

Statement by Joshua Lederberg

Very appropriately, most of my colleagues will stress their analysis of the public benefits that ensue from the overt products of biomedical research. It has been the pride of NIH to have sponsored innumerable discoveries on the biology of the human organism, and of our microbial predators -- discoveries that have assisted the ongoing defense against disease. Despite setbacks like the HIV epidemic, life expectancy in the US -- one excellent measure -- has steadily improved throughout this century, from 47 years in 1900 to 76 at the present. Pushing up that expectation is ever harder, as we face the more difficult challenges of cancer, heart disease, cardiovascular disorder, neurological deterioration ... but our progress has been steady, in many areas very exciting especially with the insights derived from genetic analysis.

But I would assert that equally important is the human capital, the skills, ideals, imagination and motivation of the scientific investigators whose work depends absolutely, day by day, on research support from the NIH. We have discovered a deep fount of creativity in the young people we have been training; and they have spilled over from academia into government and industry. In the process they have generated enormous economic advantage for the nation, most explicitly in biotechnology and pharmaceuticals, where the U.S. has unquestioned world leadership. As generous as it has been, NIH funding has not kept pace either with the scientific opportunities, nor with the talents that could be cultivated and brought to bear. So the prospects of a new acceleration in this domain are very encouraging, and there can be no doubt that the investment will be repaid many times over.

The two substantive topics I would put on the table are

1. infectious disease, and 2. aging in its most fundamental aspects.

1. My own research for 55 years has probed the genetics and evolution of microbes. While I have only occasionally worked directly with pathogens, that background has led to the elucidation of the role of plasmids, as the means why which "germs" conspire with one another, and to a particular perspective of how we relate as a species in relation to these micro-predators. In fact the microbes are our only serious competitors, and we know that in the end they will win ... dust unto dust. Our destiny is in the details. It serves the pathogenic microbe no advantage to kill its host, that is an almost incidental byproduct of its struggle against our physiological defenses; and the "smartest" pathogens are those that keep the host alive - but infected - so that we continue to serve their needs for food and shelter. If we could better understand how that balance is maintained, it would be of enormous advantage in our unremitting struggle.

The global pandemic of AIDS has been a poignant reminder of the need to maintain and strengthen our vigilance about the evolution and emergence and of microbial threats to our health. We had another reminder with the episodes of avian influenza in Hongkong. These had a very high mortality -- six out of 18 cases diagnosed as A-H5N1 -- but as events turned out, we were very lucky: this flu was not readily transmitted from human to human, and

what might have evolved into another 1918-like catastrophe was nipped in the bud. This was no accidental circumstance, but the result of well tuned international collaboration, and energetic response on the part of the Hongkong health authorities. In turn they depended on studies of virus biology and diagnosis that have deep roots in NIH-funded investigations over the past 30 years. All authorities caution that such episodes will recur -- if not flu, then any of scores of emerging and reemerging infections. Similar problems challenge us in the spread of antibiotic resistant microbes, and the need to understand how these evolve, and how better to approach the design of new generation drugs.

Coping with new infectious disease has also become a depressing element in our national security planning. With the end of the Cold War, we are no longer locked in a strategy of mutual deterrence with another superpower. Instead, rogue states, guerilla groups and psychopathic individuals have become imbued with the powers of mass destruction through the use of chemical and biological weapons. At a basic level, our long-term strategy for defense is hardly different from that for protection against naturally emerging infections: the needs for prompt and accurate diagnosis, surveillance, and far more powerful vaccines and drugs to prevent and treat infections from many exotic agents. Curiously, even the eradication of a disease like smallpox evokes new vulnerabilities with a population no longer exposed to immunizing doses -- focussing sharply on the need for agile and multi-pronged agents for health protection.

NIH does not operate in a vacuum: its research strategy needs to be and is well informed both by scientific opportunity and public health priority. Its creative people and findings must be readily transferred to the health care sector and to industry. All this is working quite well -- and I particularly wish to commend the initiatives to make medical information universally available through the electronic media of Medline.

2. One could pick many areas of challenging promise, but the biology of aging is one that seems especially ripe for advancement through the applications of molecular biology. May I say that I have had a further impulse to study this field by serving as principal scientific advisor to the Lawrence J. Ellison medical foundation, which is working closely with the National Institute of Aging to find the most creative ways for a private foundation to complement the excellent work of NIA. For example, what has been learned about the risk factors and the biochemical basis of Alzheimer's disease has already transformed our concepts of "senility", and provide the hope that homing in on specific disease syndromes can offer substantial enhancement of healthy life extension well into the 9th and 10th decades.

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