It gives me great pride to inaugurate this Center, right in the middle of the Special Period. It represents a promise of health and well-being for our people, as well as the potential for our economy since it has a great production capacity. It also constitutes the possibility of coordinating with all the other research centers here. That is why we have created these scientific complexes in the polo científico. The idea is for every center in science research to work together in close coordination, and not act independently, ignoring the others.

Fidel Castro at the inauguration of the Center for Molecular Immunology, December 5, 1994

International interest in Cuba’s biotechnology potential was aroused in May 2002 when U.S. Undersecretary of State John Bolton condemned what he alleged to be Cuba’s offensive biological warfare program. This claim was strongly rejected, including by former president Jimmy Carter, since Bolton’s objective was clearly political. Nevertheless, the incident caused many to examine Cuba’s increasing role in biotechnology. It soon became clear to Western media that Cuba had in fact developed a sprawling complex of biotechnology research and development facilities in the west of Havana known as the polo científico. This consisted of dozens of well-designed new buildings, equipped with modern technology, in which thousands of engineers, technicians, and doctors were producing a wide array of medicines, vaccines, and related products, primarily for the Cuban population, but also increasingly for foreign markets. It was obvious, too, that Fidel Castro was the prime mover behind this initiative, a fact confirmed through several interviews with leading scientists in 2013 and 2014.

This poses many questions. Why and how did applied interdisciplinary research in biotechnology evolve so early and so readily in Cuba in the 1990s? Why were preventive medications and vaccines prioritized? How could a small country like Cuba produce such an array of medications and vaccines and indeed most of the medications consumed domestically? Why
was it being praised by international bodies such as the World Health Organization (WHO) and the Pan American Health Organization (PAHO) for its exportation of massive amounts of low-cost drugs to the developing world? Apart from the occasional flurry of reporting on events such as Bolton’s claims, and infrequent articles in professional journals, remarkably little has been reported in mainstream media.

In recent years Cuban medicines have been increasingly used throughout the developing world and sold at a fraction of the cost of drugs produced by multinational pharmaceutical companies in the industrialized world. A 2009 editorial in Nature emphasized its leading position in the Global South, as well as its distinctive model, calling it “the developing world’s most established biotechnology industry which has grown rapidly even though it eschewed the venture-capital funding model that rich countries consider a requisite.”¹ This recognition came belatedly, however, since Cuba had started this research initiative several decades earlier, and the origins of Cuba’s impressive biotechnology growth may well be traced back to the statement in January 1960 by Fidel Castro that “the future of Cuba has to be of necessity a future made by people of science, of thought.”²

This chapter offers some observations to show how South-South cooperation in biotechnology constitutes a significant support to Cuba’s medical internationalism program. At first glance it might appear odd that a book examining MI, which in essence revolves around the contribution of doctors, nurses, and medical technicians in developing countries, would explore the role of biotechnology. Yet this is an important complement to the work being done by medical personnel in the field. In sub-Saharan Africa, for example, the role of Cuban physicians working in the most distant rural communities to treat patients suffering from malaria and dengue is clearly strengthened by the application of Cuban biolarvicides to kill mosquito larvae. Likewise, in Venezuela the use by Cuban physicians of Heberprot P, which has reduced drastically the need for amputations among diabetics, also assists doctors treating diabetes.³ In the state of Mérida, for example, of 1,091 diabetic patients who received this treatment, only 5 went on to need an amputation.⁴ Recent Cuban data show that since 2007 more than 29,000 Cubans with diabetes have received this treatment and that the risk of amputation has been reduced 80 percent.⁵ This integrated approach to the care of public health, both at home and abroad, is a fundamental characteristic of the Cuban healthcare model, and biotechnology is an invaluable support.
In essence the Cuban approach to healthcare focuses on attending to the greatest healthcare needs of the population. In terms of biotechnology this translates into the development of products that will best assist and protect that population, preferably (but not exclusively) in a preventive mode. Since the early 1980s Cuba has built up the human capital capacity and physical infrastructure to attend to these needs, first for the Cuban population and increasingly for developing countries. And as noted, people’s needs, and not profit, have traditionally been the driving philosophy behind the approach to biotechnology. As Simon Reid-Henry has noted, “Cuba’s policy of putting biotechnology to work within a public health framework, focused on preventive medicine, and often tied to a mission orientation, might seem rather incongruous, but it has worked. . . . Despite the difficulties of the Special Period, the country has maintained a relatively high level of public health and has continued to export some of its most basic life-enhancing technologies to other countries in need.”6 Given the small size of domestic demand, in order to be financially viable Cuba’s biotechnology industry had to look abroad.

