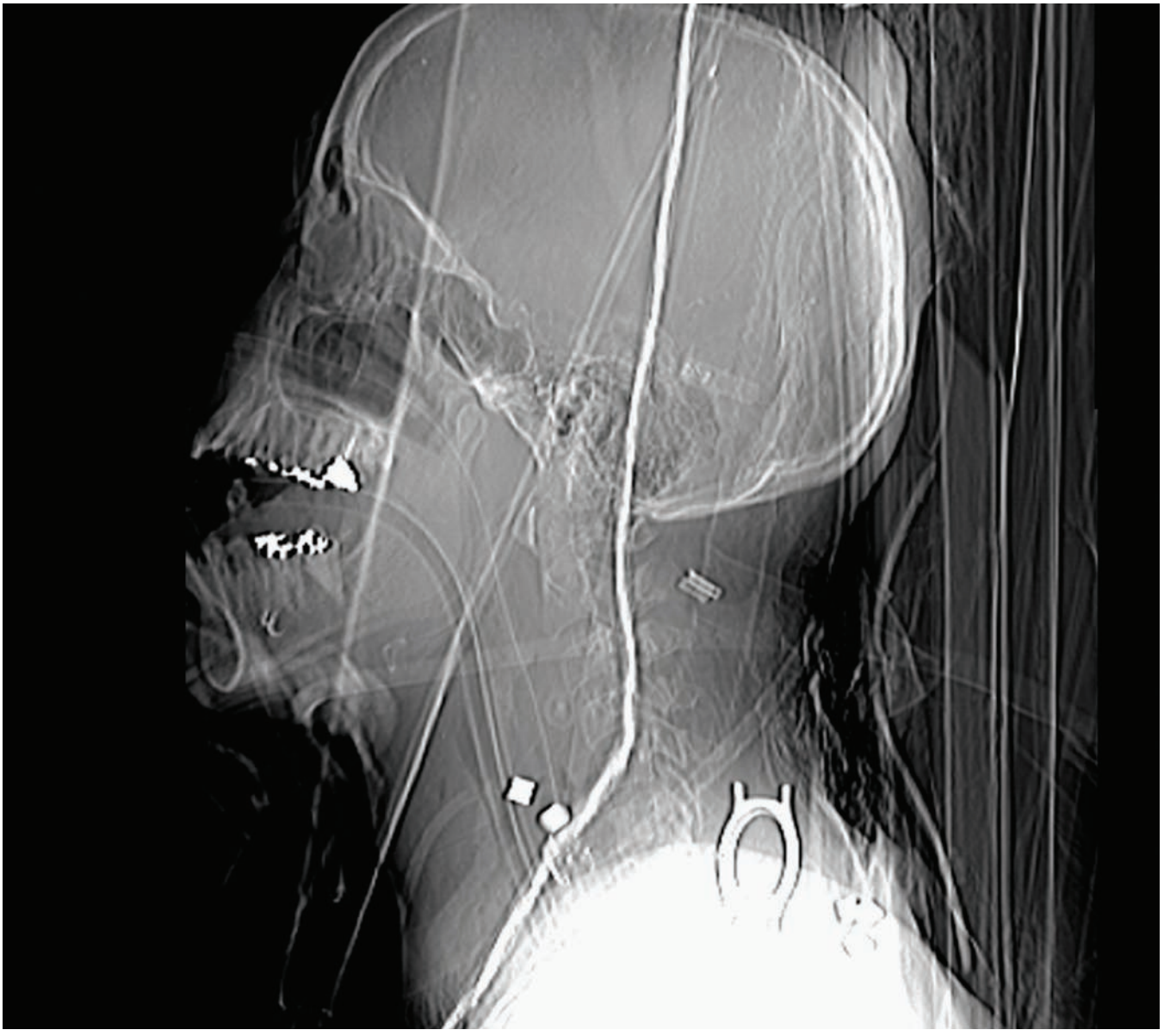
stat

COMING //

- **THROUGH JUNE 27:** The fight to make hand washing routine is documented in "Coming Clean," an exhibit of the University of Virginia's Historical Collections at the Claude Moore Health Sciences Library. Featured items include nineteenth-century antituberculosis posters and modern hand sanitizer ads.

