Global concerns

By James Strickler, M.D.

This magazine has often featured stories about Dartmouth Medical School students and faculty who study, do research, or provide clinical care in countries all over the world. These international pursuits reflect DMS's growing interest in global health, especially in the developing world, where the pattern of diseases is different than in the United States and where assessing the health needs of populations, not just individuals, is critical. Schools of public health have traditionally emphasized the need to understand diseases in a global context and to focus on the health of populations. It's time now for more American medical schools to expand their horizons and likewise become more globally oriented.

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Transmission: The globalization of world commerce, communications, and transportation has globalized disease transmission. Poor health in any country can spread beyond its borders to adversely impact the health, the economy, and the security of any other nation, including affluent, industrial nations like the United States.

During the past three decades, at least 14 new infectious diseases have been identified. Witness, for example, the economic, social, and political havoc caused by the dissemination of HIV/AIDS. In addition, a number of long-recognized infections that were previously geographically contained have now spread far and wide. Witness the emergence of West Nile virus in the U.S. and the reemergence of dengue fever in the Caribbean and Central America. Drug-resistant diseases—like tuberculosis and malaria—are spreading rapidly, too. And the more Americans travel overseas, the more important it is for them to understand health risks they will encounter abroad, including exposure to diseases not well known to most American physicians. Then add to these challenges the fear that contagions such as smallpox or anthrax may be used by terrorists.

Dilemma: Gro Brundtland, the director-general of the World Health Organization, summarizes the dilemma by saying, "All humankind today paddles in a single microbial sea. There are no health sanctuaries." The message is clear: the U.S. needs more physicians who recognize the global patterns and intricacies of infectious diseases.

A 1997 report of the Institute of Medicine's Board of International Health—titled "America's Vital Interest in Global Health"—states that "the direct interests of the American people are best served when the United States acts decisively to promote health around the world." The report's authors predicted that by 2020, ischemic heart disease, unipolar depression, and traffic accidents will replace infectious diseases and perinatal conditions as the leading causes of morbidity and mortality. The U.S., with its strength in medical science and technology, is expected to be an international leader in addressing global health concerns. The report also points out that the burden of worldwide illnesses can best be addressed by cooperative partnerships among nations and nongovernmental organizations.

In the past, health problems in foreign countries have been an ethical but not a strategic concern for those who set our foreign policy. A significant amount of U.S. foreign aid has been directed toward improving health in poor countries, but most experts feel the primary incentive for this aid has had little to do with national security. But today, owing in large measure to the destabilizing political and economic impact of HIV/AIDS, most notably in Africa, widespread ill health in poor countries is emerging as a major foreign-policy concern. The threat of bioterrorism since September 11 has significantly increased this worry.

Strategic sense: A report by the Council on Foreign Relations—"Why Health is Important to U.S. Foreign Policy"—explains that "improving the health of people in other countries makes both strategic and moral sense as an integral part of future U.S. foreign policy." Secretary of State Colin Powell agrees.

In sum, a strong case can be made for strengthening our expertise and leadership in global health. The reasons are intensely political and economic, not just humanitarian. U.S. medical schools should recognize the importance of nurturing a strong cadre of physician leaders in global health, adjusting their educational objectives and opportunities, if necessary. A modest step would be to increase the number of well-designed overseas educational and research opportunities for medical students and faculty. The principal purpose of these offerings should be to inform more students about health in other lands and to motivate some to seek careers in global health. This curricular adjustment should enhance, not compromise, schools' core missions, which are to teach students how to become thoughtful physicians and to advance knowledge in the biomedical sciences.

DMS is already playing an important role in the global health arena by encouraging medical students and physicians to participate in clinical and research opportunities throughout the world. Expanding and improving these opportunities will inspire more students and faculty to assist the medically underserved everywhere, while concurrently strengthening both health education and research. ■

"Grand Rounds" (formerly titled "Faculty Matters") covers a topic of interest to the Dartmouth medical faculty. Strickler is a former dean, a professor emeritus of medicine and of community and family medicine, and a 1951 alumnus of DMS; he also cochairs the International Rescue Committee and is a director of the Global Health Council.

Lawyers-turned-doctors

By Peter Frech, Sharon Johnston, and Paul Testa

"The first thing we must do is kill all the lawyers," said Dick the Butcher in Shakespeare's *Henry VI*. Contrary to the popular belief of many a medical school professor, that proposal was not intended to better society. Rather, Dick the Butcher was suggesting a way to eliminate those who might stand in the way of the coup that he and his henchmen were planning. Nevertheless, the stage was set for several hundred years of lawyer jokes.