The use of Cuban biotechnology also helps to illustrate the Cuban approach to public health in general, with the use of preventive medicine being of paramount importance, and not solely on the island. In 2000 the WHO recognized the potential of Cuba’s role in this area, approving their hepatitis B vaccine in UN vaccination programs, mainly in developing countries. Since that time Cuba has been involved in scores of cooperation agreements throughout the world. Thus, in addition to being a profitable export product for Cuba, Cuban biotechnology products have saved countless lives at a more affordable cost—and are therefore important in Cuba’s medical internationalism program around the globe.7

Cuba: The Evolution and Nature of Biotechnology

In the early 1980s, and with the strong backing of Fidel Castro, Cuba embarked on a journey to develop its nascent biotechnology program, based around the large science cluster west of Havana. According to UNESCO, approximately $1 billion was invested within the first two decades, resulting in the establishment of a science node of 52 institutions, in which over 20,000 scientists, engineers, and technicians are employed.8 Cuba produces almost 70 percent of its own medications, which are provided at extremely low prices domestically and at affordable prices abroad. One of the princi-
pal drivers in the Cuban approach to developing its biotechnology industry was the need to become self-sufficient in the production of medications and vaccines for its own use—and in order to accomplish this, collaboration across disciplines and extensive teamwork among those researchers was an absolute requirement. The export of biotechnology products has become lucrative for Cuba, generating some $800 million in export earnings, second only to nickel in terms of income from products sold abroad. It has been estimated that it will generate $1.04 billion in 2016. When the U.S. embargo against Cuba is lifted and American consumers can use these significantly less expensive medicines, it will prove one of the most lucrative industries in Cuba.

The integrated nature of the Cuban approach to biotechnology is very different from anything found in industrialized countries. Collaboration and not competition across several disciplines is the major philosophical factor behind its approach. Also important are the connections in the entire process of products, from initial research to the final stages of marketing. This “loop” combining various facets of the development and production process can probably be most effective in a socialist society with decades of cooperation in scientific research, supported by the government, and with an education system that from childhood has encouraged a collaborative approach to problem-solving.

Agustín Lage, probably the most significant figure in Cuban biotechnology and the director of the Center for Molecular Immunology (CIM), has explained the origins of the prestigious center, at first a small laboratory on the fourth floor of a Havana hospital. In September 1989 Fidel Castro entered the CIM and spoke of his ambitious vision for biotechnology in Cuba: “He talked about building a new Center; we just wanted to improve the small laboratory that we had. Fidel spoke about developing an industry; we had not thought of that for the immediate future.” From this humble origin a biotechnology industry grew.

Biotechnology research and production have increased steadily since the first building was constructed. By late 2012, according to Lage, “products from the Cuban biotechnology industry were either being used, were in clinical trials, or had been registered in 50 countries. In terms of cancer treatment, Cuban products were being used in more than 25 countries, with clinical trials being carried out in 12.” Cuba’s reputation as a producer of quality medical goods has increased dramatically in recent years, and Cuba is the only country in the world that has developed an effective vaccine against type-B bacterial meningitis.
There are many quality pharmaceutical products from Cuba being used both domestically and abroad. These include the world's first synthetic vaccine against Haemophilus influenza type B (Hib), the bacteria responsible for almost 50 percent of infections. Nimotuzumab, an anti-cancer epidermal growth factor receptor, is currently in clinical trials in several developing and developed countries, while a second vaccine against advanced lung cancer, Racotumomab, is now being used following the success of CimavaxEGF. In 2013 clinical tests were initiated for Itolizumab, for patients with severe psoriasis. Particularly successful among the hundreds of products is Heberprot-P, a treatment for diabetic ulcers, which has generated support worldwide, even among influential U.S. politicians, and may eventually be allowed in the United States, an exception to the U.S. embargo of Cuba.

Heberprot-P has been registered in 25 other countries (ranging from several in Latin America to others in Asia), and patents have been taken out in 14 countries, including the United States. To date, more than 60,000 patients in Cuba and abroad had benefited from this innovative treatment, which has reduced the need for amputation by some 90 percent. In the case of Venezuela, by late 2011 almost 34,000 patients with diabetes had avoided having their feet amputated as a result of this treatment. It is significant that, instead of simply exporting the drug to target markets, Cuba also provides training on the use of Heberprot-P. In June 2012, for instance, the Ministry of Health in Ecuador bought 1,012 doses, worth $3,275,000, in an arrangement that included training for Ecuadoran specialists.

One of the major research institutions in the science cluster is the Center for Genetic Engineering and Biotechnology (CIGB), with over 1,400 researchers involved in more than 50 major projects. This modern building with cutting-edge technology would not be out of place in any science complex in Western Europe or North America. According to a catalog advertising their current research, over 60 medical inventions have been accorded to the CIGB, which has also been granted 406 patents worldwide. The research program undertaken by the CIGB is ambitious, including the production of vaccines against Hepatitis C, cancer, dengue, and Human Papillomavirus 16m and treatments for rheumatoid arthritis and multiple sclerosis. There are also dozens of research projects being undertaken on agricultural biotechnology projects at the CIGB. As is the case with the other institutions mentioned, the medical products made here are also used throughout the developing world—at a fraction of the cost charged by multinational pharmaceutical companies.