contentious issue for regulators; mercury poisoning in humans can have devastating effects. Children exposed in the womb may suffer developmental delays, muscle tone and reflex problems, or even a syndrome resembling cerebral palsy. Adults can experience tremors, a lack of coordination, or deafness and vision problems. The most extreme cases lead to death.

But fish is the prime source of protein for many rural and aboriginal populations. These people face a difficult choice: take the risk and keep eating fish that are known to be contaminated with mercury; or cut fish out of their diets and lose their traditional (and sometimes sole) source of protein?

By examining three diverse populations, Mercury Rising reveals how mercury contamination is affecting fish-eating communities. And it explores the nutritional and environmental dilemmas this toxin promises for the future.

In 1956, over 100 Japanese residents in the town of Minamata died horribly when two decades worth of mercury-laden industrial waste contaminated fish in the bay where they lived. Thousands of other victims survived, but were left blind, lame, or suffering neurological damage. More than twenty years later, the Cree of Northern Quebec were exposed to soaring mercury contamination in their fish sources, after Hydro Quebec flooded the area to create reservoirs for the La Grande generating stations. Thirty eight per cent of the population studied sustained mild to severe mercury poisoning**(in excess of tolerable limits). Today, rural gold miners in Venezuela are unwittingly poisoning their own fish supply and themselves, by discharging huge amounts of mercury into local water sources from illegal gold panning operations.

Mercury levels in humans are tough to measure; the actual effects of mercury poisoning are even more elusive. To be ultra-safe, government agencies in North America are responding to rising mercury levels in lakes and reservoirs by warning people off “contaminated” fish. But this action has had major repercussions; for the Cree of Northern Quebec, the loss of fish from their diet has contributed directly to epidemics of diabetes and obesity among the population.

Now, many doctors and scientists are calling for a balance to be struck. A 1998 article in the Journal of the Canadian Medical Association claims that Health Canada’s new standards for mercury consumption are so over-cautious that most people in Canada already have higher levels of mercury in their bodies than is “tolerable”. Even a typical can of tuna often contains more mercury than what authorities consider to be “safe”.

So, what is the true risk of continuing to consume mercury-contaminated fish? How can we deal with mercury that’s already in our ecosystems? And what tricks do we have up our sleeves to cope with aquatic mercury pollution in the future? One of the biggest problems with mercury is that it’s very persistent; what’s in the environment now isn’t going to go away anytime soon. In fact, the situation is getting worse, as hydro developments and mining activities continue to release mercury into lakes, rivers and seas around the world.

We need to learn how to live with the mercury in our waterways and in our bodies today, to have a healthier tomorrow.

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SOME BACKGROUND ON MERCURY

Where It Comes From
Mercury is a metal found naturally throughout the environment in rocks, soils, sediments, air and water. But anthropogenic activities like mining, burning coal, or flooding land for hydroelectric projects release unaturally large quantities of mercury into the air and water. In water, this mercury bonds with methane molecules to form methyl mercury, which is taken up by bacteria. During flooding, this methylation process is enhanced by the decay of organic material (such as plants and trees covered by the water), which produces increased amounts of methane.

In its pure state, inorganic / elemental mercury is not a problem for humans; like fish and animals, our bodies can’t absorb it readily. But organic, methyl mercury in bacteria is bio-available; animals and insects in the water can absorb it into their tissues. As these smaller creatures are eaten by increasingly larger fish, the methyl mercury bio-accumulates up the food chain, until it’s magnified at the top – in large fish. When we consume these fish, the methyl mercury then starts to accumulate in our bodies.

Mercury vapour is also an issue for human health; in our lungs, mercury is converted into a form of organic mercury that penetrates our bloodstream.

Effects of Mercury Poisoning
A person with methyl mercury poisoning, or “Minamata disease” has five classical symptoms. The first two are strongly indicative of the beginning of the illness.

1. Visual constriction
2. Numbness of the extremities
3. Impairment of hearing
4. Impairment of speech
5. Impairment of gait

Methyl mercury can penetrate into the placental barrier, transferring mercury to the fetus. It has been observed that, when a female's intake of the poison is large and she becomes ill, sterility occurs. When the dosage is smaller, pregnancy can take place but the fetus may be aborted spontaneously or is stillborn. An even smaller dose permits conception and live birth, but the baby will have severe neurological symptoms. A dosage too small to cause noticeable neurological symptoms in the child may cause congenital mental deficiency.

In adults, short-term exposure to methyl mercury affects the kidneys. Longer-term exposure seems to affect the brain and causes neurological damage. Total mercury elimination from the body can take several years.

