

NEWS in Science and Technology

from the



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The following is an Executive Summary of the Academy's quarterly Bulletin (Vol. 24,4) that includes topics and issues in science and technology deemed by the Academy to be both timely and relevant to Connecticut's interests. Each item is briefly summarized from press releases and reports of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. Hyperlinks are included to the original online source, where more detailed information is available.

NOTE: Online versions of this newsletter and the Bulletin are available on the Academy website at www.ctcase.org.

FEATURE ARTICLE

➤ New Research Suggests Poor Dental Health Linked to More Serious Health Issues

Research conducted in Connecticut and around the world is beginning to suggest that poor dental health is linked to several more serious health conditions.

Connecticut's Oral Health

- An analysis of data showed that in Connecticut, between 2006 and 2007, about 75–85% of children between the ages of 15 and 18 had cavities.
- By age 2, one-third of children have cavities and 1 in 7 have 5 or more cavities. By the third grade, 41% had decay.
- According to Bruce Tandy, president of the Connecticut State Dental Association (CSDA), only 35–40% of people seek dental care.

Health Risks

Joanna M. Douglass, associate professor of pediatric dentistry at the University of Connecticut School of Dentistry, noted that studies are suggesting that gum disease is a chronic infection that aggravates diabetes, affects pregnancy, and may contribute to heart disease, cardiovascular disease, and stroke.

As the beginning of the digestive track the mouth is normally filled with a variety of bacteria like *Streptococci* and *Lactobacilli*, which contribute to caries. These bacteria metabolize sugars left by soda, candy, and other sugary or starchy foods, releasing byproducts that increase the acidity of the mouth. The low-pH environment gradually demineralizes teeth and the eventual result is a cavity.

- Inflamed maternal gums may be associated with premature birth and low birth weight, according to research published by Douglass and colleagues in the journal *American Family Physician*.
- During regular, semi-annual scaling as part of routine dental care, the dentist or hygienist can scrape and chisel off the plaque biofilm that otherwise hardens into a calculus of apatite, brushite, whitlockite and other minerals. When minerals and anaerobic bacteria begin to form and grow beneath the gums, the body's immune system responds with inflammation. Cytokines, leukotrienes, prostaglandins, immunoglobulins and other proteins are released and spread through the blood stream.
 - Research suggests that these defensive proteins in the mouth can damage other parts of the body.
 - University of Minnesota researchers released a study in October concluding for the first time that gum disease contributes to rheumatoid arthritis.

- Douglass said experiments suggest that people with diabetes are more likely to have periodontal disease. "We also know that with periodontal disease, the amount of sugar in the blood is higher." This is probably because the inflammatory proteins affect small blood vessels, exacerbating diabetes, she said.
- Pockets of infected gum tissue draw the cytokines IL-6 and IL-8, and the prostaglandin PGE₂, a hormone-like substance that participates in a wide range of body functions. "Elevated levels of these inflammatory markers have been found in women with periodontitis and preterm birth, compared with healthy control patients," Douglass and colleagues reported.
- "There is also a correlation between periodontal disease and coronary disease," Douglass said. "Individuals with periodontal disease are at increased risk for stroke and sudden death. People with heart disease should maintain meticulous oral health. The more bacteria there are in the mouth, the more likely the mouth is to be releasing bacteria all of the time," she said.

Awareness and Access Critical Factors for Success

In Connecticut, state and local dentists and other healthcare providers are fighting to raise awareness of the importance of good oral health.

- "People don't know when to start brushing," said Ardell A. Wilson, head of the Connecticut Department of Public Health's Office of Oral Health until her recent retirement. "You should start when the baby has two teeth. You must brush at least two minutes and do not leave the baby with a bottle in his mouth. Back teeth should be sealed." Bruce Tandy, president of the Connecticut State Dental Association (CSDA), said education of young mothers is key.
- "Even when care is accessible, only 35–40% of people seek dental care," Tandy said. "We're looking to school-based programs to help with that."
- Dentists like Douglass and others are working closely with doctors to educate them on the risks of poor oral health. "One reason oral health doesn't get attention is because it is avoided. But there are new anesthetics that make most procedures practically painless," she said.
- Since 2004 Connecticut has earmarked \$2.5 million in state bonds to enhance or expand oral health facilities, established eight regional oral health collaboratives, and developed repayment methods for people on Medicaid or children in the state's HUSKY insurance plan.
- Public health officials want to halt progression of oral health problems while children are still young. The state plans efforts to reduce caries and tooth loss, seal vulnerable molars, provide access to dental care for the general population and low-income

children, reduce levels of gum disease, and detect oral cancers early.

- The CSDA has programs to ensure that the state's elderly receive adequate dental care.
- Lisa Reynolds, executive director of the non-profit Connecticut Oral Health Initiative, said some of the goals set out by the state health department in 2004 have been achieved—assessment, for example—while others, including policy to implement a state-wide oral health improvement plan, have yet to be completed.
- “Give Kids a Smile,” is a dental association charitable program that holds clinics across the state. The Connecticut Foundation for Dental Outreach, another association program, is also designed to provide access to care.

