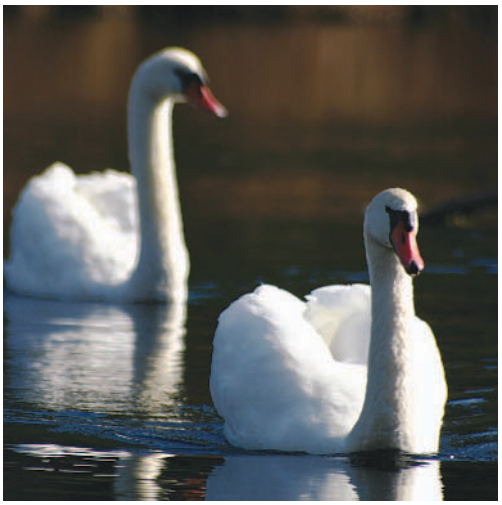
Tamiflu Swan Song?

Building Resistance to Top Avian Flu Drug

As the WHO has begun warning of the potential for an avian flu pandemic, governments worldwide have been stockpiling Tamiflu (oseltamivir phosphate). Tamiflu minimizes flu symptoms and duration by preventing the virus from escaping the cells it infects. It also reduces the likelihood of spreading the virus. Now British researchers are predicting that heavy use of Tamiflu, as during a pandemic, will expose wild waterfowl to enough of the antiviral agent to foster a resistant strain [***EHP* 115:102–106; Singer et al.**].

The risk that Tamiflu will promote a resistant virus comes from the drug's excreted metabolite, oseltamivir carboxylate (OC), which is in fact the active antiviral. Up to 80% of ingested Tamiflu is excreted as OC in urine and feces. OC withstands degradation through sewage treatment and for several weeks afterward. Birds drinking water from catchments contaminated with OC would ingest the antiviral, which would inhibit nonresistant viruses in the birds' digestive systems while enabling resistant viruses to proliferate. Birds excreting the resistant virus would spread the strain among other waterfowl at the same body of water.



Release and catch. Release of excreted Tamiflu into the environment could create drug-resistant strains of avian flu in wild waterfowl.

To estimate birds' exposure to OC, Singer and his colleagues examined data on OC's biodegradability along with measurements of wastewater discharges into 16 major catchment areas in the United States and the United Kingdom. They estimated the number of flu cases in an outbreak within each catchment. Among other suppositions, the researchers assumed that all cases were treated with a standard five-day regimen of Tamiflu.

The team calculated that the most vulnerable catchment in the United States is the Lower Colorado, where they predicted OC concentrations high enough to promote Tamiflu resistance in the virus for up to eight weeks. The most vulnerable British catchment would be the Lee catchment in northeast London. Resistant strains could proliferate within a week after pandemic starts in a region, assuming all patients start taking Tamiflu as soon as they develop symptoms. The authors also note that the range of predicted concentrations could have yet-uncharacterized ecotoxicologic effects.

Singer and colleagues call for more detailed modeling of OC water contamination, particularly in Asia, where the virus is most prevalent and human-to-wildfowl contact is more common. They also recommend studies of ways to minimize the release of OC into waterways, which could include biological and chemical pretreatment in the toilet bowl. **–Cynthia Washam**

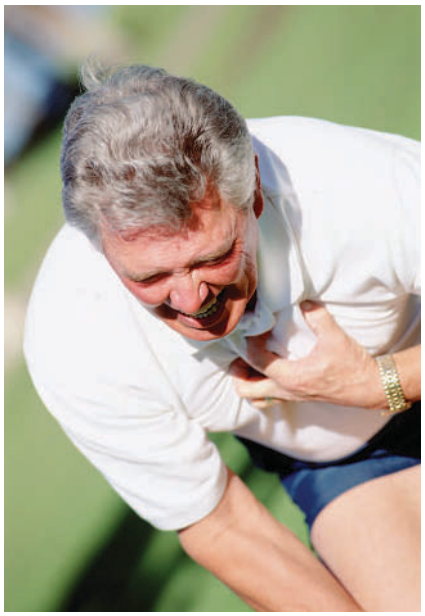
Does Closeness Make the Heart Grow Weaker?

Heart Attacks and Proximity to Local Traffic

Growing evidence links heart attacks with short-term exposures to vehicle exhaust from nearby streets. Now some of the first evidence that long-term exposures also are a culprit has been published by a team of Massachusetts researchers [***EHP* 115:53–57; Tonne et al.**]. Cardiovascular disease, of which heart attacks are one major type, is the leading killer in the United States and much of the world.

The team evaluated more than 5,000 cases of acute myocardial infarction that occurred in residents of the mid-sized city of Worcester, Massachusetts, from 1995 to 2003, to determine if there was any connection between the heart attacks and exposure to traffic. They used two measures of exposure: cumulative local traffic within 100 m of the home, and the distance of the individual's house to major roadways. They also factored in variables such as age, sex, income, education, amount of open space in the town, and nearby point sources of fine particulates.

They found that local traffic within 100 m of an individual's house was associated with a 4% increase in heart attack risk for each interquartile increase in cumulative traffic volume. The linkage wasn't as strong at 200 m and 300 m, which fits with other findings that local traffic-related pollutants tend to diminish around 100–150 m from the roadside. For major roadways (such as highways), heart attack risk increased by 5% for each kilometer closer to the road.



