New Directions for Biomedical Science

Biomedical science faces two critical questions in the 21st century. One is brand new, having become especially urgent in the world that has existed since September 11: How do we ensure that our enormous investment in biomedical research makes a difference for the safety as well as for the health of ordinary people?

My mother, a 90-year-old lawyer with an active practice, asked the question with painful precision: "We give all that money to your famous NIH," she said. "How could they not know that anthrax could escape through a sealed envelope?" Indeed, how can it be that modern molecular biology didn't know that could happen? In truth, of course, we never anticipated that a terrorist attack would come through the mail. We worried instead about terrorists releasing a deadly pathogen in a public place.

In this new world, it is clear that science must follow new directions. At grand rounds at the University of Miami School of Medicine recently, I told the doctors and students that we have to assume that the greatest threat to come will be something we have never seen before. What we used to tell medical students was, "If you hear the pounding of hooves, don't think zebra." Now, I'm afraid, they do need to think zebra.

The events of the past few months have dramatically illustrated that our strongest defense against bioterrorism of any kind must be at the local level. It is clear that the federal agencies responsible for public health and research must have substantially more resources to respond to threats. But the Centers for Disease Control and Prevention was never designed to be a local lab testing thousands of people. The real battle must be waged in state and local health departments, in hospitals, and in the offices of family doctors. Those doctors must be trained in what to look for to recognize anthrax or smallpox. They must get diagnostic help from local labs. And they must be able to make treatment decisions within the narrow window allowed by these deadly agents.

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All this will depend on the research base we have built to answer the other, older question: How do we apply science to health? Support for that research depends on whether the public perceives its benefits. Our investment in research has grown enormously. In the best of all worlds, how quickly can we turn that work into treatments that improve and prolong lives? What may seem like rapid progress to us can never feel fast enough to a person with Alzheimer's disease, or diabetes, or multiple sclerosis.

We also need to ask: Who will translate the research results into diagnostic tools and lifesaving treatments? We need people who understand scientific findings and who also understand patients: MDs; MD/Ph.D.s; or, more often, nurses. But the pressures on physicians and nurses have reduced the likelihood that they will get involved in research and thereby become effective translators. Creative solutions include combined clinician/researcher tracks in medical schools and programs to pay back the medical school loans of physicians who go into research. We have raised the quality of training for nurses; we must now integrate them into decision-making.

Whether the battle is against cancer or bioterrorism, there are doors for which we have not yet found the keys. We must open those doors carefully, never letting our science get ahead of our ethics. Science and technology are not inherently moral; the responsibility for putting them to a moral use belongs to us. The vast majority of government-sponsored studies adhere to the highest ethical standards. But even one lapse is one too many. The moral and ethical reasons for meeting the high expectations Americans have for clinical research are obvious. But there are also practical reasons: If we cannot guarantee the safety of patients in clinical research, public support for gene therapy and other potentially lifesaving treatments is likely to evaporate.

Finally, if citizens are educated about where we are going in genetic research, about the way anthrax and smallpox work, and about the promise of stem cells, they will make better decisions for their families, their communities, and their nation.

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