

## SMOKING AND SECONDHAND SMOKE

## Study Finds No Level of SHS Exposure Free of Effects

How much exposure to tobacco smoke can the lungs endure before damage ensues? The answer appears to be none, based on gene activity measured by researchers at Cornell University.<sup>1</sup> “No level of smoking or exposure to secondhand smoke [SHS] is safe. Even at the lowest detectable levels of exposure, we could detect changes in gene expression within the cells lining the airways,” says coauthor Ronald Crystal, head of pulmonary and critical care medicine at New York-Presbyterian/Weill Cornell Medical Center.

Crystal and coworkers at Cornell analyzed gene activity in small airway epithelial cells collected from 121 healthy volunteers. The type of cells tested are where early damage first occurs that leads to chronic obstructive pulmonary disease (COPD) and bronchogenic cancer, according to Crystal.

The volunteers, all of whom had normal lung function, were categorized by tobacco smoke exposure status as determined by their urine levels of nicotine and cotinine. Nonsmokers had non-detectable urine nicotine or cotinine levels, low-exposure individuals had urine nicotine and/or cotinine levels up to 1,000 ng/mL, and active smokers had urine nicotine and/or cotinine levels greater than 1,000 ng/mL. The low-exposure group included occasional smokers and people exposed to SHS.

The researchers first compared the smokers and nonsmokers. Microarrays detected significant changes between these two groups in the activity of 372 genes. Among the low-exposure group, about a third of these 372 genes were up- or downregulated compared with nonsmokers, and 11% of the genes differed compared with active smokers.<sup>1</sup>

Even subjects with the lowest levels of nicotine and cotinine had enhanced activity of biological pathways involved in the metabolism

of xenobiotics by cytochrome P450 and arachidonic acid. The same two pathways also were highly activated in smokers, suggesting exposure to low levels of SHS caused changes in the airways similar to those from active smoking, representing the earliest biologic abnormalities that can lead to disease.<sup>1</sup> The authors believe this may be the first study to document biological changes in the lung cells of people exposed to low levels of tobacco smoke.

The results support epidemiologic studies that link early respiratory damage to low levels of SHS exposure or occasional smoking.<sup>2,3</sup> However, the tobacco smoke-induced gene changes “do not tell us which ones [genes] are dangerous and which are protective,” Crystal notes.

Moreover, the cross-sectional nature of the study precluded determining whether the genetic changes predicted disease. Followup studies lasting 20 years or more are needed to sort out the genes that play a role in the development of lung diseases, and Crystal plans to follow some of the people in this study.

People often wonder what level of exposure to SHS is harmful—is it a problem, for instance, to hang out with smoking friends once or twice a week? Crystal’s study “employs sophisticated molecular genetic techniques to address this very important public health question of whether a threshold exists,” says Norman Edelman, a professor of preventive medicine at Stony Brook University Medical Center and chief medical officer at the American Lung Association. The finding that no level of tobacco smoke exposure appeared safe “is important for informing both individual behavior and public health policy,” Edelman says.

Carol Potera, based in Montana, has written for *EHP* since 1996. She also writes for *Microbe*, *Genetic Engineering News*, and the *American Journal of Nursing*.

### REFERENCES

1. Strulovici-Barel Y, et al. *Am J Respir Crit Care Med*; doi:10.1164/rccm.201002-0294OC [online 6 Aug 2010].
2. Chan-Yeung M, Dimich-Ward H. *Respirology* 8(2):131-139 (2003); doi: 10.1046/j.1440-1843.2003.00453.x.
3. Jaakkola MS, Jaakkola JJ. *Scand J Work Environ Health* 28(suppl 2):52-70 (2002); PMID: 12058803.

## The Beat

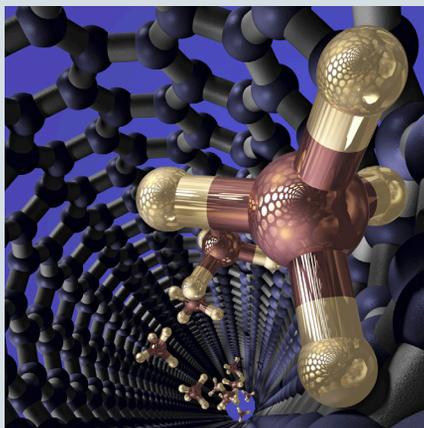
by Erin E. Dooley

### EFSA on Revising BPA Guidance: Not Enough Evidence

In September 2010 the European Food Safety Authority (EFSA) released the findings of its latest review of bisphenol A (BPA), concluding there is no new evidence that warrants a revision of the current Tolerable Daily Intake of 0.05 mg/kg body weight.<sup>1</sup> EFSA also concluded that currently available animal data do not provide convincing evidence of neurobehavioral toxicity of BPA. The EFSA panel said it would reconsider the current opinion should new relevant data become available.