Hazard near home. New data link small increases in heart attack risk to living within 100 m of local traffic and major roads.

For unknown reasons, there was a link to individuals' age, with those under 65 being most vulnerable. Those aged 65 to 74 were less vulnerable, and there was no link for those aged 75 and older. There also were significant links between increasing heart attack risk and both decreasing open space and increasing poverty.

The high number of cases studied is one of the many strengths of the study. However, the authors acknowledge that a number of factors need to be better studied to more fully understand what is going on. For instance, they were unable to study individual income and education. Instead, they relied on census block group data, which reflects some homogeneity of socioeconomic conditions, but doesn't capture individual variations. Other weaknesses included a reliance on estimates instead of actual counts for local traffic volumes, and lack of personal pollution exposure data. In addition, these cases represent circumstances in just one city and one period of time. Nonetheless, the study offers some of the first evidence that long-term exposure to vehicle emissions may be an important contributor to heart attacks. **–Bob Weinhold**

Top to bottom: Chris Reuther/EHP; image100/Alamy

Ahead by a Hair

Preterm Delivery and Maternal Mercury Intake

Pregnant women often receive confusing information about whether or not they should consume fish and fish oils. Protein and unsaturated fatty acids in fish confer health benefits. Yet numerous studies have suggested that fish consumption is a major source of mercury exposure, and scientists have raised concerns that mercury levels safe for adults could pose a hazard to the developing fetus. Now a new study suggests another possible hazard associated with mercury exposure during pregnancy: preterm delivery [***EHP* 115:42–47; Xue et al.**].

Predictor of preemies? Measures of mercury in maternal hair may predict risk for preterm delivery.

The Pregnancy Outcomes and Community Health study, conducted by researchers at Michigan State University, is the first large, community-based study to examine the risk of preterm birth in relation to mercury concentrations among women with low to moderate exposure to the contaminant. This study is also the largest in the United States to correlate fish consumption and maternal hair mercury. Hair levels of total mercury reflect a longer window of contaminant exposure (for example, across the first half of pregnancy) than blood levels, which reflect recent exposure.

The researchers examined maternal hair mercury levels during mid-pregnancy (between weeks 15 and 27) in 1,024 women from 52 prenatal clinics in five Michigan communities. This state borders on four of the five Great Lakes, giving the women easy access to sport-caught fish, which can be relatively high in mercury. Each community included urban, suburban, and rural areas.

The women reported the amount and category of fish they consumed from the beginning of the current pregnancy through the time of the interview. Canned fish was the most frequently eaten fish category during the first six months of pregnancy, followed by fish bought at a store or restaurant. Only 9.2% of women reported consuming sport-caught fish during the first six months of pregnancy, and almost none ate shellfish. These women's levels of reported fish consumption would be considered moderate to low when compared to populations that subsist on fish.

The researchers took hair samples from close to the scalp to approximate exposure during the pregnancy to date, then assessed them for total mercury levels. They found that total fish consumption correlated positively with mercury levels in hair. Women who delivered before 35 weeks had three times the odds of having hair mercury levels at or above the 90th percentile (0.55–2.5 µg/g), compared with women delivering at term (37 weeks or later). Although the study sample was large, the small number of women delivering before 35 weeks (44) means more studies are needed to test this association. **–John Tibbetts**

Signs for Girls

Biomarkers of Common Exposures

Urinary biomarkers are useful measures of environmental agents in the body. However, little is known about levels of such biomarkers in children and how they may vary by race, age, body mass index, and sex. A three-city pilot study reported this month used urinary biomarkers to better characterize a number of exposures in young girls [***EHP* 115:116–121; Wolff et al.**]. The discovery of detectable urine levels of a range of hormonally active substances in the children may shed light on how various biomarkers relate to pubertal development.

The study authors measured parent compounds and metabolites of phytoestrogens, phthalates, and phenols in the urine of girls aged 6 to 9. They tested for 25 biomarkers from 22 agents including triclosan (an antimicrobial agent found in many household products), enterolactone (a micronutrient from seeds and grains), and monoethyl phthalate (a metabolite of phthalates used in shampoos, soaps, and cosmetics). The chemical classes studied were chosen because of their suspected hormonal activity and because they have been widely detected in the general population.

The 90 girls in the pilot study were recruited in New York, Cincinnati, and San Francisco, and included members of four racial/ethnic groups. The pilot study sampled a relatively small population to determine whether urinary biomarkers of the chemicals of concern would be detectable and variable enough for meaningful comparisons of their concentrations in relation to outcomes of female growth and development.

Most of the markers analyzed were found in more than 94% of the participants. Nine of them—including metabolites of isoflavones found in foods containing soy and of di(2-ethylhexyl) phthalate, a softening agent used in plastics—were found in all of the girls.

Chemicals in kids. Scientists have identified useful biomarkers of girls' exposure to chemicals including agents found in antimicrobial soaps, shampoos, and other personal products.

The team established that urinary metabolites of phenols, phthalates, and phytoestrogens in children are detectable and variable enough to make meaningful comparisons. And though the number of subjects was small, preliminary results point to variations in concentrations of some metabolites between girls of different races, as well as variation according to body mass index, and seasonal variation during the year—all factors that will be useful in dissecting the roles of the studied chemical classes in breast cancer and other diseases. **–Victoria McGovern**

Top to bottom: Millanovic/iStockPhoto; Robert Gubbins/Shutterstock