Full information is available on the CSDA website at <http://www.csdacom.com>. — Abram Katz, freelance science writer
[http://www.ctcase.org/bulletin/24_4/24_4.pdf]

NEWS FROM THE NATIONAL ACADEMIES

The following is excerpted from press releases and other news reports from the National Academies (www.national-academies.org).

➤ “Hidden” Costs of Energy in United States

A new National Research Council report examines the “hidden” costs of energy production and use in the United States— costs that are not reflected in market prices. The committee estimated \$120 billion in damages in 2005, a number that primarily reflects health damages from air pollution associated with electricity generation and motor vehicle transportation. The report examines but does not monetize damages from climate change, harm to ecosystems, effects of some air pollutants such as mercury, and risks to national security. The report focused on monetizing the damage of major air pollutants—sulfur dioxide, nitrogen oxides, ozone, and particulate matter—on human health, grain crops and timber yields, buildings, and recreation. When possible, it estimated both what the damages were in 2005 (the latest year for which data were available) and what they are likely to be in 2030, assuming current policies continue and new policies already slated for implementation are put in place. The committee separately derived a range of values for damages, though wide-ranging possibilities made it impossible to develop precise cost estimates. However, all model results indicate that climate-related damages caused by each ton of CO₂ emissions will be far worse in 2030 than now; even if the total amount of annual emissions remains steady, the damages caused by each ton would increase 50-80%.

[http://www.nap.edu/catalog.php?record_id=12794]

➤ Smoking Bans Reduce Secondhand Smoke Risks

Smoking bans reduce the risk of heart attacks and heart disease associated with exposure to secondhand smoke, says a new report from the Institute of Medicine (IOM). The report also confirms that there is sufficient evidence that breathing secondhand smoke boosts nonsmokers' risk for heart problems, noting also indirect evidence indicating that even relatively brief exposures could lead to a heart attack. About 43% of nonsmoking children and 37% of nonsmoking adults are exposed to secondhand smoke in the United States, according to public health

data. The study was based on a comprehensive review of published and unpublished data and testimony. Eleven key studies that evaluated the effects of smoking bans on heart attack rates informed the committee's conclusions. The studies found that reductions in the incidence of heart attacks range from 6% to 47%. The repeated finding of decreased heart attack rates overall after bans were implemented conclusively shows that smoke-free policies help protect people from the cardiovascular effects of tobacco smoke, the report said.

[http://www.nap.edu/catalog.php?record_id=12649]

Web: <http://www.iom.edu/en/Reports/2009/Secondhand-Smoke-Exposure-and-Cardiovascular-Effects-Making-Sense-of-the-Evidence.aspx>

➤ Improved Voter Database Interoperability Urged

Several actions are needed to help make voter registration databases capable of sharing information within state agencies and across state lines, according to a new report from the National Research Council. These include short-term changes to improve education, dissemination, administrative processes, and long-term changes to improve data collection and entry, matching procedures, and to ensure privacy and security.

[http://www.nap.edu/catalog.php?record_id=12788#description]

➤ New School Meal Nutrition Guidelines Advised

The National School Lunch Program and the School Breakfast Program should adopt a new set of nutrient targets and standards for menu planning, says a new Institute of Medicine report. The report's recommendations, which will bring school meals in line with the latest Dietary Guidelines for Americans and Dietary Reference Intakes, include limiting sodium and calories and encouraging children to eat more fruits, vegetables, and whole grains. Implementing the recommendations will likely increase the costs of providing school meals, stated the report. A combination of higher federal meal reimbursement, capital investment, and additional money for training food service operators will be needed. The National School Lunch Program is available in 99% of US public schools and in 83% of private and public schools combined. The School Breakfast Program is available in 85% of public schools. About 30.6 million schoolchildren participated daily in the school lunch program in fiscal year 2007, and 10.1 million children participated in the school breakfast program.

[http://www.nap.edu/catalog.php?record_id=12788#description]

➤ White House Announces ‘Educate to Innovate’

President Obama recently announced a new nationwide effort to create public-private partnerships to improve science, technology, engineering, and math (STEM) education and encourage more students to pursue careers in these fields. The campaign, called “Educate to Innovate,” will focus on mobilizing resources to help already successful programs reach more young people and on using media such as video games and television to aid learning in math and science, among other goals.

[http://www.nap.edu/catalog.php?record_id=12788#description]

➤ New Radio Spectrum Management Policies Needed

The current means for managing the radio frequency spectrum—which is used by researchers for myriad purposes, including weather forecasting and astronomical investigations, and by consumers for such technologies as cellular phones and wireless Internet—must be changed, says a new report from the National Research Council. The current policies threaten to thwart scientific discovery, diminish the utility of critical environmental observations, and limit economic growth because of inefficient use of these resources.

[http://www.nap.edu/catalog.php?record_id=12800]

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