- **JULY 1:** Medicare reimbursements are scheduled to be cut by 10.6%. Physician groups worry that this decrease, the deepest ever, will force doctors to stop accepting new Medicare patients or to opt out of the system entirely.



FOCUS // **AFTER A TERRORIST ATTACK,** it seems to photographer Diane Covert, victims are forgotten in the rash of questions about perpetrators and motives. For her exhibit "Inside Terrorism: The X-Ray Project," Covert collected images from two medical centers in Jerusalem and transferred them to Duratrans film so they could be viewed in daylight. The grotesque effects of homemade bombs appear in neat clinical detail: a nail in the throat, hex nuts in hips and, as shown, a watch that partially severed the victim's carotid artery and lodged in her neck.

DIANE COVERT; THE ORIGINAL DOCUMENTS IN THIS EXHIBIT WERE PROVIDED BY HADASSAH EIN KEREM MEDICAL CENTER AND SHAARE ZEDEK MEDICAL CENTER, BOTH IN JERUSALEM. "THE X-RAY PROJECT" IS PARTIALLY SUPPORTED BY THE DAVID PROJECT

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INTERVIEW //

Our Earth, Our Health

BY ANITA SLOMSKI

ANDREW HETHERINGTON FOR *PROTO*, PHOTOGRAPHED AT THE MUSEUM OF COMPARATIVE ZOOLOGY, HARVARD UNIVERSITY

With the extinction of both species of Australia's gastric brooding frog, medicine may have lost a treatment for peptic ulcer disease in humans. "We'll never know what mysterious substance the tadpoles secreted that allowed them to hatch in their mother's stomach without being digested," says Eric Chivian, who worries that other medical mysteries may remain forever unsolved as a result of global climate change and loss of biodiversity. In the early 1980s, Chivian, now assistant clinical professor of psychiatry at Harvard Medical School, helped drive home to the public the idea that nuclear war in one region could devastate human health worldwide, work for which he shared the 1985 Nobel Peace Prize. More recently, he founded the Center for Health and the Global Environment at Harvard Medical School and, as its director, has worked closely with Congress and the United Nations.

Q: In your upcoming book, *Sustaining Life: How Human Health Depends on Biodiversity* (Oxford University Press), you write that medicine will suffer a great loss if certain organisms become extinct. How so?

A: Polar bears, for example, can help teach us how to prevent and treat type 2 diabetes: They become enormously obese from eating seal blubber before hibernating, but they don't get the disease. Estimates are, however, that two-thirds of polar bears will be gone by 2050 as a result of global warming. Fortunately, they share other physiological wonders with nonthreatened bears: They don't get osteoporosis during the five to nine months they den. A substance in their blood recycles calcium, and they actually lay down new bone despite being immobile. Humans, by contrast, lose as much as a third of their bone mass if they are bedridden for that long. And denning bears don't urinate; their urea is turned into amino acids, then into new proteins. This amazing mechanism has implications for preventing and treating renal disease.

Q: You also mention that cone snails have secrets to teach us.

A: There may be 700 different species of cone snails, and each one is thought to make at least 100, maybe even 200, extremely potent toxins to paralyze prey. A synthetic derivative of one toxin is now on the market, a painkiller called

Prialt. It's thought to be at least 1,000 times more potent than morphine, and it doesn't seem to cause addiction or tolerance. Discovering a new class of painkillers is a watershed event. Yet coral reefs, where cone snails are found, are dying in many parts of the world as sea surface temperature warms.

Q: Last August, the Center for Health and the Global Environment took evangelical leaders and scientists to Alaska to witness the destruction of biodiversity there. Why bring together two groups that couldn't be more different in their views on the origins of life?
A: It's clear to me that both evangelicals and scientists share a deep and profound reverence for life. Evangelical leaders need us to help them better understand environmental science because they want to explain it to their congregations, and we need them for their effectiveness in conveying the messages we agree on. Evangelicals are highly effective at communicating and, with 70 million members in the United States, have enormous political power.