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The ensuing conversations are often stimulating and show how dependent medicine and law are on one another.

But it's no joke that a few lawyers—as well as doctors—have decided to become physician-lawyers. Who else is better suited to unraveling the complexities of a health-care system that involves the government, managed care companies, and the courtroom? Still, many people are surprised that lawyers are willing to take on the demands of a medical education.

Take our classmates' reactions when they found out that we were attorneys. Invariably, their facial expressions reflected disbelief and curiosity, and they did a quick eyeball assessment to confirm our sanity. The most common question was "Why take on med school when you've already completed the rigorous training to become an attorney?" To our classmates' credit, they listened to our explanations with interest, caring, and quiet understanding.

Universality: It wasn't long, however, before they began to realize that we had entered medicine for the same reasons they had: We were drawn to the profession of healing because we want to help people and we are fascinated by the universality of scientific truth.

As our classes got under way, we noticed some similarities between law school and medical school. In law school, we had grown accustomed to spending long hours analyzing legal cases and judicial precedents. In medical school, we were spending long hours poring over anatomy texts, peering at histology slides, and examining cadavers. In law school, we had learned how essential it was to be organized and to thoroughly understand cases in preparation for a trial. In medical school, we were expected to have a thorough understanding of a patient's condition before presenting the case to the attending physician on morning rounds. And being able to communicate effectively is crucial in both law and medicine.

There have been differences, too; our legal training had prepared us for only some of the rigors of medical school. Learning law means becoming familiar with a set of rules that are driven by principles of equity and fairness. If you are taking a test and don't know the pertinent law, you can usually use intuitive reasoning to figure it out. Medicine, however, requires far more memorization. Intuitive reasoning most certainly has its place in medicine, but it is a field premised much more on hard data than is the law.

We have also been amused and surprised by others' perceptions of lawyers. Sure, we've heard, chuckled at, and told our share of lawyer jokes. But every so often something unexpected happens—like the professor who interrupted while one of us was introducing himself to the class: "You're the attorney," he said. "You can sit down. We don't need to hear any more from you."

Perspective: Most clinical faculty, however, have been eager to have us to share our unique perspective. We not only can raise legal issues, but we can share our perspectives from having worked with clients, delivered bad news, and managed our own trials. Faculty and our fellow students have listened when we explained the nuances of informed consent, power of attorney, competency, and patient confidentiality. Classmates have turned to us with fascinating legal questions drawn from hypothetical situations that we could well encounter as doctors. Although there may be no "right answers" to the questions that they raise, the ensuing conversations are often stimulating and help to show how dependent medicine and law are on one another.

There is great value in exploring the relationship between our systems of law and of health care. Doctors, nurses, and other health-care providers are advocates for their patients. What we share as attorneys and hope to bring with us as physicians is an understanding of how advocacy effects change. As a society, we choose to control much of the provision of health care through the legal system. As doctors first, and attorneys second, perhaps we can find a way to contribute to the ongoing dialogue about what health care is to become in the future.

Dynamic dialogue: The three of us came to medical school to become physicians and to care for patients. We also hope to use our legal knowledge to benefit the medical community. We have seen firsthand that at Dartmouth, there is a dynamic dialogue flowing among doctors, medical students, patients, and their families and that there is a commitment to crafting patient-centered outcomes—a model that the law has used for generations.

Perhaps one day, physician-lawyers like us will make it easier for attorneys and doctors to work together more effectively as they deal with the constantly changing field of health care. ■

"Student Notebook" (formerly titled "Student Perspective") shares word of the activities or opinions of students and trainees. All three authors of this essay were lawyers before they entered medical school. Frech, a DMS '02, went to law school in Seattle, worked there as a criminal prosecutor, and then had his own practice in northern Washington. Johnston, an '03, received her legal education in England and worked as a clerk for a Canadian judge. And Testa, an '04, attended law school in Boston and worked as a health-care and litigation associate in corporate law firms in New York City and Boston.

Too much iron?

By Leo R. Zacharski, M.D.

We are barraged today with iron in vitamin and mineral preparations and in all manner of iron-supplemented foods, yet too much iron in our diet can be dangerous and may increase the risk of cardiovascular disease. In fact, most of us take in several times more iron than we need to replace the trace amounts that we lose in urine and in cells that are shed from our skin and intestinal tract.

In 1981, Jerome Sullivan, then a pathologist at the University of South Florida, observed a correlation between increased levels of iron and age- and gender-related heart-attack rates in the general population. He published his hypothesis—that body iron stores might contribute over time to vascular disease—in the *Lancet*. Sullivan's hypothesis was controversial because hormone levels or other factors were considered to be more likely contributors to heart disease risk. But more recent epidemiological evidence has discounted the role of hormones and has supported Sullivan's findings.

