

We shape our buildings, and afterwards our buildings shape our world.

Winston Churchill

quoted in *Ethics and the Problems of the Twenty-First Century* (1979)

CHILDREN'S HEALTH

Mother's Thyroid, Baby's Health

Since the 1970s, epidemiologic studies have linked maternal thyroid insufficiency during gestation with fetal brain malformation, fetal death, and miscarriage. The fetus is wholly dependent on the maternal thyroid during the first 10–20 weeks of gestation.

U.S. women generally get enough iodine, the elemental nutrient essential for synthesis of the thyroid hormone thyroxine (T_4). But regular daily intake may not be sufficient during pregnancy due to metabolic changes in the mother-to-be, and recent studies suggest that detection and treatment may be needed long before birth. These and other topics were discussed by scientists at a January 2004 symposium cosponsored by the Centers for Disease Control and Prevention, the National Center on Birth Defects and Developmental Disabilities, and the American Thyroid Association (ATA).

Early maternal thyroidal insufficiency, or EMTI, is a failure of the maternal thyroid to provide an adequate supply of T_4 in early pregnancy. According to Steven Lamm, a pediatrician and director of the Washington, D.C.-based Consultants in Epidemiology and Occupational Health, EMTI may affect 0.5–5.0% of all pregnant women. When depletion occurs early in pregnancy, fetal brain formation can be markedly altered. Even subtle degrees of thyroid dysfunction in pregnant women might be associated with impaired psychomotor development in their infants, toddlers, and preschool children.

While there's no doubt that EMTI is related to poor fetal outcomes, the follow-up data on child development are only available until 5–6 years of age, so it's still unknown whether these developmental delays persist over the long term, said Victor Pop, a professor in the Department of Clinical Health Psychology at Tilburg University, Netherlands, whose landmark study on EMTI was published in the February 1999 issue of

Clinical Endocrinology. In a later study published in September 2003 in *Clinical Endocrinology*, Pop found that women with the lowest tenth percentile of T_4 concentrations at 12 weeks' gestation bore children who experienced impaired mental and motor functioning at age 1–2 years. In EMTI women who showed an increase in T_4 concentrations at 24 and 32 weeks' gestation, child development was not adversely affected. Most of the concerns related to fetal risk have focused on the first half of gestation.



Intimately connected. New studies are showing the significance of a healthy thyroid in mothers-to-be on the future health of their babies.

However, the third trimester is a critical time for cerebellar development and myelination.

The limited amount and quality of the evidence to date is one reason it has been difficult to reach consensus on the etiology as well as screening and treatment requirements for EMTI. Researchers aren't sure whether using T_4 to treat women with EMTI benefits all children of these mothers, or whether there are unforeseen effects. Therefore, placebo-controlled studies are urgently needed, said Pop.

John Lazarus, a senior lecturer in medicine at the University of Wales, United Kingdom, described his upcoming randomized clinical study of 22,000 women at 13–16 weeks' gestation. An experimental group will have T_4 and the complementary thyroid-stimulating hormone (TSH)

measured and thyroxine treatment applied if necessary, while the control mothers will remain untested until after their babies are delivered. Children from both groups will undergo developmental testing at ages 2 and 5 years. This study will rigorously evaluate the impact of both subclinical maternal hypothyroidism and hypothyroxinemia (inadequate TSH and free T_4 , respectively) on the IQ scores of the offspring, as well as the effect of prenatal treatment.

Additional discussions focused on the possible need for screening and treatment. "While it is not yet known whether early identification and treatment of thyroid deficiency will avoid fetal death and neuropsychological deficits in the offspring, it is clear that women themselves will benefit," said James Haddow, medical director of the Foundation for Blood Research in Scarborough, Maine. "Many women go undiagnosed for longer periods of time, so that they lack the energy they need to function well in everyday life during their child's early years, when the demands placed on them are greatest."