Q: When you were searching for a home for the Center for Health and the Global Environment, you insisted that it be housed at a medical school.
A: We wanted the information we were disseminating to be seen as clinical medicine rather than medical research. All physicians need to understand the health consequences of environmental change because they are going to start seeing those consequences: more patients with Lyme disease and other infectious diseases, more patients with heatstroke from more frequent heat waves and more patients whose blood pressure medication needs adjusting because rising sea levels deposit salt in wells near coastal areas. Physicians are powerful advocates for the environment; people listen when we talk about matters of public health.

Discovering a new class of painkillers derived from cone snail toxins is a watershed event. Yet coral reefs, where cone snails are found, are dying.

Q: What are the roots of your social activism?
A: I have to credit one of my medical school professors, Tom Fitzpatrick, who was chief of dermatology at the Massachusetts General Hospital and an expert on malignant melanomas. In 1971, when the United States was in a race with Britain and France to create a fleet of supersonic transport planes, Tom told the U.S. Senate that we'd see more cases of melanoma if we damaged the ozone layer with those planes. That was essentially the end of the debate in this country. I never forgot the power of a physician's testimony about what happens to human health if we proceed down a particular path. ■

BY THE NUMBERS //
Hospital Bound

1996 Year that the term *hospitalist* was coined in the *New England Journal of Medicine* by Robert M. Wachter and Lee Goldman to describe a doctor who treats only hospitalized patients and who, unlike specialists in the ER or critical care units, manages patients throughout their hospital stay

0 Training other than a residency required to become a hospitalist

12,000 Estimated number of hospitalists practicing in the United States

55 Percentage of hospitals with more than 200 beds and at least one hospitalist on staff

$191,436 Median 2007 salary for a hospitalist

$166,420 Median 2007 salary for a general internist

9.6 Median number of hours a patient's hospital stay is reduced when cared for by a hospitalist

$268 Median reduction in cost for a patient cared for by a hospitalist vs. one seen by a general internist

0 Statistically significant difference in deaths among patients cared for by hospitalists vs. patients cared for by internists and family doctors, according to a recent *New England Journal of Medicine* study

0 Statistically significant difference in readmission rates among patients cared for by hospitalists vs. patients cared for by internists and family doctors ■

The Eight Americas

BY LINDA KESLAR // INFOGRAPHIC BY FLYING CHILLI

Vermont and Massachusetts have begun providing health care insurance to all their residents, and 11 other states are wrestling with ways to do so. A worthy goal, to be sure, but universal medical insurance isn't the golden ticket to universally improved health, warn researchers at the Harvard School of Public Health.

In the most comprehensive study of life expectancy in the United States, published in 2006, Harvard researchers tracked death rates by county of residence and race, creating "race-county units." To combine these units into a manageable number of groups, they settled on the idea of eight "Americas." For each America, researchers estimated life expectancy, the risk of death from specific diseases at various ages, the percentage of people who had health insurance and the frequency of doctor visits. The findings: extreme differences in life expectancy—people in America 1 (Asians) live an average 13.8 years longer than those in America 8 (high-risk urban blacks)—but lack of health insurance is not the problem.

1. **Asians** living in counties where Pacific Islanders make up less than 40% of total Asian population
2. **Northland low-income rural whites** living in the northern plains and the Dakotas with 1990 county-level per capita income below $11,775 and population density less than 100 persons/km²
3. **Middle Americans**—all whites not included in Americas 2 and 4, Asians not in America 1 and Native Americans not in America 5
4. **Low-income whites in Appalachia and the Mississippi Valley** with 1990 county-level per capita income below $11,775
5. **Western Native Americans** living in the mountain and plains areas, predominantly on reservations
6. **Middle American blacks** living in counties not included in Americas 7 and 8
7. **Southern low-income rural blacks** living in counties in the Mississippi Valley and the Deep South with county-level per capita income below $7,500 and population density below 100 persons/km²
8. **High-risk urban blacks**—populations of more than 150,000 blacks living in counties with cumulative probability of homicide death between 15 and 74 years greater than 1%