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Too much iron in our diet can be dangerous. Will cereal manufacturers soon label their products "no iron added"?

Excess: The key is in deciphering what levels of iron might be toxic. Amounts of iron are assessed by measuring serum levels of two iron-binding proteins—transferrin, made by the liver, and ferritin, made by all the cells in the body. Transferrin picks up iron from the intestines and from storage sites, and delivers it to cells where the iron reacts with oxygen for respiration and supports DNA synthesis. Only a tiny fraction of total body iron is bound to transferrin. However, all cells are programmed to anticipate damage from too much iron and to produce ferritin to capture excess iron. Excess iron can be tracked because leftover iron-protein complexes have nowhere to go and break down to form microscopically detectable deposits—that look like purple blobs in stained tissue—called hemosiderin. Hemosiderin is deposited throughout the body in the reticuloendothelial system, the inflammatory cell network that defends against outside threats and serves as the body's "toxic waste dump."

Levels: Ferritin levels vary dramatically between males and females and with age. The normal range for ferritin—15 to 300 nanograms per milliliter (ng/ml) of serum—represents a whopping 20-fold spread that is far greater than the range for virtually any other blood measurement. Ferritin levels in children, menstruating women, and athletes average about 25 ng/ml. In children, there's less apt to be excess iron because growing muscles use so much of it. Menstruating women—and blood donors—shed excess iron in the blood they lose. In males, ferritin levels begin rising in the late teens. In females, the levels don't increase until after menopause. It was because of this disparity that Sullivan was able to correlate ferritin levels with coronary risk.

How can an essential mineral like iron be toxic in excess? We know that as iron atoms lose or gain electrons, they become highly reactive free radicals that can damage lipids and cells. The more iron, the more free radicals; the more damage, the more disease. Too much iron activates platelets, increases the cellular trigger for blood clotting, and decreases levels of nitric oxide, the molecule that causes blood vessels to relax. But when the amount of iron is decreased, the levels of nitric oxide and "good" cholesterol increase, and the level of "bad" cholesterol decreases.

In 1993, we began testing the iron hypothesis in patients at the VA Medical Center in White River Junction, Vt. We confirmed that ferritin levels vary with age and that they are different in males and females. We also noticed that in blacks (compared to whites and Hispanics), there's an exaggerated rise in ferritin with age for both genders. We found that iron stores can be reduced—by calibrated blood removal—to ferritin levels typical in children and premenopausal women. Then, in 1999, we began a controlled study to examine the long-term effects of reducing iron stores in patients with vascular disease. Enrollment has been completed, with 1,350 patients entered from 24 VA hospitals. We already know that high ferritin levels predict coronary risk, adverse stroke outcome, atherosclerosis, and increased thickness of the carotid artery wall, as well as poor blood flow through the heart muscle. Our study is designed to determine whether purposely reducing iron stores will alter long-term patient outcomes. Time will tell.

Beware: How will policy-makers, and those concerned with environmental toxins and "natural" foods, view the results? The FDA allows sale of over-the-counter iron preparations ad lib for self-treatment, and the Centers for Disease Control and Prevention has taken a "wait-and-see" attitude. But vitamin manufacturers recognize the problem—they already make iron-free products for men and for senior citizens. Will cereal manufacturers soon label their products "no iron added"? For now, individuals are advised to consult with their physicians, get tested, and heed the advice "Consumer beware!"

At the very least, this hypothesis signals a special interdependence between humans and the environment and a possible new way for individuals to participate in their own health maintenance. The implications of finding a low cost, low-tech, non-toxic, drugless method for disease containment continue to challenge the imagination. ■

"Bench to Bedside" explores the research underlying advances in clinical medicine. Zacharski is a professor of medicine at Dartmouth Medical School and associate chief of staff for research at the VA Medical Center in White River Junction, Vt.

The mysteries of science

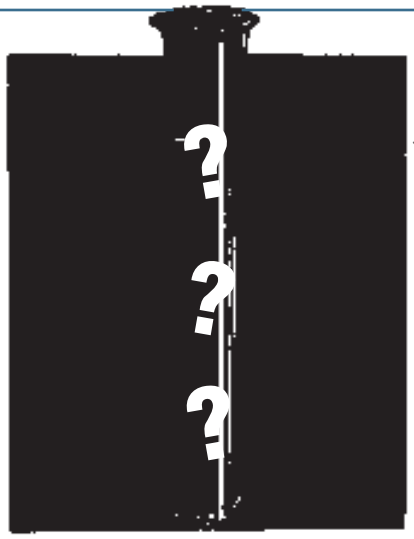
By Laura Stephenson Carter

No fair! The organizers of a recent professional meeting I attended—the Nieman Conference on Narrative Journalism at Harvard—made it impossible for me to skip the final session. I was tired. I wanted to head home to the Upper Valley. I had work to do (for other parts of this issue of Dartmouth Medicine, in fact). But they had invited one of the greatest scientists alive—Edward O. Wilson—to give the closing keynote address. There was no way I was going to leave early.