Haddow contended that TSH measurement should be added to the list of tests routinely performed at the first prenatal visit (the ATA currently advocates testing for pregnant women with a history of miscarriage, fetal loss, infertility, autoimmune disease, goiter on exam, and family history of thyroid disease). Lamm and other participants also suggested that normal levels for both TSH and T_4 should be determined for the different stages of pregnancy. Another suggestion was to supplement prenatal vitamins with 150 micrograms of iodine (many currently contain little or none).

But scientists still need to agree on other matters, such as TSH and/or T_4 cut-off points for defining high risk. A TSH level of 2.5 milliunits per liter was proposed as a good initial cut-off. "This is a conservative cut-off," said conference co-planner Joseph Hollowell, a professor of pediatrics at the University of Kansas Medical Center, "and it will prompt further investigation to see if there's a real problem." —**M. Nathaniel Mead**

AIR POLLUTION

Asia's Two-Stroke Engine Dilemma

Asian cities face a serious air pollution problem from two- and three-wheeled vehicles that run on two-stroke engines. Global experts shared their knowledge about these vehicles at an international conference held 30 March–1 April 2004 at the Centre for Science and Environment (CSE) in Delhi, India. Anumita Roychowdhury, associate director of the CSE, said the inexpensive two-wheelers form a staggering 75–80% of the traffic in most Asian cities. She called them “an Asian dilemma.”

Because two-stroke engines burn an oil-gasoline mixture, they emit more smoke, carbon monoxide, hydrocarbons, and particulate matter than the gas-only four-stroke engines found in newer motorcycles. Making matters worse, many Asian two-wheelers are converted into three-wheeled “baby taxis” by adding a sidecar. However, “the vehicle is not designed for the extra weight,

and the engine burns even dirtier,” said Michael Walsh, an independent consultant who advises nations worldwide about motor vehicle pollution and control issues.

The World Health Organization ranks urban outdoor air pollution as the thirteenth greatest contributor to disease burden and death worldwide. Air pollution raises the risk of respiratory illnesses; about two-thirds of the residents of Delhi and Calcutta suffer from respiratory symptoms such as common cold and dry and wet cough, which Twisha Lahiri, head of neuroendocrinology at India's Chittaranjan National Cancer Institute, largely blames on two-stroke engine emissions.

In work presented at the conference, Lahiri and colleagues examined 2,000 non-smoking adults from Calcutta and Delhi and 300 from the rural Sunderban region, where air pollution is extremely low. Spirometry measurements found impaired lung function in 46% of Delhi adults and 56% of Calcutta adults, but only 21% of those from the Sunderban islands. Lahiri has also observed early indicators of lung cancer, such as metaplastic epithelial cells,

in people exposed to traffic pollution. These findings “warrant immediate measures to abate the alarmingly high vehicular pollution in Indian cities,” she warned.

Measurements of how much pollution two-wheelers emit are rare, but one study of traffic intersections in Bangkok, Thailand, found that two-wheelers contributed up to 47% of particulates. When the city instituted a stringent inspection program and emissions standards in 2000, two-wheelers made up 96% of the city's traffic; by March 2004 they made up only 40%, reported Supat Wangwongwatana, deputy director general of Thailand's Pollution Control Department.

Similarly, when two-stroke baby taxis were phased out of Dhaka, Bangladesh, in 2002, particulate concentrations dropped up to 40%, and carbon monoxide and

hydrocarbons fell significantly, reported S.M.A. Bari, director of engineering at the Bangladesh Road Transport Authority. However, no country has established particulate standards for two-wheelers, said Roychowdhury, and there are no standardized

methods for measuring particulate emissions from these vehicles.

Economic incentives were what drove the transition from two-stroke to four-stroke tricycles in the Philippines' San Fernando City. In 2001, three-quarters of the city's 1,600 registered tricycles ran on two-stroke engines. The city council mandated a total phase-out of these vehicles by 2004 and offers interest-free loans for down-payments on four-stroke models. According to San Fernando City mayor Mary Jane Ortega, 400 four-stroke tricycles had replaced older two-stroke models as of March 2004.

