Series Overview

We periodically examine topics of interest to your well-being and we keep you abreast of medical developments.

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Questions & Comments

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Element Of Risk

by Natalie Salat

ILLUSTRATION: DANIEL SHELTON

It is unique--a metal that is liquid at room temperature and vaporizes easily, yet is heavier than lead. It can be practically anywhere--in the air you breathe, the fish you eat, in many commercial products and, if you have "silver" or amalgam fillings, in your mouth. It is also one of the most toxic substances known to man. "It" is mercury.

Although the metal occurs naturally in the Earth's crust, human use has nearly tripled environmental levels since the dawning of the industrial age. Once released into the environment, mercury cycles between soils, water systems and the atmosphere. As the metal does not break down, but rather accumulates in the food chain, this has implications for human and environmental health.

The substance's devastating effects came sharply into public focus in the 1960s and '70s, when several thousand Japanese became severely ill or died after eating fish and shellfish contaminated with the mercury from a nearby factory. "We need to make mercury poisoning a thing of the past," says Klaus Töpfer, executive director of the United Nations Environment Program. "There can no longer be any excuse for exposing people

Mercury and its compounds are potent neurotoxins; they impair the brain, central nervous system, kidneys, immune and cardiovascular systems, even at low levels. Long-term exposure can lead to personality changes, tremors, blurred vision, deafness and memory loss. The impact depends not only on the amount and length of exposure, but the chemical form of mercury, how it gets into a person's system, and how vulnerable the person is.

The most toxic forms that the general population is regularly exposed to are elemental mercury vapour and methylmercury (the kind that accumulates in fish). Both pose a particular risk to pregnant and lactating women as well as small children, because they can cross the placental and blood-brain barriers and harm brain development.

In the environment, too, the equivalent of one teaspoon of liquid mercury is enough to pollute a small lake and make the fish unfit for consumption by humans and animals.

Wildlife toxicologist Neil Burgess, who led a three-year Environment Canada initiative to determine the effects of mercury in the Atlantic region, explains that when coal or mercury-containing products are burned, they emit mercury vapour. Through the rain cycle, that vapour ends up in water. Bacteria in lakes and other bodies of water convert that mercury into methylmercury. This compound builds up in the food chain as it remains in the bodies of fish which are then eaten by larger fish who accumulate large amounts that can be passed on to humans.

"Mercury is not destroyed in the environment. It's a metal, so it's not going to disappear. That makes it very persistent," Burgess notes. "Once it becomes converted into methylmercury, it starts to get into animals, and the concentration goes up with every step."

The Canadian Council of Ministers of the Environment, CCME, an intergovernmental organization, has begun to put in place countrywide standards for reducing mercury pollution on a number of fronts: mercury emissions from waste incinerators and

According to Health Canada, the single largest source of exposure to mercury in the overall population is in those "silver" dental fillings so many of us have. Referred to in the dental industry as amalgam, this alloy contains around 50 per cent mercury, along with silver, copper and tin.

The CCME's Canada-Wide Standards address the placement and disposal of amalgam, which is deemed hazardous waste. But there continues to be heated debate as to what

The major dental associations in North America, The Canadian Dental Association and the American Dental Association, along with established university faculties of dentistry, maintain that amalgam fillings are indeed safe. They also point out that the alloy is effective as a restorative material because it lasts long and can withstand large amounts of stress from chewing.

However, a growing number of dentists are opting to buck 150 years of traditional dentistry and go mercury-free. Dr. Richard Smyth, a dentist in western Ontario, is one of them. He went on sabbatical in the 1980s, unhappy with the way things were going in dentistry, and took a number of courses in nutrition and toxicology. "In spite of all the propaganda that my (dental) associations had been feeding that mercury in amalgam was totally safe and totally bound (in the alloy)," he says, "I started connecting with other sources and found that indeed they were not bound, and there were amounts of mercury actually leaking out of these fillings."

Benoit Soucy, the Canadian Dental Association's director of professional services, responds, "We are well aware of the fact that 30 years ago we thought that amalgam was entirely stable. With the existence of more precise equipment, we do now know that

Boyd Haley, PhD, a leading expert on mercury toxicity says, "Eighty to 90 per cent of the mercury in your body, if you have four or five or more amalgams, comes from dental amalgams." Haley, who chairs the Department of Chemistry at the University of Kentucky, believes dental associations in North America are downplaying the issue.

"They say, it's just a little bit. Of course it's just a little bit. But just a little bit of mercury every day will cause you severe problems."