Health Authorities and Mercury Consumption
Mercury consumption is becoming a hot button issue with regulators, the fishing industry, consumers and the medical profession. All fish have some mercury in them. The challenge facing regulators is to find a balance of fish consumption that encourages proper nutrition while maintaining safe exposure levels.

Blood or hair samples are used to measure accumulated mercury levels in humans. The problem is that the level at which mercury begins to affect human health is still very unclear. And that uncertainty fosters fear.
In the United States, the Environmental Protection Agency is currently under pressure to lower their guidelines for safe mercury consumption to levels lower than they’ve ever been; lower, some say, than is necessary for the average person.

Health Canada has already enacted more stringent guidelines for mercury consumption. There is one “tolerable” level set for children under six, women of childbearing age and First Nations peoples; another for the rest of us. According to these new levels, most of the Cree affected by the La Grande project are still over the “tolerable” limit twenty years after the flooding; this in spite of a lack of symptoms of mercury intoxication. In fact, according to Health Canada’s new guidelines for measurable mercury levels in hair samples, most of the general population is also over the limit and thus “at risk”, theoretically.

Mercury Stories
In Alice’s Adventures in Wonderland, Lewis Carroll first popularized the effects of mercury poisoning with his fictional character, the Mad Hatter. Back in the 19th century, workers in the felt-hat industry dipped furs into vats of mercury nitrate solution to make them pliable for shaping. In the process, they absorbed the compound through their skin and inhaled mercury vapours. The results were tremors, loss of teeth, difficulty in walking and mental disabilities.

In the 20th century, mercury hit the news when Japanese families starting dying in Minamata. From 1932 to 1968, Chisso Corporation, a company located in Kumamoto, Japan dumped an estimated 27 tons of mercury compounds into Minamata Bay. Methyl mercury contaminated the fish, which was the main source of protein in the local diet. People ate the contaminated fish and eventually became poisoned. A few survivors still live in Japan today and compensation claims are on-going.

Two decades later, around the world, mercury contamination hit the traditional fishing grounds of the Cree peoples in Northern Quebec. Decomposition of organic matter in the reservoirs created for the La Grande hydroelectric project produced large quantities of methyl mercury. This bio-accumulated in reservoir fish tissue to levels often exceeding the Canadian standard for edible fish. Depending on the species and reservoir considered, the maximum mercury concentrations corresponded to values 3 to 7 times higher than those measured in natural environments. According to recent studies, these levels are taking 15 to 30 years to return to normal; again, depending on the species.

In the 1970’s, a gold rush started in Latin America that continues today. Artisanal or freelance miners living in small communities do much of the work, often mining gold by hand. In Venezuela alone, over one million individuals are involved, producing somewhere between 115 and 190 tonnes of gold. They are mostly poor people, with no other way to make a living. Like the Japanese and the Cree, their diet is reliant largely on fish. Mercury in its pure form is a key part of the mining process; it bonds with gold. Miners crush up the rock, add mercury to catch the gold, wash off the rock, then boil off the mercury. Mercury residues are then released into the water and into the air.

On average, these miners emit over 200 tonnes of mercury into the environment every year. Eventually, the mercury ends up bio-accumulating in the fish. The result is that the miners and local communities are exposed to mercury poisoning from the air and from their fish diet. Yet they remain largely ignorant to the truths about the effects of mercury on their health.

Since 1990, the United Nations Industrial Development Organization (UNIDO) has provided assistance to the artisanal mining sector, trying to promote cleaner, more efficient mining techniques. They’re also working with groups like the La Salle Foundation and scientists at the University of British Columbia to educate miners and their families about the risks of mercury poisoning and how to manage their fish consumption.
Environmental Mercury Remediation
Methyl mercury is extremely difficult to clean up or remediate; it’s very persistent. Dredging and covering up hot spots are options that are expensive and can have limited effectiveness. In some cases, it’s possible to treat contaminated waters with selenium, which binds to methyl mercury. But there’s a risk of the selenium itself becoming a lethal contaminant in the ecosystem.

Some say the best thing to do is nothing; in ten or twenty thousand years, our lakes and rivers will be gone, filled in by sediment, just as they were before the last ice age gouged them out. Others advocate sweeping waterways clean of big, old fish that contain the highest levels of mercury. If they’re removed and disposed of as toxic waste, the methyl mercury in their bodies will be eliminated from the ecosystem. Otherwise, if they’re allowed to die and decompose in the water, younger, smaller organisms will simply take up the methyl mercury from their systems and the cycle will continue indefinitely.