### EPA Issues SNURs for Carbon Nanotubes

Significant new use rules went into effect 18 October 2010 for generic multi-walled carbon nanotubes and single-walled carbon



nanotubes.<sup>2</sup> Carbon nanotubes currently are used in applications such as advanced composites, electronics, and fuel cells. Now companies that manufacture, import, or process these materials must notify the U.S. EPA 90 days before using them in a way that is deemed a significant new use. In May the GAO issued a report calling on the EPA to strengthen its oversight of nanomaterials used in commerce.<sup>3</sup>

### PM Pollution: An App for That

University of Southern California researchers have developed a smartphone application to estimate atmospheric particulate matter.<sup>4</sup> The app currently works with Android systems, and an iPhone app is being developed. Users upload their photographs of the sky to a central computer, which compares the picture with established models of sky luminance to determine visibility, a measure associated with particulate pollution. The system then returns a message to the user and registers the information.

### Updated Green Guides Open for Comment

In June 2010, *EHP* reported on the growing use of environmental stewardship claims in product marketing.<sup>5</sup> Now the Federal Trade Commission has issued proposed changes to its Green Guides, which aim to help marketers determine if their “green” claims are true and substantiated.<sup>6</sup> The Green Guides were last updated in 1998, well before a recent escalation in the

## RESPIRATORY HEALTH

## Measuring the Health Effects of Crop Burning

What to do with crop residue left in fields at the end of a growing season is, literally, a burning issue. Some farmers prefer the inexpensive approach of setting the stubble ablaze, but repeated burning is not good for the soil,<sup>1</sup> and the resulting smoke is a health hazard.<sup>2</sup> Although many studies have measured the particles released into the air by crop burning, fewer have isolated the effect of the smoke on lung function. New research now shows the smoke produced by crop burning could have a lasting effect on children's lung function.<sup>3</sup>

Ravinder Agarwal, head of the University Science Instrumentation Centre at Thapar University in Patiala, India, and colleagues used portable spirometers to regularly test the lung function of children aged 10–13 and adults aged 20–35 over the course of a year. The 40 participants were healthy nonsmokers living in a village surrounded by farmland, with little traffic and no industry within 10 km.<sup>3</sup>

Children's force vital capacity (FVC)<sup>4</sup> dropped from a mean 98% in August 2008 to 92% in July 2009. Mean FVC dipped as low as 88% in October and November, when farmers burned their rice crop residue, and in April and May, when they burned wheat stubble. The children's mean lung function remained significantly lower throughout the test period. The mean lung function of the adult study participants declined during the burn seasons as well, but largely returned to original levels by the end of the study.<sup>3</sup>

Decreases in lung function correlated with increases in the concentration of particulate matter, which exceeded India's national air quality standards during the burn season.<sup>3</sup> Small particles (PM<sub>2.5</sub> and PM<sub>10</sub>)—which make up the majority of the smoke produced by crop burning—were more closely associated with decreases in lung function than suspended particulate matter (SPM), which can contain particles 100 μm or larger.<sup>5</sup>

The findings linking seasonal burning with health issues “coincide with the anecdotal evidence that we have been seeing in the Canadian prairies,” notes Kate Letkemann, environmental issues coordinator of The Lung Association, Manitoba, and a member of the provincial Crop Residue Burning Advisory Committee. On top of regulations regarding what time of day and where crop residue can be burned,<sup>6</sup> Manitoba uses incentives to encourage farmers to adopt alternative residue management practices, says Andrew Nadler, coordinator of the governmental Manitoba Crop Residue Burning Program. In the United States, crop burning is regulated at the state level.<sup>7</sup>

Argawal's work “builds a relationship between pulmonary function tests and the concentration of SPM, PM<sub>10</sub>, and PM<sub>2.5</sub>,” notes Shijian Yang of the School of Environmental Science and Engineering at China's Shanghai Jiao Tong University. But he would like to see further research that looks closely at the dose–effect relationship between lung function and crop residue burning. Yang's work has shown that the peak concentration of PM<sub>10</sub> and its duration may be more important than average concentrations for estimating the health effects of burning crops.<sup>8</sup>

**Tina Adler** first wrote for *EHP* about the Clinton–Gore environmental agenda in 1993. She is a member of the National Association of Science Writers and the American Society of Journalists and Authors.