The information presented at the conference supports public policies promoted by the CSE. “Small incremental steps will not help us beat the rapidly growing pollution,” said Roychowdhury. Instead, the CSE recommends stringent emissions standards for two-wheelers, an effective vehicle inspection program, fiscal incentive programs to replace existing two-stroke engines with four-stroke ones, and the development of efficient public transportation systems. —Carol Potera



Two strokes and you're out. Two-stroke engines, ubiquitous throughout Asia, are major contributors to air pollution and resulting respiratory illness in people.

Further Support for Sustainable Cities

In February 2004, representatives at the Asia and Pacific Leadership Forum adopted the Hong Kong Declaration on Sustainable Development for Cities. The document stems from Agenda 21,

recently reaffirmed at the World Summit on Sustainable Development, and sets a goal of significantly improving the lives of at least 10% of the world's estimated 1 billion slum dwellers. The declaration encourages cities to develop comprehensive strategies for not only economic development, but environmental protection as well, and notes the role that education and public health play in sustainable development. The declaration also notes the challenge that urban transportation poses to sustainable development, particularly in cities in the Asia/Pacific region.



BBC 'Toons Tout Healthier Snacks

No longer will popular BBC cartoon characters like the Teletubbies and the Tweenies grace the labels of unhealthy snack foods. In April 2004, network officials announced the characters' removal from labels of products with high sugar, salt, and fat contents, in response to growing concerns over children's diets and obesity. The network will continue to license its characters for healthier foods including yogurt, pasta, and bread, as well as special-occasion treats like birthday cakes. The network is also planning to license the characters for a line of staple foods including fruit, vegetables, meat, milk, and dairy products. This new move follows a July 2003 decision by the network to end a sponsorship deal with McDonald's using BBC characters.

Fast Food Premieres

Director Morgan Spurlock has documented the impact the fast-food industry has on Americans' waistlines in his film *Super Size Me*. With obesity affecting growing numbers of adults and children alike, Spurlock wanted to find out what was causing this epidemic. He interviewed people in 20 cities, from children eating at McDonald's to the U.S. Surgeon General, and lived on nothing but fast food for an entire month while he made the movie, gaining 25 pounds and damaging his liver in the process. The website for the movie (<http://www.supersizeme.com/>) notes that each day 1 in 4 Americans visits a fast-food restaurant, and that most nutritionists recommend not eating fast food more than once a month.



NOISE POLLUTION

EU Ramps Up Road Improvements

Noise costs the European Union (EU) 10–40 billion annually, by various estimates, with roughly half of this due to road noise. Contributing factors include medical costs, reduced worker productivity, and *de facto* condemnation of noise-exposed land. Due mostly to the demands of greater population density, European noise mitigation efforts are far ahead of those of the United States, and U.S. officials are paying attention: this spring, officials and researchers toured the best European projects.

Tires hitting pavement can cause as much as 90% of road traffic noise, depending on the traffic conditions, vehicle type, and driving style, says Ulf Sandberg, a senior research scientist at the Swedish National Road and Transport Research Institute. The treads squeeze air as they strike the road and snap as they pull away, which sets the tread

and sidewalls vibrating. The upward-curving treads and the road surface form a “horn,” amplifying the cacophony, and the highway surface reflects the noise, says Roger L. Wayson, an associate professor of civil and environmental engineering at the University of Central Florida.

One strategy to fight road/tire noise is single-layer porous highways sitting on an asphalt concrete foundation, which cover hundreds of miles in Europe. The pores, created by using stones of similar size in the asphalt mix, are thought to dampen the hiss of the pumped air and to impair the acoustic reflectivity of the road surface. The resulting 3-decibel reduction over a conventional European highway is readily perceptible.