The average amalgam filling contains about half a gram of mercury. According to Health Canada, Canadians have an average of seven fillings each. Estimates vary as to how much elemental mercury vapour people take in, but the range established by the World Health Organization in 1991 is three to 17 micrograms per day (with an average of 10 micrograms) from the fillings; 2.3 micrograms from all dietary sources; and 0.3 micrograms from all other environmental sources.

Haley says chronic, low-level exposure of this magnitude is a health risk, particularly as people get older. "When we age, we reach that stage in our lives--and some of us reach it earlier than others--in which we can't excrete mercury. "Mercury is a well-known, potent neurotoxicant. Common sense would lead to the conclusion that severe neurotoxins would exacerbate all neurological disorders, including Parkinson's, multiple sclerosis, autism and Alzheimer's disease."

He points to numerous research papers recently published that show mercury's effects, including the fact that it produces the same pathological hallmarks in neuron culture as those that appear in brain samples of people with Alzheimer's.

Soucy, a prosthodontist by training, rejects Haley's claim, saying a definite link has not been established, and that many of the studies were done on animals. "Is mercury dangerous? I'm telling you yes. Should we do everything we can to minimize exposure to mercury vapour? Definitely. Is amalgam, under the known set of circumstances, a material that has acceptable side effects in the majority of the population? The answer is, all the information we have is yes to that also."

In 1996, after an extensive review, Health Canada recommended that pregnant women, children with primary teeth and those with impaired kidney function should not, where possible, have amalgam fillings placed or removed.

The government's recommendations are based on the precautionary principle, says Soucy. "What that means is, we have no facts to indicate we should do that, but common sense would suggest that's a good idea." Smyth, the Ontario dentist, questions why the government deems amalgam safe for some people but fine for others. "It doesn't make sense."

Dr. Philip Neufeld, who runs the device surveillance division of Health Canada's medical devices bureau, says there is controversy on the available research. "We know mercury is toxic and we know the largest source for most people is their tooth fillings. None of that proves that the amount of mercury they're getting from their fillings is causing them illness." He is also aware that when Health Canada was reviewing amalgam, a group of people came forward to say they experienced numerous health benefits after having fillings removed.

Haley notes that it is not possible to determine a safe level of mercury exposure, as other toxins such as lead, aluminum, formaldehyde and cadmium (from cigarettes) will worsen its effects. "The effects of combining any of these is not known, except that they would be worse than for any toxicants alone."

What's more, say Haley, Smyth and others who argue against the use of amalgam, there are no published studies to demonstrate unequivocally that these fillings are safe. They say the onus should be on dental associations to prove it.

Soucy acknowledges he cannot name any published studies. "And I can't name you any published studies that will prove drinking water is absolutely safe." He points out that any filling material has side effects, whether the replacement material is gold, porcelain or a composite. The latter is the synthetic white filling material that came on the market

in the 1970s and that is more and more being used.

Dorothy McComb, the head of restorative dentistry at the University of Toronto's faculty of dentistry, observes that composites pose their own problems, including the fact that they have a shorter lifespan than amalgam, some people could be allergic to them, and some dentists do not know how to work with the material, to make sure it bonds properly to the tooth.

She says her faculty is trying to take a balanced approach in teaching students how to place fillings, and that amalgams are superior for filling molars, where there is heavy-duty stress from chewing. "To either use exclusively amalgam or exclusively composite material is clearly wrong."

Health Canada's Neufeld notes that use of amalgam is decreasing in Canada. "If we are concerned about the exposure of the population to mercury from amalgam, it is declining, and will probably continue to decline."

Richard Smyth says he is indeed seeing increased interest in mercury-free dentistry, and that patients from as far away as Florida are coming in to have their amalgam fillings removed. Ultimately, he believes environmental concerns will precipitate the end of amalgam's use, even if dental associations continue to stand by its safety. "That's fine by me, as long as we get rid of the stuff."

Smyth advises that people who wish to have their fillings removed should visit a dentist who follows strict safety protocols, such as those approved by the International Academy of Oral Medicine and Toxicology. These measures include cutting the filling out (rather than the common practice of grinding the amalgam away), using suction to draw away vapours, providing proper ventilation and making sure the filling is disposed of safely.

And what about the environmental implications? According to the CCME's statistics, approximately 1.3 tonnes of mercury in new filling material are used each year in Canada, and dental offices generate about two tonnes a year of mercury in amalgam waste from the removal of old fillings and the placing of new ones. More than one third of the mercury load to sewage systems comes from dental practices. There is also the issue of mercury emissions from cremation; most crematoria are not equipped to stop emissions.

