

We live in a time when the words *impossible* and *unsolvable* are no longer part of the scientific community's vocabulary. Each day we move closer to trials that will not just minimize the symptoms of disease and injury but eliminate them.

Christopher Reeve
 Testimony to U.S. House of Representatives (1999)

SUBSTANCE ABUSE

Resurgence of Teen Inhalant Use

The 2004 Monitoring the Future (MTF) survey showed that inhalant use (“huffing”) is rising among American teenage students, particularly 8th graders. The results, released in December 2004, showed that 9.6% of 8th graders used inhalants in 2004, up from 7.7% in 2002 and 8.7% in 2003. Inhalant use was also up slightly among 10th and 12th graders in 2004. Findings from the latest MTF will be released in late December 2005, and researchers are anxious to see if the trend holds.

“These increases are disturbing because they come after a long period of decline in inhalant use by students in all three grades,” says Lloyd D. Johnston, a professor at the University of Michigan Institute for Social Research and principal investigator of the MTF since it began in 1975. “We are concerned that the use of this class of drugs may be about to rebound.”

Each year, the MTF, which is funded under grants from the National Institute on Drug Abuse (NIDA), asks approximately 50,000 8th-, 10th-, and 12th-grade students in some 400 schools nationwide about their use of drugs, alcohol, and cigarettes. The data gathered are used to help government officials and policy makers identify potential drug problem areas so they can target resources to deal with them.

“We know that inhalant use starts early and that long-term abusers are among the most difficult drug abuse patients to treat,” says NIDA director Nora Volkow. “It is critical that research efforts to characterize the behavioral effects of inhalants intensify, so that more effective preventions, interventions, and treatments can be developed.” This year, NIDA announced the continuation of a broad-based research initiative begun in

2002 to address the epidemiologic, social, behavioral, cognitive, and neurobiological consequences of inhalant abuse, as well as treatment and prevention.

More than 1,000 readily available products are used as inhalants, and they can potentially kill, according to the Office of National Drug Control Policy (ONDCP). Such products include glue, shoe polish, gasoline, lighter fluid, and the propellants in spray deodorant, hair sprays, and canned whipped cream.

The ONDCP further reports that glue, shoe polish, and toluene-containing products were the most commonly abused inhalants among users aged 12 to 17. According to the American Association of Poison Control Centers, gasoline accounted for the greatest percentage (44%) of reported inhalant deaths between 1996 and 2001, followed by air fresheners (26%) and

propane/butane (11%). Other health effects of inhalant use include headache, nausea, vomiting, slurred speech, loss of motor coordination, and wheezing.

The physical and social environment both play a key role in inhalant use, says Harvey Weiss, executive director of the National Inhalant Prevention Coalition. Treatment sometimes requires removing the abuser from the environment in which he or she is abusing inhalants. “We should not view inhalant abuse [simply] as a substance abuse problem,” Weiss says. “It’s a public health problem, so we need to do more public health outreach to young people.”

Sources believe that education is the key to preventing inhalant use from becoming a dangerous fad. When MTF data from the mid-1990s began showing a long-term gradual increase in inhalant use, the Partnership for a Drug-Free America and NIDA mounted an aggressive media campaign about the dangers of inhalants. The next round of MTF data showed a decline in inhalant use and a concurrent increase in young people viewing inhalants’ use as risky, but use began climbing again after the media campaign ended.

“Of course, the evidence is circumstantial, but we’ve seen the same thing happen for so many other drugs,” Johnston says. “A drug can have a resurgence in use among young people because of what I call ‘generation forgetting’—that is, a new generation of young people comes along that hasn’t heard too much about a drug, so it is naïve about the consequences of its use. That begins to change when a public education campaign is launched.”

Despite the MTF findings, the U.S. government hasn’t yet documented a trend indicating a rise in inhalant use among teenagers, says Terry Zobeck, deputy associate director for policy and budget at the ONDCP. But he adds, “The MTF is respected and well documented. We will be quite concerned if its next survey shows that inhalant use is up for the third year in a row.” —Ron Chepesiuk



Huffing is up. A new survey shows the practice of inhaling toxic—often deadly—substances is increasing among American teens.