Who's insured

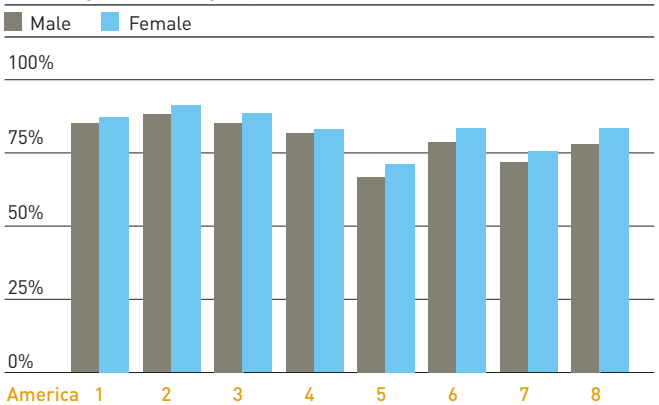
Compared with the wide variation in life expectancies, differences in health plan coverage across the eight Americas are slim. It's the same story with routine medical checkups; in fact, America 8 (high-risk urban blacks, the group with the lowest life expectancy) reported the highest rates of doctor visits. (Hispanics do not have their own America; rather, they are accounted for in the black and white Americas, depending upon the group with which they identified in the U.S. Census.)

Why they die

The top killers across all eight Americas are cancer, heart disease and noncommunicable diseases such as diabetes and cirrhosis—consequences of such largely controllable risk factors as smoking, alcohol use, obesity, high blood pressure and high cholesterol. Low-income whites in Appalachia and the Mississippi Valley (America 4), for example, have a life expectancy similar to people living in Mexico and Panama because of such individual factors as diet, exercise and smoking.