So I settled into my chair to listen to a leading authority on ants, the father of biodiversity, and a scientist who knows how to write.

"The ideal scientist thinks like a poet, works like a bookkeeper, and, all too rarely, writes like a journalist," Wilson said at one point during his talk.

There have been times when I'd have settled for a scientist who knows how to speak plain English.



SUZANNE DEJOHN

Edward O. Wilson—the father of biodiversity and a scientist who knows how to write—read to us: "In our heart, we hope we will never discover everything." I like that.

Stories: But scientists *can* write stories, according to Wilson. The trouble is that those "stories" usually take the form of scientific papers, which have their own rigid structure, language, and rules.

First in such papers comes the abstract, which Wilson described as a sort of "*Reader's Digest* version of a few hundred words about the subject." For 90 percent of readers, that's as far as they'll get ("readers" here being other scientists, who have to read so many journals to keep up with work in their field that they often just skim to capture the essentials). Wilson explained that the writing in the abstract—as well as in much of the main body of the paper, which is broken down into sections about materials, methods, and results—is as deadpan as a tax report, because "any deviation in style, any hint of emotion" would discredit the scientist.

Wilson added that there are, however, some parts of a scientific paper where a little creativity may be appropriate. In the introduction of "a well-written scientific paper, you tell a story—what has gone before, the amazing results that you are about to report. Who did what. Why the subject is important. And even, ever so briefly," Wilson explained, "a hint of what is to come. You're allowed a little latitude in expression, a flash or two of muted emotion."

A bit of emotion: In the discussion section, too, Wilson said, there's a chance to introduce a bit of narrative. There, the scientist speculates about the meaning of the work and the future of the subject and has a chance to offer up "a bit more emotion, although chaste—like a smile and a lift of an eyebrow across a crowded room." He paused then long enough to let the audience's laughter die down. "What should shine through, however," he went on, "is the creativity and hard work and vision that went into your scientific report."

Okay—I found myself feeling sorry for poor scientists who are forced to understate their findings because "hyperbole, no matter how brilliant, spells death to the scientific reputation."

On the other hand, Wilson is one of those rare scientists who manages to convey his excitement about his work, while still being careful to get the facts right. He considers himself, and fellow scientists, to be treasure hunters. (Picture the Indiana Jones of the science world.)

He then read aloud, from his 1992 book *Diversity of Life*, a passage where he had blended fact with nonfiction creative writing. The book is set in the Amazon rainforest. His research was about the role of ants as dominant elements of the ecosystem, and he was describing the various forces that can destroy ecosystems: a tropical storm, from which the forest can recover quickly; the 1883 explosion of Krakatau, from which recovery took decades; the great meteorite strike at the end of the Mesozoic era, which caused damage that took millions of years to repair; and current human activities.

Compelling description: The passage he read to us included a compelling description of a tropical thunderstorm: "The thunderhead reared up like a top-heavy monster in slow motion, tilted forward, blotting out the stars. The forest erupted in a simulation of violent light. Lightning bolts struck, broke to the front, and then closer to the right and left, 10,000 volts dropping along an ionizing path at 800 kilometers an hour, kicking a countersurge skyward—10 times faster back and forth in a split second, the whole perceived as a single flash and crack of sound."

Then, as he continued to read, he shared a secret: "The unsolved mysteries of the rainforest are formless and seductive . . . the unknown and prodigious are drugs to the scientific imagination, stirring insatiable hunger with a single taste. In our heart, we hope we will never discover everything. We pray that there will always be a world like this one at whose edge I sat in darkness. The rainforest and its richness is one of the last repositories on Earth of that timeless dream."

"In our heart, we hope we will never discover everything." I like that. I left Wilson's talk with even more appreciation for the work of scientists—and with even more eagerness to return home so I could write about the work of Dartmouth Medical School's scientists. ■

"Point of View" provides a personal perspective on some issue in medicine. Laura Carter, the associate editor of Dartmouth Medicine *magazine, was invited to write a synopsis for a journalism Web site called Poynter.org of a session on science journalism at a recent professional meeting she attended. This essay is adapted from that piece.*