Lori Struss

AUTOIMMUNE DISEASE

Phthalate Linked to Lupus in Mice

No one knows to what degree genetics or environmental agents cause lupus, an autoimmune disorder that affects the skin, joints, and internal organs including the kidneys. However, researchers at Indiana State University may have strengthened the environmental evidence by discovering that phthalates trigger lupus antibodies in a mouse model.

Phthalates are found in adhesives, cosmetics, fragrances, vinyl flooring, polyvinyl chloride pipe, and certain toys and medical supplies. According to a report out of the Centers for Disease Control and Prevention and the National Toxicology Program, published in the October 2000 issue of *EHP*, phthalate exposure is more extensive than previously suspected, especially in women aged 20–40 years. Other studies have pointed to possible links with asthma, rhinitis, and eczema in children as well as altered genital development in male infants. The new lupus findings add to a growing list of potential health effects caused by these chemicals.

In lupus, the immune system loses its ability to tell the difference between foreign substances (antigens) and the body's own cells and tissues. The immune system makes antibodies against the body itself, causing inflammation, tissue injury, and pain. Up to 1.5 million Americans have been diagnosed with lupus, and another 16,000 develop the disease each year, according to the Lupus Foundation of America.

While investigating the gene sequence of a monoclonal antibody used as a marker for tumor growth, biochemist Swapna Ghosh, interim chair of the Life Sciences Department at Indiana State University, noticed that it shared 98% similarity with an antibody protein component (light chain) made by NZB mice, a popular model for autoimmune diseases. In lupus, such antibodies attack DNA in the kidneys, heart, and lungs. The finding, published in the December 2003 issue of *Immunology*, was a surprise: "I was not studying lupus or autoimmune diseases at all," says Ghosh. But he took advantage of the unexpected turn and has launched a series of experiments to further explore the phthalate–lupus connection.

In the latest study, Ghosh and graduate student So-Yon Lim injected four types of mice, including NZB mice, with di-(2-

ethylhexyl) phthalate, or DEHP. Initially, all the mice generated antiphthalate antibodies, but only the lupus-prone NZB mice developed nephritis, which led to kidney failure and early death. The other mice initially produced antiphthalate antibodies, but the antibodies were counteracted by CD8+ suppressor T cells, which prevented kidney damage. "There's something different about the immune systems of NZB mice [that makes them more susceptible to phthalates]," says Ghosh. The details of the investigation are reported in the August 2005 issue of the *Journal of Autoimmunity*.

Although the phthalate–lupus connection has been observed only in mice, "many things found in the mouse immune system have proven to be true in humans," says Ghosh. On the other hand, "not everything seen in a mouse model reflects what happens in humans," cautions Betty Diamond, chief of rheumatology at Columbia University.

Although Ghosh's results are far from applicable to humans, they do raise several questions for future studies on the potential phthalate–lupus link in people. Do lupus patients have high levels of antiphthalate antibodies? Ghosh plans to screen lupus patients and healthy people in the future to find out. Does exposure to phthalates increase the risk for lupus? He plans to explore this, too, by measuring blood levels in workers exposed to phthalates in the plastics manufacturing industry. Lupus is five times more common in women than men. Might this be because women use more phthalate-containing cosmetics and perfumes than men do?

The American Chemistry Council (ACC), an industry trade group, has criticized Ghosh's study because he combined DEHP to proteins like bovine serum albumin. "The attached proteins may cause autoimmune and allergic responses," says Marian Stanley, director of the ACC's Phthalate Esters Panel. Ghosh counters, "We also studied DEHP not complexed to a protein, and it evoked an anti-DNA response." He explains that he attached a main metabolite of DEHP to proteins because some studies have suggested that phthalate metabolites show an affinity for albumin in the body.

So far, exposure to ultraviolet light is the only environmental factor that has been clearly linked to lupus in genetically susceptible patients. As lupus researchers continue to investigate other environmental causes, "we need to be open-minded, but not jump to conclusions," Diamond says. —Carol Potera

Fly the Environmentally Friendly Skies

In June 2005, the British airline industry unveiled a 15-year initiative to make itself more environmentally friendly. The industry wants to improve its fuel efficiency, reduce perceived external noise, and lower carbon dioxide emissions on new planes by 50% and nitrogen oxide emissions by 80%.