Besides dampening noise, porous surfaces drain rain, potentially reducing accidents. But they also drain winter road salt (sand can't be used because it blocks the pores). Europeans use wetted salt, which sticks longer to the road, but U.S. observers worry that more salt use could trade one environmental problem for another. Still, single-layer porous surfaces are successful in

the European countries visited, says Christopher Corbisier, a civil engineer and noise specialist with the Federal Highway Administration who took the recent tour.

More experimental are roadways with two layers of porous asphalt atop the foundation, which shave another several decibels from the din, says Gijsjan van Blokland, general manager of the Dutch company M&P Consulting Engineers. At short test sites in Italy and the Netherlands noise-absorbing Helmholtz resonators are embedded in the concrete foundation, cutting several decibels more. These highways tend to wear more quickly than the single-layered ones.

Although noise costs have not been estimated for the United States, road noise is still a concern here. In the United States, noise mitigation must be considered if residential exposures reach 66 decibels, although it is not required if deemed not reasonably feasible. Tall concrete noise barriers are typically used, but cost more than \$1 million per mile. Quiet roads offer a potentially cheaper, more aesthetically pleasing alternative. —David C. Holzman

MARINE SCIENCE

Surf's Yuck

To get the real skinny on the health effects of coastal water pollution, talk to a surfer. While catching the waves, surfers are also catching colds, stomach bugs, and more. Surfers long ago made the connection between sick days and urban storm drains dumping untreated runoff from streets, yards, and waterways into beach water. But researchers have now calculated the likelihood of surfers succumbing to waterborne bacteria and viruses.

Environmental scientist Ryan H. Dwight of the University of California, Irvine, and colleagues interviewed 1,873 surfers in two California surfing hot spots: rural Santa Cruz County and urban northern Orange County. The researchers interviewed the surfers in April 1998, following a very wet El Niño winter with greater runoff than usual, and again in April 1999, following a very dry La Niña winter with less runoff than usual.

The first year, Orange County surfers reported almost twice as many symptoms over the previous three months compared with Santa Cruz surfers. Their symptoms included fever, nausea, stomach pain, sore throats, and eye, ear, and skin infections, the team reported in the April 2004 *American Journal of Public Health*. But even Santa Cruz surfers weren't entirely safe that spring. Every additional 2.5 hours that surfers in either county spent in the water increased by 10% their likelihood of developing symptoms, the team writes. In the spring following the drier La Niña winter, Orange County surfers reported only slightly more symptoms than Santa Cruz participants.



Dangerous waves. A study of surfers connects a raft of health symptoms with waters flooded with toxic runoff following storms.

All of the participants, whose mean age was 30, surfed at least once a week. For their water quality data, the researchers used mean monthly total coliform counts collected by the two counties' health agencies. Orange County scored much worse on water quality tests in the first year than did Santa Cruz, which is a small, less-developed watershed.

Since the study was done, California has expanded its water quality testing requirements. In 1999, in accordance with updated state

standards, California began measuring for enterococci, bacteria that inhabit the intestine. Dwight and others say that although overall water quality may not have improved, the change did result in many more beach closings, particularly in Orange County.

The work by Dwight and colleagues helps confirm in a tangible way what swimmers and surfers know from experience, says Cheryl McGovern, a program manager with the U.S. Environmental Protection Agency in San Francisco. People need studies to quantify the health risks associated with various recreational waters, especially if they will be paying for pollution cleanup, she says. She would like to see a follow-up study that uses more sophisticated water quality data, including measurements of enterococci.