The Canada-Wide Standards will aim to reduce environmental releases of amalgam waste from Canadian dental offices by 95 per cent by 2005, through better waste management practices, particularly the addition of filtration systems called amalgam separator units.

It is too early to tell how successful adoption of the standards will be, says Peggy Hallward, co-chair of the CCME's mercury standards committee. "This is a new, young process. Provinces are only now implementing them and we'll have to wait a few years to see if they're achieved."

The greatest source of mercury emissions to the air, and the one for which there is currently no nationwide standard, is coal-fired power plants. Dan McDermott, director of the OntAIRio clean air campaign, observes, "Coal-fired generators are just about the

McDermott says the electricity sector in Canada has done a masterful job of stalling the process to develop a standard. "They argue that they want regulatory certainty on the one hand, and that there should be a multi-pollutant approach. Then they turn around and say, 'We're not ready there with mercury. The technologies are imperfect, they're expensive.'"

John Earl of Ontario Power Generation, one of the largest energy producers in North America, says the company is working on reducing mercury emissions, particularly by

adding to its nuclear and hydro facilities. At the moment, 35 per cent of the electricity supplied by OPG comes from coal-fired power plants.

He lists three challenges in developing a nationwide standard: "Historically, the analytical methods for mercury measurement have been of limited accuracy. Secondly, there is no economically viable commercial technology for removing trace amounts of mercury from coal-fired generating plants. Finally, the risks to public health attributed to fossil plant emissions have never been properly studied and quantified." The company is working in partnership with a number of organizations, including the United States Department of Energy and other utilities, to develop a mercury control technology.

In the meantime, everyone can take steps to reduce their own and others' exposure to mercury, says Lorrie Hayes of Environment Canada. "Look at what you're purchasing and, whenever possible, purchase alternatives." For instance, digital thermometers and thermostats are readily available alternatives to the older-style versions. "Use less energy around your home--not only does it benefit the environment for other reasons, but (to reduce) mercury emissions from coal."

She adds it is important to consider what products you have when you're disposing of them; municipalities and the ministry have programs to take back items such as thermometers to prevent more mercury from getting into the environment. The ministry's Web site has a detailed list of mercury-containing products, which include fluorescent lamps, electrical switches, old latex and oil-based paints, measurement instruments and skin-lightening creams. The Web address is: www.ec.gc.ca/mercury/home.html.

People should also be aware of how much fish they are eating, as certain types, particularly tuna, swordfish and shark are more likely to contain larger amounts of

consumption of these varieties to no more than one meal a week, while pregnant women, women of childbearing age and young children should limit consumption to no more than one meal per month. At the same time, says Hayes, "We wouldn't want to

And, of course, people have the option of using other materials besides amalgam to fill their teeth. Dan McDermott observes, "The less mercury we have circulating in our environment to be taken into the bodies of living things, the better off we'll be."

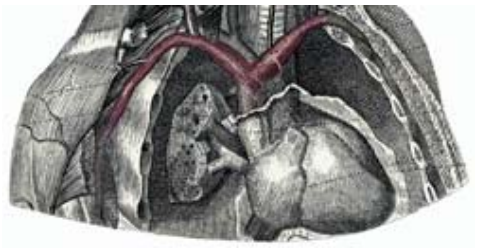
Health File

by Natalie Salat

Warfarin The Clot-Buster

People prone to dangerous blood clots can substantially reduce the risk of recurring deep vein thrombosis (DVT) or pulmonary embolism by taking a low dose of the inexpensive drug warfarin over the long term. Researchers at the U.S. National Institutes of Health recently identified this new use for the anticoagulant, which has been around for decades. Until now, patients have received full-intensity warfarin for at least six months after identification of a clot, but therapy is usually discontinued

as full dosage then carries a risk of major bleeding.



In the first trial to compare long-term, low-dose warfarin against a placebo, patients on the anticoagulant benefited so much that the National Institutes of Health stopped the study well before its scheduled 2005 conclusion. The results of the Prevention of Venous

Journal of Medicine.

Researchers found that warfarin in small amounts over several years reduced the risk of recurring blood clots by 64 per cent compared to the placebo. Further, there was no evidence of risks such as major hemorrhaging or other potential side effects of warfarin.