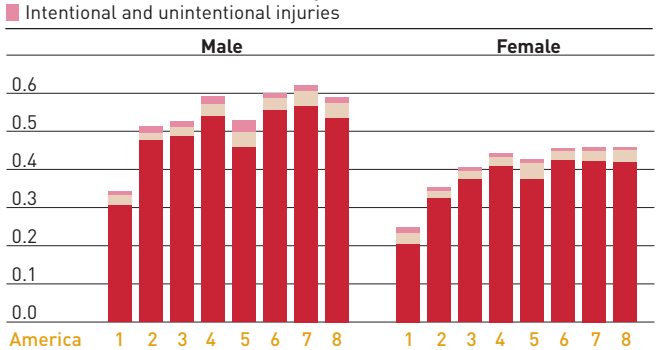
Health plan coverage

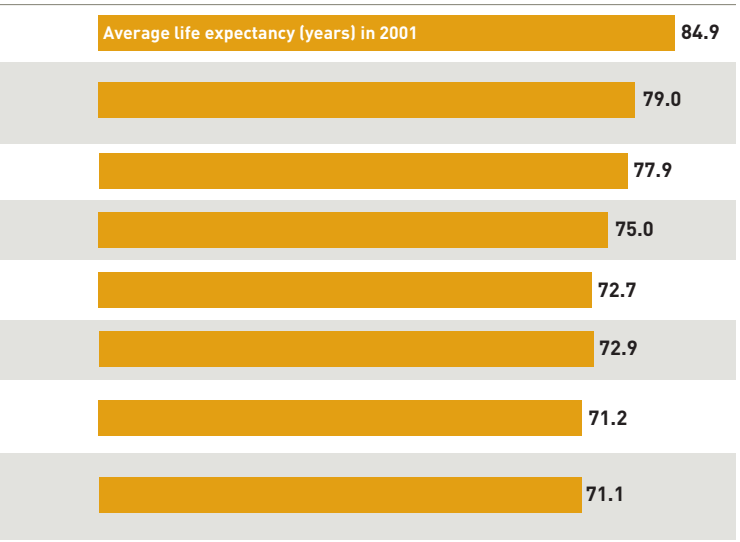
Percentage with coverage, by America



Mortality disparities

Probability of death by disease among males and females ages 75 to 84



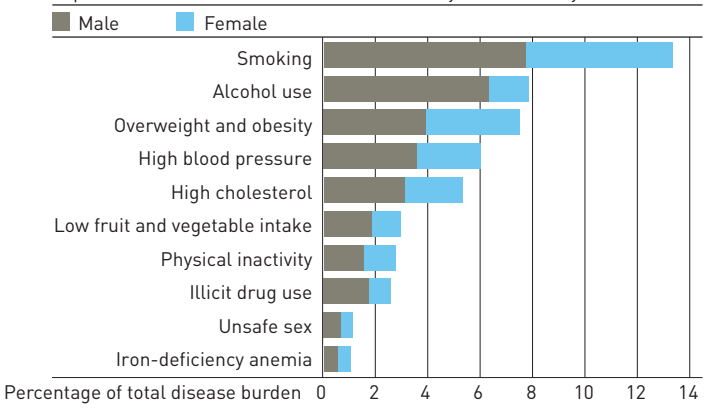


What needs to change

"A risk factor such as high blood pressure is four or five times more important than lack of insurance," says Christopher Murray, a professor at the University of Washington School of Medicine in Seattle, who led the 2006 study and its successor, which is due out this spring and expands on some of these findings. Yet educational campaigns and policies in place during the 20-year period studied seem to have had little impact on changing behaviors that could lower such risk factors.

Burden of disease

Top 10 risk factors in North American mortality and morbidity



MILESTONES //

The Balm in the Willows

THE GRANGER COLLECTION

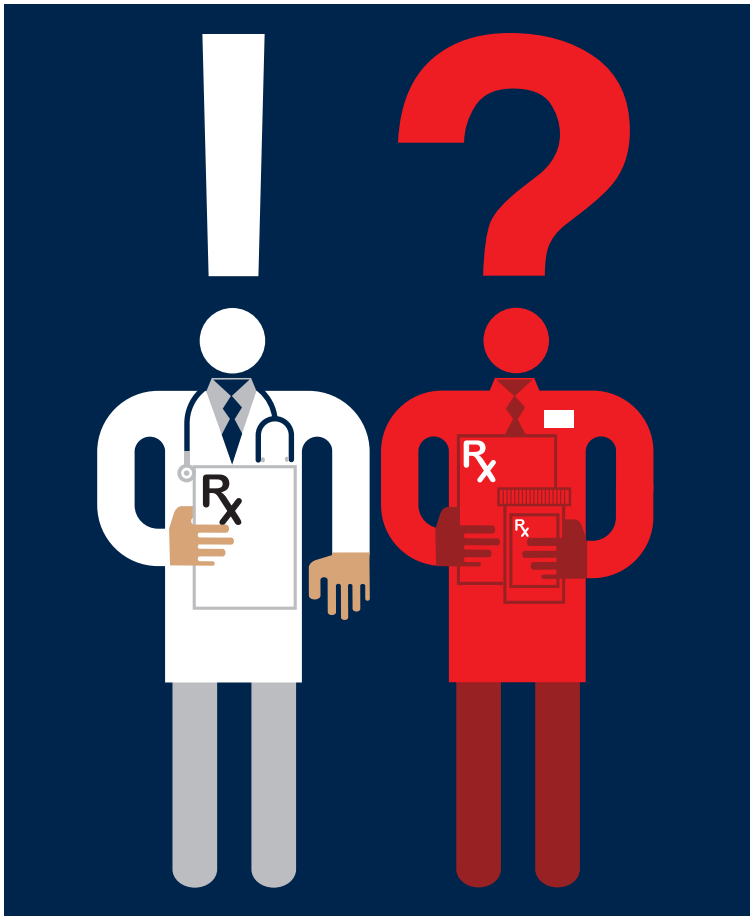
An Egyptian papyrus from 1500 B.C. prescribes a cooling poultice of willow leaves to treat inflammation; Hippocrates encouraged women in labor to chew willow bark; and Native Americans brewed a bark tea to soothe headaches. But it was not until the industrial revolution that the active ingredient in the willow tree was isolated. In 1828, Johann Andreas Buchner, a professor of pharmacy at the University of Munich, boiled a sample of white willow bark, distilled the solution and was left with a yellow substance that he named salicin, after *salix*, the Latin name for willow.