Dwight notes that surfers are not the only people exposed to the waters in these or other coastal counties—several millions of tourists and local residents swim in these waters every year. “If the surfers are getting sick—and they are young and healthy—then the public is at risk as well,” he says. —Tina Adler

ehpnet

European Pollutant Emission Register

Pollutant release and transfer inventories are a relatively new database-driven means of providing information on the who, what, and how much of industrial emissions. Though governments have for some time collected such data for their own use, it has only been in the last decade or so that a move has been under way to make this information publicly available. Agenda 21, the plan of action adopted at the 1992 United Nations Conference on Environment and Development, advocated the development of national registries in each of the participating countries as a means of educating the general public and others about pollution sources. Today, inventories of emissions from more than 9,000 large and medium facilities in 16 European countries are available for free online through the European Pollutant Emission Register (EPER), located at <http://www.eper.cec.eu.int/eper/>.



A joint project of the European Commission and the European Environment Agency, EPER allows users to compare data between such variables as industry type and locale so that interested parties can act to reduce disparities. Environment commissioner Margot Wallström commented at the 23 February 2004 launch of the register that people need to know about pollution in their environment because it directly affects their health and their quality of life. She added that by using the register, citizens can put pressure on government and industry—an essential aspect of the public's involvement in protecting the environment.

The data included within EPER have been provided by facilities that exceed specified emission thresholds. The data cover 50 air and water pollutants that can harm human and environmental health, including arsenic, lead, mercury, nitrogen, phosphorus, and small particulate matter. Industrial sectors include pig and poultry farming, minerals, metals, pharmaceuticals, cement and glass, asbestos, and waste disposal. The current version of EPER includes data from the year 2001; a set of year 2004 data will be added in 2006.

Choosing the Facility Level search allows users to search for facilities by area—all of the European Union countries or any of 17 individual nations. Users can also choose from pull-down lists of pollutants and industrial activities, and search by facility name and/or address. Users can also choose to run an Industrial Activity or Pollutant search.

The Map Search tool of the website allows the user to create a customized color-coded map that can show such elements as the density of all EPER industries across a region, the density of certain types of industries in a certain area, and the industries in a single metropolitan area. The map can also be configured to show only facilities emitting a single substance across specified areas.

EPER has also provided a searchable glossary of terms related to industry and pollutants. Links to the national emissions registers that were used in helping to compile the EPER database, as well as to a number of European and international environmental organizations, are available as well, under the Links heading. —Erin E. Dooley

London Hits Volume Control

Noting that noise can affect a person's speech, learning, and concentration, the mayor of London, England, has set forth a citywide plan for a quieter capital. The plan requires reductions by all sources of ambient noise, at all times of day—the three main priorities for the strategy are improving and maintaining road surfaces, securing a night-time aircraft ban over the city, and reducing noise through better planning and design of new housing. Ongoing incentives for alternative vehicles will also help decrease noise, as these vehicles are often quieter than their conventional counterparts. The London initiative comes ahead of a requirement that the entire country enact an ambient noise strategy by 2007.



U.S. Signs Tobacco Treaty

In May 2004, the United States became the 108th country to sign the WHO's international treaty on tobacco control, which outlines a plan of action for issues ranging from tobacco advertising to cigarette smuggling. The action was praised by many groups, but it is not apparent whether the United States will actually ratify the treaty; 40 governments must ratify the treaty for it to take effect, but only 9 have done so. With 5 million people around the world dying from tobacco-related causes each year, supporters hope the treaty will come into force. Among other actions, signatories must ban cigarette advertising, increase taxes on tobacco products, and require cigarette manufacturers to size health warnings to take up at least 30% of the package label.

Where Does the Old Oil Go?

The United States generates approximately 1 billion gallons of used automotive, hydraulic, and cutting oils each year, 75% of which is resold untreated as a cheap industrial fuel. This practice leads to significant emissions of toxic metals including lead and cadmium, according to a 15 January 2004 report in *Environmental Science & Technology*. The report compared three ways of dealing with used oil: re-refining it, distilling it, and burning it untreated. The authors found the toxicity potential of using the untreated oil was 150 times greater for terrestrial ecosystems and 5 times greater for humans. Development of better oil filters for cars and less frequent oil changes can greatly reduce the volume of used oil.