Also planned are ways to give travelers information on the amount of fuel used and pollutants emitted on routes that they travel. The industry may also prohibit foreign carriers from flying older, more-polluting aircraft into the United Kingdom.



A Loan for Colombia

In June 2005 the World Bank announced it was granting a \$150 million loan to Colombia to help that nation integrate sustainability principles into its environmental programs and policies and meet the UN Millennium Development Goals, including halving the number of people without adequate water and sanitation facilities. The monies are earmarked for three areas: development of a framework for planning and monitoring the progress toward meeting the UN goals; increased interinstitutional cooperation and public participation in environmental decision making; and development of laws and policies related to air and water quality, solid waste management, and environmental licensing. Bank officials hope the work financed by the loan will also decrease child mortality rates related to respiratory and diarrheal diseases.

Wave Power in the Works

Just off the northern coast of Portugal is the site of the world's first commercial wave-generated electric plant. The contract was signed in May 2005 for the \$9.6 million project, under which three wave energy converters will be built at the site.

The long, hinged converters move with the flow of tidal currents, pumping fluid to hydraulic motors that drive generators.

The wave power plant is expected to provide electricity for more than 1,500 Portuguese households while displacing more than 6,000 metric tons of carbon dioxide produced each year by conventional power plants. If this first phase proves successful, 30 additional wave converters will be ordered by the end of 2006.



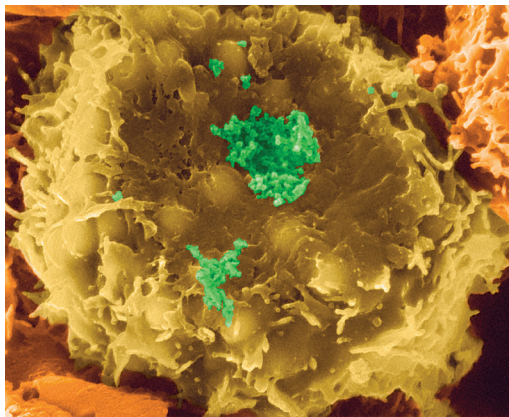
INFECTIOUS DISEASE

New Human Retroviruses

Retroviruses called human T-lymphotropic viruses (HTLVs) are found in two types—HTLV-1 and HTLV-2—in people all over the world. Genetic evidence suggests that they crossed into humans from simian T-lymphotropic viruses (STLVs) and that each type, plus various subtypes, have crossed independently. Now, two more types of HTLV have been found in humans living in central Africa.

At least 22 million humans are infected with HTLV-1 or HTLV-2, and the viruses are endemic in several areas. About 2–5% of those infected with HTLV-1 develop adult T cell leukemia. HTLV-1 also causes a neurologic disease called tropical spastic paraparesis/HTLV-1 associated myelopathy. HTLV-2 is less pathogenic but is thought to cause similar neurologic illnesses and increase susceptibility to opportunistic infection.

William Switzer, a researcher at the Centers for Disease Control and Prevention, and his colleagues sequenced HTLV strains from a high-risk population: people in Cameroon who reported contact with nonhuman primate tissues through hunting and butchering or keeping primate pets. The study uncovered many previously unknown subtypes of HTLV-1, most with known correlates in nonhuman primates. The team also found that two people carried previously unknown HTLV types. One, HTLV-3, is similar to the nonhuman primate virus STLV-3. The other, HTLV-4, is genetically different from any known virus in humans or



Cross-species predator. A T lymphocyte infected with HTLV-1 (green), which causes a type of leukemia. Such viruses are believed to have crossed to humans from simians.

other primates. The findings appear in the 31 May 2005 issue of the *Proceedings of the National Academy of Sciences*.

Because HTLV-4 is so divergent from other HTLVs, this virus may have evolved in humans over quite some time, Switzer says. It's possible, though, that primates are infected with an equally divergent simian version that just hasn't been found yet. "We're screening primates in that same area to see if we can answer that question," Switzer says.