Soon after, the compound was purified into salicylic acid, and for years it was prescribed for rheumatic fever and arthritis, though the cure was often worse than the disease: The acid was overwhelmingly bitter and irritated the stomach. Then in 1897, Felix Hoffman, a chemist with Bayer & Co., hit upon a way of tempering the corrosive effects of the compound without losing its benefits. By century's end, his synthetic derivative—acetylsalicylic acid, or aspirin—was being sold in its modern-day form.

Prior to aspirin, pain relief often came in the form of heavy sedatives such as morphine. Mild, nonaddictive aspirin ushered in the era of nonsteroidal anti-inflammatory drugs, all of which inhibit an enzyme that produces hormonelike substances, called prostaglandins, that induce pain, inflammation and fever.

Ironically, aspirin likely would never have won FDA approval because it can cause stomach upset, ulcers and internal bleeding. Aspirin can also exacerbate such conditions as asthma and tinnitus and, in children, can trigger Reye's syndrome, a rare disease that causes brain swelling. Yet despite these many side effects, aspirin is the most popular drug in the world (yearly output, if stacked, could stretch to the moon and back). That's because it is much more than a painkiller: Most people who take it daily in the United States are seeking to reduce their risk of heart disease and stroke. And of the more than 25,000 scientific papers on aspirin published since its invention, some have reported results that hold promise for the treatment of such diseases as Parkinson's and preeclampsia (pregnancy-induced hypertension).

Research also suggests that aspirin reduces the risk of certain cancers, especially of the colon. But, warns Michael Thun, vice president of epidemiology and surveillance research at the American Cancer Society, the risk of internal bleeding will outweigh aspirin's possible benefits until the treatment has been proved effective across many cancers. A number of studies are in the pipeline, however, and the search for a miracle drug may lead us right back to our own medicine cabinet. ■



POLICY WATCH //

Class Conflict

BY DAVE HOWARD

Buying a pack of cigarettes takes just proof of age and less than $10. But breaking the nicotine habit with, say, the drug varenicline requires a doctor's prescription. That's "an unacceptable irony," says professor Daniel Hussar of the Philadelphia College of Pharmacy, which is why he and many of his colleagues support the creation of a third drug category.

There are two classes of drugs today: those available on pharmacy and grocery shelves and those physicians prescribe. The proposed third category—known as "behind the counter," or BTC—would be prescribed by pharmacists.

Here's how it might work: Patients with easily diagnosable conditions (such as nicotine addiction) would describe their symptoms to a pharmacist, who would then conduct a clinical evaluation, which might include drawing blood and reviewing a patient's relevant medical records. After prescribing medications, pharmacists would be responsible for monitoring their effects. (They would likely receive training in drug administration before being licensed to do so.) The types of drugs most frequently mentioned for inclusion in this category are antismoking products, epinephrine auto-injectors (for people at risk of dangerous allergic reactions) and statins (for those with high cholesterol).

The proposal has opened a rift as physicians, the American Medical Association and over-the-counter drugmakers face off against the American Pharmacist Association and the American Society of Health-System Pharmacists. "When a drug is considered unsafe without supervision, a physician should be supervising its use," says Joseph Cranston, the AMA's director of science, research and technology. A third class of drugs, he says, would remove the "vital step" of physician treatment. He notes that it could also force consumers to pay higher costs if insurers refuse to cover medications that are not prescribed by doctors.

William Zellmer, deputy executive vice president of the ASHP, counters that the new category would be limited to medications with high ratios of benefit to risk. In the past, Zellmer says, making certain drugs widely available by removing them from the prescription-only category has had a clear public health benefit. When a prescription was no longer required for several nicotine-replacement products, their use spiked, increasing as much as 200% in the first year following their switch to OTC status. Varenicline, a relatively new drug, would be a candidate for BTC status because it lacks an adequate track record and some users have experienced problematic side effects.