All 508 participants--from the U.S., Canada and Switzerland--had a history of deep vein thrombosis or pulmonary embolism, and had gone through at least three uninterrupted months of treatment with full-dose warfarin. In DVT, a blood clot develops in the legs and may completely or partially block blood flow through the vein. Left untreated, DVT may lead to pulmonary embolism, where the clots move up to the lungs and can fatally block the pulmonary artery. Risk factors for DVT include extended periods of inactivity

Dr. Paul Ridker, one of the principal investigators of PREVENT, says the findings in favour of low-dose warfarin are likely to revolutionize treatment of blood- clotting disorders.

Yogurt Does A Body Good

Trying to win the battle of the bulge? Look no further than the dairy aisle. A recent study suggests that yogurt may help the body burn fat, making it easier to drop unwanted pounds while keeping muscle.

Michael Zemel, a professor of nutrition at the University of Tennessee, found that people who included yogurt as part of a reduced-calorie weight-loss plan shed considerably more weight--and fat--than those who just reduced calories.

Zemel and colleagues at the university studied the effect of adding yogurt to a 12-week reduced-calorie regime. Thirty-four healthy obese adults were randomly put into one of two groups. The first group consumed 1,100 milligrams of calcium per day, including three servings of light yogurt. The second group took in only 500 milligrams of calcium a day, an amount typical of the American diet. All participants received an individualized diet plan that lowered their food intake by 500 calories a day.

By the end of the 12 weeks, the yogurt eaters lost 22 per cent more weight, 61 per cent more body fat, and 81 per cent more stomach fat than the other group. "Not only did yogurt help the study participants lose more weight--the average weight loss was 13 pounds--they were about twice as effective at maintaining lean muscle mass," said

management.

He added that a diet low in calcium appears to encourage production of fat-producing enzymes and decrease the activity of enzymes that break down fat. The moral? "A diet rich in low-fat dairy foods, like yogurt, can help make your weight loss easier."

A Novel Use For Crustaceans

Next time you eat shrimp or lobster, consider the shells you discard as a valuable material. A Canadian biomedical company has found a way to turn crustacean shells into a gel that may be used to effectively heal surgical incisions.

The shells of certain ocean critters contain chitin (pronounced kite-in), a starchy compound that has similar properties to plastic but is biodegradable and non-toxic. Chitogenics Ltd. of Halifax uses a patented process to grind shrimp shells into a white powder, which is then heated. After checking for impurities, the residue is turned into a gel that surgeons can apply like caulking.

The goo reduces or prevents the common post-surgical complication of adhesions, which are fibrous tissues that join normally separated surfaces. These adhesions can lead to problems such as blocking of the intestine after abdominal surgery, infertility after pelvic surgery and cardiac adhesions.

The surgical gel is being tested in clinical trials and, pending success and approval by the U.S. Food and Drug Administration, is to be launched within a year. Clive Elson, a chemistry professor at Saint Mary's University in Nova Scotia, and one of the founders of Chitogenics, has been researching chitin since the 1970s. He says the company is exploring other uses for compounds based on the material, which is abundant in the environment. "We have tested it for the delivery of drugs and for wound management products to stimulate healing. It also has some applications in opthalmics and orthopaedics."

Accessibility Issues For VIA

VIA Rail's new high-speed trains present major accessibility problems for people with disabilities, according to the Canadian Transportation Agency. The independent federal tribunal determined in late March there are 14 obstacles on board the "Renaissance"

The agency ordered the rail company to disclose technical information, including what it will cost to revamp the trains. Communications adviser Normand Bergeron says VIA had 60 days to respond to the agency's requirements.

VIA acquired the 139 rail cars from French firm Alstom in 2000 to increase its fleet by one third. The Canadian company laid out $130 million to buy the trains and put them in service. The Council for Canadians with Disabilities filed an application to the transportation agency shortly afterward, detailing 46 concerns with the Renaissance equipment's accessibility.

The CTA has identified 14 obstacles as being "undue," including a lack of necessary space in the wheelchair tie-down area and in the washroom, and the fact that there are no moveable aisle armrests on the double-seat side of the cars to help transfer a person from their wheelchair to the seat.

David Baker, a lawyer for the Council of Canadians with Disabilities, says the tribunal's decision confirms the trains are inaccessible.

VIA defends buying the cars, which it says were "a unique purchase, unavailable at any other time, and at a remarkably low cost." The company also points out that the Renaissance trains offer accessible suites in every car as well as a wheelchair tie-down in each economy class coach.

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