A group led by Antoine Gessain, head of the Epidemiology and Physiopathology of Oncogenic Viruses Unit at the Pasteur Institute, also recently found a subtype of HTLV-3 in a human, but it's somewhat different from the subtype Switzer and his colleagues found, which suggests "another example of multiple independent, cross-species transmission events," Switzer says. The HTLV-3 strain

Gessain found is extremely similar to a strain reported in the red-capped mangabey, which suggests that it crossed to humans very recently, Switzer says. Gessain's findings were published 9 May 2005 in *Retrovirology*.

The current dogma surrounding retroviruses is that cross-species transmission is rare, but finding so many near-identical strains between humans and nonhuman primates suggests this is not a rare event. Benign retroviruses probably cross from nonhuman primates to humans frequently, but we don't notice them because we don't get sick, says Bernard Poiesz, a professor of medicine at SUNY Upstate Medical University. "But every once in a while," he says, "one of them will jump and we may not handle it so well." —Melissa Lee Phillips

ECOLOGICAL CHANGE

Life Lessons

"All global environmental change eventually ends up as a human health problem," said Eric Chivian, director of the Harvard Center for Health and the Global Environment, opening the August 2005 First International Conference on Health and Biodiversity in Galway, Ireland. Speaker after speaker showed how careless disregard for the environment and its variety of life forms squanders potential new medicines, endangers our food security, and exposes us to new risks of infectious disease.

Many frequently prescribed drugs are derived from or patterned after compounds in natural sources, Chivian noted. For example, ziconotide—a pain killer 1,000 times more powerful than morphine—comes from marine cone snails that inhabit narrow ranges in coral reefs and thus are increasingly endangered by coral bleaching, mostly from global warming. How many other useful species are lost without our ever recognizing their potential?

Species loss may also mean the loss of valuable models for medical research, said Chivian. Black bears, which hibernate for several months over the winter without losing bone mass, could provide a clue to the cause of osteoporosis, an enormous public health problem. But bear populations in many parts of the world are threatened by habitat destruction and overhunting.

Discussion of sustainable food systems for developing countries focused on promoting the use of indigenous plants. In Lebanon, where diets are high in bread and refined grains but low in fruits, vegetables, and fish, a quarter of the children are overweight and a third of the women of child-bearing age are anemic. Malek Batal, a nutrition professor at the American University of Beirut, is exploring how wild plants such as fennel, mint, and salsify have the potential to increase diversity of nutrient intake and food security in poor communities. He found that wild plants offer antioxidants, flavonoids, fiber, iron, calcium, and many other nutrients. Being easily accessible, easy to use, and palatable, they also contribute to food security.

Interfering with ecosystems can have dire consequences for biodiversity, as conservation biologist Diana Bell of the University of East Anglia explained: when the South American myxoma virus was introduced into Europe in the 1950s to control rabbit populations, it contributed to the collapse of a species-rich ecosystem in which the rabbit was the keystone prey for more than 45 predators. Bell also identified the illegal trade in wildlife (especially small carnivores) in Southeast Asia as a dual threat to human health (as the origin of the SARS coronavirus) and massive species loss in this "biodiversity hot spot." She believes an interdisciplinary approach involving ecologists, microbiologists, medical specialists, and others will best advance research in the twin fields of human health and species loss.

The time to address biodiversity loss is now, speakers agreed. As Chivian said, "We are in deep, deep trouble with what we are doing to life on Earth. . . . We are tampering with the life support systems of the Earth in ways that we barely understand." —Dorothy Bonn

ehpnet

National Eye Institute

The National Eye Institute (NEI) is the primary institute of the NIH for supporting and conducting research on preventing, diagnosing, and treating eye diseases and other vision disorders. Currently the NEI oversees approximately 1,600 research projects at more than 250 institutions in addition to the research ongoing at its own facilities in Bethesda, Maryland. The institute also works to translate research findings into clinical applications and to raise public awareness about eye and vision problems. The NEI uses its website, located at <http://www.nei.nih.gov/>, to help disseminate information about its many programs.