### REFERENCES AND NOTES

1. Fasching RA. Burning: Effects on Soil Quality. Agronomy Technical Note Number MT-86. Bozeman, MT: Natural Resources Conservation Service, U.S. Department of Agriculture (October 2001).
2. Cançado JED, et al. *Environ Health Perspect* 114(5):725–729 (2006); doi:10.1289/ehp.8485.
3. Awasthi A, et al. *Sci Total Environ* 408(20):4440–4445 (2010); doi: 10.1016/j.scitotenv.2010.06.040.
4. FVC is the amount of air a person can exhale in the first second of breathing out, expressed as the percentage of the predicted values for the person's age, height, ethnicity, and sex.
5. EPA. Compendium of Methods for the Determination of Inorganic Compounds in Ambient Air. Chapter IO-2. Integrated Sampling of Suspended Particulate Matter (SPM) in Ambient Air. Overview. EPA/625/R-96/010a. Cincinnati, OH: Center for Environmental Research Information, Office of Research and Development, U.S. Environmental Protection Agency (June 1999).
6. Manitoba Crop Residue Burning Program [website]. Winnipeg: Manitoba Agriculture, Food and Rural Initiatives. Available: <http://tinyurl.com/37hy5r1> [accessed 8 Oct 2010].
7. Agricultural Burning [website]. Updated 25 Jun 2008. Washington, DC: U.S. Environmental Protection Agency. Available: <http://tinyurl.com/344tkc9> [accessed 8 Oct 2010].
8. Yang S, et al. *Atmos Environ* 42(9):1961–1969 (2008); doi:10.1016/j.atmosenv.2007.12.007.

number of advertisements touting claims of environmental friendliness.<sup>5</sup> The proposed revisions include new guidance on the use of product certifications and other labeling tools. They also contain the first federal guidelines for the marketing of carbon offsets and renewable energy claims. The proposals are open for public comment until 10 December 2010.<sup>7</sup>



Left to right: Shutterstock; © Richard Marzyniak/iStockphoto

## Database of Bedbug Resources

A new online resource offered by the U.S. EPA aids consumers battling bedbug infestations.<sup>8</sup> The database lists about 300 pesticides that have been registered for use on bedbugs, and users can search for products that meet specific needs. The site emphasizes the importance of proper use of pesticides. The EPA Office of Pesticide Programs advises that pesticides work most effectively against bedbugs when used along with other steps such as reducing household clutter, using protective covers on mattresses, and vacuuming regularly. Bedbugs are classified by the U.S. EPA as “a pest of significant public health importance” under the Federal Insecticide, Fungicide, and Rodenticide Act.<sup>9</sup>

### REFERENCES

1. EFSA. Scientific Opinion on Bisphenol A: Evaluation of a Study Investigating Its Neurodevelopmental Toxicity, Review of Recent Scientific Literature on Its Toxicity and Advice on the Danish Risk Assessment of Bisphenol A. Parma, Italy: European Food Safety Authority (2010).
2. EPA. Multi-Walled Carbon Nanotubes and Single-Walled Carbon Nanotubes; Significant New Use Rules. FR Doc No: 2010-23321. Washington, DC: Government Printing Office (2010).
3. GAO. Nanotechnology: Nanomaterials Are Widely Used in Commerce, but EPA Faces Challenges in Regulating Risk. GAO-10-549. Washington, DC: U.S. Government Accountability Office (2010).



4. Air Visibility Monitoring [website]. Los Angeles, CA: Robotic Embedded Systems Laboratory, University of Southern California. Available: <http://tinyurl.com/2axtaoj> [accessed 12 Oct 2010].
5. Dahl R. *Environ Health Perspect* 118(6):A246–A252 (2010); doi:10.1289/ehp.118-a246.
6. FTC. Proposed Revisions to the Green Guides. Washington, DC: Federal Trade Commission (2010). Available: <http://tinyurl.com/2fsvzud> [accessed 12 Oct 2010].
7. Comment Form, Request for Public Comment, Guides for the Use of Environmental Marketing Claims; Project No. P954501 [website]. Updated 12 Oct 2010. Washington, DC: Federal Trade Commission. Available: <http://tinyurl.com/246hwyj> [accessed 12 Oct 2010].
8. EPA-Registered Bed Bug Products [website]. Updated 12 Oct 2010. Washington, DC: U.S. Environmental Protection Agency. Available: <http://tinyurl.com/24rcp5u> [accessed 12 Oct 2010].
9. Manuel J. *Environ Health Perspect* 118(10):A429 (2010); doi:10.1289/ehp.118-a429.