Many pharmacists think the BTC category would also improve general health by lowering barriers to helpful medications. That's because, industry experts say, pharmacies are often the entry point into the health care system for people who can't—or won't—see a physician for economic or sociological reasons (such as illiteracy or a fear of doctors).

Great Britain and Germany are among the nations that have created a BTC category, but the pros and cons are still being debated. A Canadian government official told the FDA during testimony in November that Canada has generally embraced the designation. No further hearings are planned, but the FDA "remains interested," spokeswoman Karen Mahoney says. ■

CARLOS APONTE

UPDATE //

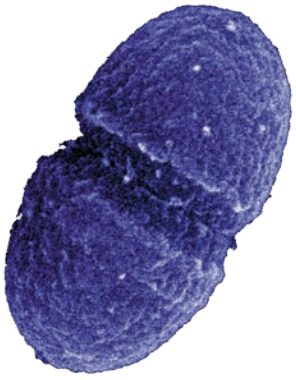
The Autism Gene

When the article "You Can Hurry Science" was published in *Proto* (Winter 2006), researchers knew that autism, a neurodevelopmental disorder affecting as many as one in 166 children, had complex genetic causes. Those factors were known in fewer than 10% of cases, and they were associated with other disorders. But in February, two research groups independently reported the first strong genetic cause to be specifically associated with autism: a variation on chromosome 16 that often arises spontaneously and accounts for about 1% of cases.

One percent seems meager, says Mark Daly at the Center for Human Genetic Research of the Massachusetts General Hospital, who is senior author of one of the studies, but in fact the variation opens the door to understanding autism's underlying biological pathways. As researchers drill down to find the gene responsible, he says, they can begin as well to connect the dots to other genes that share the same pathways and thus might also play a role in autism. And Children's Hospital Boston is already developing a diagnostic test to spot the chromosome 16 variation.

University of Chicago researchers, who published their results in the journal *Human Molecular Genetics*, studied 712 subjects, whereas members of the Autism Consortium in Boston, whose results appeared in the *New England Journal of Medicine*, scanned the DNA of more than 2,000 subjects in three different populations. Both groups were able to make such strides because they could process data more quickly than ever—the latest generation of gene chips can analyze more than a million genetic variations in patients—and because they were more willing to band together across institutions to share information.

That's some consolation for Portia Iversen, who, with her husband, Jon Shestack, founded the Autism Genetic Resource Exchange, upon which both research groups relied for samples. "There's such an abundance of data now that everybody's scrambling," she says, a very different picture from when their son Dov (above) was diagnosed in 1994. Dov, now 15, can communicate through typing and is beginning to talk. "There are better minutes and worse minutes," Iversen says. "But for him, he's doing really well." ■



FROM TOP: MICHAEL EDWARDS FOR *PROTO*; COURTESY UNITED STATES DEPARTMENT OF AGRICULTURE

DEFINED //

human microbiome

['hyü-mən 'mīkrō'-bī'ōm'] n: the collective genome of all microorganisms that inhabit the human body; it is now being mapped by a $115 million National Institutes of Health project.

In humans, microbial cells outnumber human cells by as many as 10 to one; some 182 species of bacteria are known to thrive on a two-centimeter-square patch of human skin. Until recently, scientists had only a glimmer of an idea how microbes affect our bodies—some help us digest food and synthesize vitamins, while others have been connected to illness, including immune diseases and digestive disorders. Beyond that general understanding, though, microbiologists haven't made much headway because they haven't been able to re-create the microbes' environment outside the body to examine how they work together.

The NIH's Human Microbiome Project, launched in December, will not only study single microbes (as in traditional microbiology) but also use a new research approach called metagenomics, which analyzes all of the genetic material derived from samples of microbial communities harvested from volunteers' noses, mouths, skin, digestive tracts and, in women, the urogenital system. The project will begin by sampling healthy subjects to learn more about the microscopic communities that exist in a body that is functioning properly; those results will then be compared with samples from subjects with various diseases to pinpoint which combinations of microorganisms correlate to which diseases. Analysis of that data might then show how to treat patients by readjusting their microbial balance instead of prescribing drugs. ■