The What's New section provides links to newly released NEI-funded research and other topics of interest to those in the field. The more in-depth News and Events section includes press releases, clinical alerts for professionals, information on meetings and special events, and a list of official statements and reports on vision.

The Health Information page links to information on 21 eye diseases and disorders. There is also a section on basic eye anatomy with diagrams of the eye, links to glossaries of eye terminology, a collection of eye care resources, NEI information provided in Spanish, and a way to order NEI materials online. The collection of eye care resources consists of an eye health organizations database; a page of frequently asked questions about clinical trials and how they are conducted; and tips on finding an eye care professional, procuring financial assistance for eye care, and talking to doctors about eye health.



National
Eye
Institute

NATIONAL INSTITUTES OF HEALTH

More information on NEI clinical trials is available on the Research Funding page and through the Clinical

Studies Database. The Research Funding page has information on grant and funding opportunities for researchers, news on staff appointments, updates on grants and funding policies, and overviews of councils and workshops of interest to NEI researchers, among other resources. The Clinical Studies Database provides a list of all ongoing and completed NEI-supported studies. This section also includes study results and lists of journal articles that have been generated by the research, as well as a list of NEI studies that are currently enrolling participants. Site visitors can search the database for studies under six topic areas or by keyword, study location, age of study participants, patient recruitment status, or study status.

The Education Programs page offers overviews of NEI outreach activities. Through the National Eye Health Education Program, the NEI conducts large-scale public and professional educational activities in partnership with national organizations. Specialty initiatives within this program focus on diabetic eye disease, glaucoma, low vision (when everyday tasks become difficult to do even with corrective lenses, medicine, or surgery), and educating Spanish-speaking Americans about eye and vision problems. VISION is a teaching supplement for grades 4 through 8 that is available for download at no charge. This 16-page guide helps teachers plan lessons about how the eye works, eye problems, and eye safety. The supplement was developed in cooperation with the Association for Research in Vision and Ophthalmology. THE EYE SITE is an NEI-sponsored exhibit that travels to shopping malls around the United States to educate the public about low vision, vision rehabilitation services, and vision adaptive devices, as well as about the NEI itself. The exhibit features five colorful kiosks and an interactive multimedia program. Another exhibit, VISION, educates visitors to science museums about how vision works and about how researchers are working to develop ways to protect our eyes from disease and developmental problems. —Erin E. Dooley

Baytril Gets the Boot from Bird Farms

Amidst calls from doctors and public health advocates, the FDA has banned the use of the antibiotic Baytril in poultry. The FDA is also reviewing requests to ban the use of other drugs given to animals. Although Perdue Farms and other producers stopped using Baytril before the July 2005 ban, an industry spokesman said alternative drugs are not as effective in dealing with respiratory illnesses in mass-produced poultry.

The ban is intended to stop the increase of drug-resistant strains of foodborne *Campylobacter*. *Campylobacter* infection causes abdominal symptoms and fever, and is one of the most common bacterial causes of diarrheal illness in the United States. According to the FDA, 20% of human *Campylobacter* infections involve the resistant strain.



WHO Knows About Radon?

The WHO has launched the International Radon Project to educate the public about the hazards of this chemically inert, radioactive gas that occurs naturally in soils and rocks around the world. The project will include a database of average radon levels in member nations, radon action levels, and mitigation measures, among other information. The WHO has also published a new fact sheet on radon and cancer as part of the project.

Radon may cause 6–15% of lung cancer cases, and moderate exposure may increase the risk of lung cancer in smokers by 25 times. Radon exposure in homes varies according to a home's location, ventilation, and presence of exterior cracks and openings.

From Carpet to Kilowatts

Each year some 4.7 billion pounds of carpet are taken to U.S. dumps, taking up almost 1% of the country's landfill space. Now Shaw Industries, the world's largest carpet maker, has opened a \$10 million power plant that is fueled by the 16,000 tons of scrap the company turns out annually as well as by 6,000 tons of sawdust produced by wood flooring manufacturing. The new plant powers one of the company's main factories, and should save the company \$2.5 million in fuel oil each year. The plant engineers say the process emits about the same amount of pollution as natural gas.

