

## News focus

# Fighting isolation

Cuban scientists have a tough time because of the isolation from the United States, but as **Michael Gross** reports, this has forced successful innovation in the biosciences with global potential amongst poorer, third world countries.

The pictures from the city centre of Havana are familiar: the crumbling colonial style buildings and classic cars that miraculously survived half a century have provided the picturesque backdrop of movies like *Buena Vista Social Club*. Just a couple of kilometres west of the Buena Vista district, however, there are dramatically different sights to be seen: a whole cluster of state of the art research centres in modern, purpose-built dwellings.

One of them is the Centro de Inmunología Molecular (CIM), built 10 years ago. Its central control room could easily serve a nuclear power station. It reveals at first glance that the centre is involved in large scale production as well as in research. It currently produces several kilograms of monoclonal antibodies per year, and is soon to step up to more than a kilogram per month. Not to mention growth factors, vaccines, and other drugs. While the first consideration is always the supply of affordable drugs for the pioneering Cuban health system, some products are sold commercially, such that the centre is already funding its own research.

At the research front, collaborations with European and Canadian laboratories are bearing fruit. Just recently, the centre has published a crystal structure of a mouse antibody which appears promising in the therapy of melanoma and breast cancer, in collaboration with researchers at the technical university of Göteborg, Sweden.

CIM is just one of around 20 high level research centres in the neighbourhood of Playa. Nearby there are: The Centro de Ingeniería Genética y Biotecnología, which was founded in 1986 as the first of the “new generation” research centres. It

employs around 400 research staff and has developed several new vaccines. One of the research areas is the expression of drug proteins in plants such as tobacco, a major agricultural crop in the country. The Centro Nacional de Investigaciones Científicas, which dates from 1965. The Centro de Química Farmacéutica, where over 60 researchers are exploiting the rich biodiversity of the Cuban flora to identify new natural products and develop them into drugs and nutraceuticals.

And yet, one of the most sensational success stories of Cuban science comes from the heart of the crumbling city of Havana. There, on the campus of Havana University is the Laboratory for synthetic antigens, where a team led by Vicente Verez has succeeded in creating the first fully synthetic vaccine that is fully effective. This research is typical in that it arose from a very specific domestic need. Since the late 80s, there has been a vaccine against the meningitis pathogen *Haemophilus influenzae* B (HiB),

but, as Verez explains, “it is only a vaccine for the rich countries.” With a cost of well over ten dollars per child, the established vaccine is out of reach for most of the world’s children. According to UNICEF, only 2 per cent get immunised, and half a million children under five die from HiB infection every year.

Verez’s lab set out in 1989 to develop a vaccine that would be affordable for Cuba. After the clinical trials conducted in collaboration with Canadian researchers showed the vaccine to be fully effective, the Cubans now have a Third World blockbuster drug in their hands. The global demand is estimated at around 500 million doses. The Cuban biotech industry has started production and is planning to make 50 million doses by the end of this year. Global coverage will however require additional production sites on other continents, for example in India.

This example illustrates the paradoxical advantage of having advanced biotechnology centres in a poor country. Whatever Cuban scientists develop for their domestic market is at the same time likely to benefit the over 5 billion people in the world who simply cannot afford most of the drugs sold by the pharmaceutical companies of the rich countries.



**Inside world:** the imposing buildings of the University of Havana fail to reflect the degree of isolation scientists working in Cuba have had to work around. (Photograph: Michael Gross)

Even if these customers cannot pay very much, they still represent a huge export market for a small country like Cuba.

For the first time in its history, the cash cows of tourism and biotechnology offer Cuba the prospect of becoming independently viable and economically competitive. Now this is exactly the kind of outcome that the US administration wants to avoid at all cost. Earlier this year, they tried to stop scientific journals from publishing papers by Cuban researchers but many scientists in Cuba were resigned to such tactics. Eventually, it became clear

that such a measure would breach the US constitution and the government quietly backed down.

A more serious threat to Cuban research are the impediments to buying vital equipment. Everybody has such a story to tell. Typically, a Cuban scientist would have ordered a scientific instrument from a European supplier, and it all went well until one day the contacts went cold and the shipment never arrived. Only after prolonged pestering would the researcher be able to get in touch with a highly embarrassed executive who would say something along the lines of: "We are very sorry but it has turned

out that a US company holds a patent on the design of the fuse used in this instrument, so if we sell you one of them, they will withdraw our licence to use that fuse." Cuban scientists still find channels to buy the equipment they need, but it often is a lengthy and frustrating experience.

The second significant worry for the otherwise infectious cheerful scientists on the island is internet access. As a tourist paying in hard dollars, you can comfortably access the net from your hotel via satellite. Most university researchers, however, have to rely on what little bandwidth there is in the terrestrial connection to the rest of the world. The internet consortium insists that Cuba's connection must go via Florida, ruling out politically less troublesome alternatives like Mexico. "There is a cable to Florida, but it is thinner than my little finger, more like a hair" explains Sergio Pastrana, the Foreign Secretary of the Cuban Academy of Sciences, "so the necessary bandwidth just isn't there". And that results in extremely slow and unreliable connections — an ordinary web page without heavy graphics may take five minutes to load or may in fact never arrive. Thus, there is a serious bottleneck in the information flow (books and journals are also scarce for currency reasons), which could be fixed with less than 50 km of fibreglass cable, if the blockade were to be abandoned.

The present US administration is, of course, not going to make things better. In May it has further restricted the amount of cash that Cuban Americans can send their families back home. But watch this space. In a few years from now, the whole world — minus the US citizens — will be able to buy innovative and cheap pharmaceuticals made in Cuba. Future US presidents may find that reason enough to reconsider their country's policy.

Michael Gross is a science writer in residence at the school of crystallography, Birkbeck College, University of London. He can be contacted via his web page at [www.proseandpassion.com](http://www.proseandpassion.com)