Singing the praises of Cuba's science base

Castro, communism and cigars are what the rest of the world associates with Cuba – as yet its ground-breaking scientific achievements in biotechnology have gone largely unsung. Karen Beynon reports.

Biotechnology and Cuba, that Caribbean island known for communism, Castro and cigars, are arguably not the most natural of bedfellows.

Yet Cuba, which has just celebrated the 40th anniversary of its revolution, has been at the cutting edge of biotechnology for years. Its 38 biotech facilities, grouped together in a science park to the west of Havana, have produced important products such as a vaccine for Dengue fever, a recombinant hepatitis B vaccine, recombinant streptokinase, monoclonal antibodies and a recombinant meningitis B vaccine.

The last, developed by Cuba's Finlay Institute, is the world's only effective vaccine against meningitis B, and SmithKline Beecham is currently negotiating to license it outside Cuba. The island already exports the product to Brazil and Argentina.

Another first is a recombinant vaccine to combat ticks which plague livestock, developed by the Centre for Genetic Engineering and Biotechnology. The vaccine, Gavac, is 97% efficient and has been tested in Mexico, Brazil and Colombia as well as Cuba. It was developed through the isolation of a protein from the tick's intestine, which was then replicated in yeast.

It seems astounding that such a poor and isolated country should be able to conduct such ground-breaking science on a par with the world's most advanced research institutes and companies. But there is a rich history of scientific excellence in Cuba that was recognised and harnessed by Castro following the revolution.

Within one year of seizing power, the Cuban president declared, "the future of our nation is necessarily the future of men of science". He established the health of his nation as one of the pillars of the revolution and the primary building block for the development of life sciences.

In 1959, only 25% of the population was literate, there were only two or three scientific institutes and infant mortality levels were between 70% and 80%. The country was transformed during the 1960s with healthcare and mass education programmes. Now over 96% of the island's children regularly attend school and the infant mortality rate has been reduced to 7.2%, the lowest in the developing world.

In 1964, Cuba's National Centre for Scientific Investigation was founded and became the matriarch of the numerous centres that exist today. Not only did the state provide funding for innovative R&D, it also went about building a life sciences infrastructure with a strong regulatory affairs system and quality control. In the 1980s all this work came together facilitating the establishment of a host of scientific institutes supported by a huge government investment programme in biotechnology.

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Of the many differences between life science R&D conducted inside Cuba and that conducted in industrialised countries, two in particular stand out. They are the unique scientific approach taken by Cuba and the desperate lack of funds that affects every aspect of Cuban life.

Cuban scientists are given a very clear remit when they embark on a project. The government determines what diseases should be tackled in relation to the state of Cuban health and pools resources to achieve the required result. For example, the country successfully combatted a Dengue epidemic in the early 1980s when scientists found that their own interferon, which had been perfected in under two months, was effective against internal bleeding, a complication of the disease.

Similarly, with cardiovascular disease, the island's number one killer, scientists at the Centre for Genetic Engineering and Biotechnology developed a recombinant version of streptokinase as a thrombolytic agent. And with cancer, the second leading cause of disease, scientists at the Centre for Molecular Immunology (CIM) are developing both antibody approaches and vaccines. This highly focused strategy has also had excellent epidemiological success resulting in the development of diagnostics and novel therapeutics for diseases which are now eradicated or controlled in Cuba.

And it particularly impressed Associate Professor Jacques Simard, director of Laval University's Laboratory of Hereditary Cancers in Canada. During a Cuban-Canadian workshop last year on cancer immunotherapy, he was struck by the drive to mix academic science with that of the clinic to establish Good Clinical Practice as well as Good Laboratory Practice.

"This is not an approach often taken by universities," says Simard. "It is ambitious because of the huge investment required both financially and by the staff involved, but I believe it is an approach that universities in other countries may follow."