

## /THE LAST WORD

# Cuba's Biotechnology and the United States Embargo

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To the extent that an objective of the long-standing U.S. economic embargo of Cuba was the stifling of creative enterprise, the architects of the embargo would have done better to remember that ideas, especially in science and technology, laugh at borderguards. Despite an absolute ban on U.S. economic activity, an array of restrictions proscribing the ways that U.S. trading partners can transact business, and a host of minor interferences, such as threatening suppliers of essential spare parts, Cuba's biotechnology is now a fully developed, integrated set of industries that last year generated close to \$200 million from the worldwide sale of its products. With the recent introduction of a *Pichia*-produced, recombinant hepatitis B vaccine, Cuba now exports more than a dozen biotechnology-derived pharmaceuticals.

For a small, third world country, which 30 years ago had a population that for the most part was barely literate, to have accomplished this is remarkable enough. That it did so under the constraints of an increasingly vicious economic war waged by the world's last superpower, is nothing short of amazing. Whenever I attempt to answer the obvious question—how did they do it—I recall a large and very beautiful piece of calligraphy that adorns the lobby of the Center for Biological Research (the precursor of the present Center for Genetic Engineering and Biotechnology), which I saw on my first visit to Havana in 1986. The canvas says, "*El futuro de nuestra Patria tiene que ser necesariamente un futuro de hombres de Ciencia*" [The future of our country is of necessity the future of its scientists (Fidel Castro, 1964)], a perception curiously similar to one of Chaim Weizmann's contained in a large and very beautiful piece of stone calligraphy at the Weizmann Institute of Science in Rehovot. Although much enamored with the intention, I also wondered to what extent it was true. After a tour of the very new center, I had at least part of the answer. As I wrote then (*Bio/Technology* 4:265, 1986), from its inception, the Cuban biotechnology enterprise was intellectually and technically extremely sophisticated and serious.

A few weeks ago, returning from "Biotechnología Habana '94" (a symposium organized by the Cuban Center for Genetic Engineering and Biotechnology and sponsored by UNESCO, UNDP, PAHO, WHO, and other initialed organizations, and attended by more than 1000 scientists from over 40 countries), I remembered recounting a version of this story in a session devoted to international cooperation and societal issues. I concluded my remarks noting, as evidenced by the accomplishments in biotechnology between 1986 and 1994, one had to acknowledge that Castro not only meant what he said back in

1964, he appears to have been correct as well. The future of Cuba does indeed seem to be, then and now, in the hands of its young scientists.

In an apparent contradiction, the very U.S. government policies designed to cripple its economy may have actually contributed to the success of Cuba's biotechnology program. For example, Fred Kramer from New York City's Public Health Research Institute (who chaired a session on new diagnostic technologies), like many American scientists over the years, was refused a license to purchase a ticket on the Miami-Havana shuttle, making it necessary to travel to Cuba via Mexico. The reason, according to U.S. Treasury Department spokesperson Helen Lardner: "The meeting was neither international nor sanctioned by a U.S.-recognized international organization." But the denial of *pro forma* access also insulated the Cubans from what would have been an almost irresistible, yet quite possibly suffocating, abundance of good advice in the formative stages of their biotechnology development. As Eric Senior of the Innovation Foundation of the University of Natal, South Africa told the symposium, Cuban scientists responded to their relative isolation by becoming increasingly selective, imaginative, and thoughtful about their mission. A response to external forces, he noted, quite different from sectors of South Africa's academia, which took the isolation, imposed in their case by true international sanctions, as a license to become ingrown and indolent. He also noted, with some amazement and to general acclamation, if Castro and de Klerk, whose soldiers had until recently been shooting each other, could embrace and forgive an actual brutal history, how absurd it was that Clinton could not offer even a gesture toward reforming an unjustifiable and internationally repudiated U.S. policy.

Before leaving Havana, I accompanied Charles Cooney of the Massachusetts Institute of Technology to visit the newest addition to the biotechnology complex, a state-of-the-art, ISO 9000 facility to produce monoclonal antibodies for human therapy. Its construction began in late 1992 during the most dire economic period the country had ever known, and today the site is one of intense activity as it is made ready for a ceremonial inauguration on the fast-approaching National Builders' Day. While Agustin Lage (the new center's director) was showing us through the facility, he stopped at the entrance to one room where a group of workers was performing a variety of demanding, manual tasks. "You will like this, Harvey," he said as he pointed them out. "That one is the head of the molecular biology research unit, she is a physicist who works in the nuclear medicine section, he is a welder, she is a fermentation scientist, that one is a painter." ///