biotech focus

The promise of South African biotech

Britt Akermann, britt.akermann@chiltern.com and **Faiz Kermani,** faiz.kermani@chiltern.com

An emerging sector

In the past decade South Africa has undergone dramatic political changes that have transformed it from an isolated country subject to trading restrictions to an emerging world economy. The South African government is keen to develop industries that will allow the country to compete internationally, and sees the biotech industry as one area that can. The country has a notable past in the medical field, which it hopes will give it an advantage over some of its biotech rivals (such as Brazil and South Korea). For example, it was South Africa where the first human heart was transplanted by Christian Barnaard in 1967 and the computed axial tomography (CAT) scan was co-developed by the South African physicist Allan Cormack (http://www.southafrica.info/doing_business/trends/innovations/inventions.htm) [1]. There has been a long history of South Africans gaining educational and vocational training abroad, which has potentially given the country a base to work from in keeping up to date with advances in technology (see Figure 1 for a map of South Africa).

One advantage South Africa has to offer, particularly if its biotech industry can advance products to clinical trials, is a well-established medical infrastructure and availability of suitably qualified medical personnel. The standard of healthcare at the best institutions in South Africa is equivalent to that in most industrialized nations and this is evidenced by the country having become one of the major world regions for medical tourism [2]. According to South Africa's Annual Tourism Report, over 100,000 people travelled to the country in 2003 for medical procedures [2]. In addition, major industry sponsors are already using South Africa as a location for clinical trials across a range of therapeutic areas. This expertise will be important to the development of the domestic biotech sector (Figure 2).

Developing a biotech strategy

In 2001, to create a realistic and long-term plan for its future biotech industry, the South African government published its National Biotech Strategy and allocated R400 million (~US$52.8 million) towards its implementation (http://www.dst.gov.za/). The report coincided with a general period of political optimism in South Africa about competing in a global environment. As such, we suggest that stimulating a domestic biotech industry would help in achieving national goals in terms of reducing the impact of major diseases, and promoting employment, urban renewal, human resource development and regional integration.

However, it was soon realized that a more realistic approach was needed that would identify South Africa's weaknesses and strengths. A survey was carried out in 2003 as an audit of what biotech-related activity was actually taking place in South Africa, revealing that >900 biotech and biotech-related research projects were being carried out in the country, indicating a strong research base (eGoliBIO South African Biotech Audit 2003; http://www.egolibio.co.za). However, despite this large number, very few products from these projects had actually been commercialized.

This productivity gap was caused by the weaknesses of the previous strategies to develop a viable biotech sector. Under the previous political regime, the biotech industry appeared less attractive for dedicated investment than industries that could keep the country going in the face of international restrictions. Thus, areas like the mining industry and arms industry received greater attention from the government.

In an attempt to modernize the approach towards the biotech industry to suit a new political and technical environment, South Africa introduced a National System of Innovation (NSI). The NSI attempted to promote collaborations between different organizations (like the Department of Trade and Industry and regional science councils) in South Africa that would kick-start the industry. The NSI focused on the following issues:

- Outdated technology and technology-support used by many small companies;
- Failure rates of start-ups;
- Access to competitiveness and business support;
- Promotion of innovative ideas.

Although it provided background information on relevant organizations that could help address these industrial issues, the NSI appeared unable to stimulate actual collaborations between them. Advances in genetics were beginning to dominate modern biotech innovation in South Africa and yet there remained an unstructured system for coordinating projects in the country. An equally important finding was that the emerging biotech groups were underfinanced and lacked the critical mass necessary to compete internationally. It was concluded that important opportunities to exploit the existing technological base had been missed, and that this needed reform [3].

1359-6446/06/$ - see front matter doi:10.1016/j.drudis.2006.09.013

FIGURE 1

A map of South Africa.

An attempt was made to overcome these problems by establishing several Biotechnology Regional Innovation Centres (BRICs). The specific role of the BRICs was to coordinate the national biotech strategy on a regional and national level by acting as focal points for the development of biotechnology platforms (http://www.pub.ac.za/links/brics.html) [4]. The three BRICs that have been established are BioPAD (Biotechnology Partnerships and Development), Cape Biotech and LIFElab East Coast Biotechnology Consortium (Table 1). In 2006, the BRICs were estimated to be supporting 15 companies each, but all of these were still at an early stage of development [5].

A primary role of the BRICs was to invest the R400 million funding, allocated in 2001, in start-up biotech companies and in training graduates with appropriate scientific and business skills to support the growing industry through various capacity development programmes. At present, it is unclear how much of this funding has been initially allocated. Many of the arrangements will depend on the duration of the projects which the companies seeking funding have put forward as candidates.

The BRIC activities are overseen by the Biotechnology Advisory Committee (BAC), which ensures development of the sector on a national level by coordinating and integrating regional activities. Furthermore, by training local scientists in biotechnology-related disciplines, South Africa hopes to have a resource base to staff the industry as it develops.

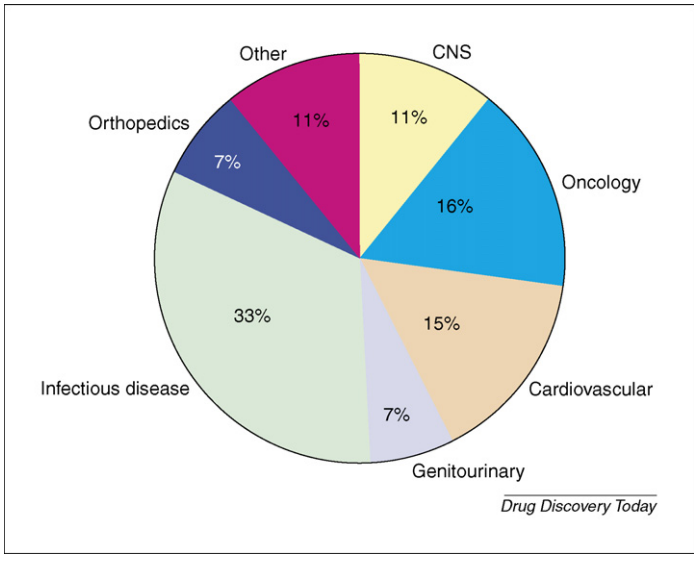

FIGURE 2

Therapeutic focus of clinical trials currently being run in South Africa.

The challenges in seeking funding

It is clear that having an attractive medical infrastructure to work from will not be enough to boost the emerging South African biotech industry and that long-term commercial funding is still a problem. Owing to the fact that many local biotech companies are in an early stage of development, private investors have been reticent to provide funds to start-ups because they are not convinced about the prospect of commercial gains. There is considerable research activity in the biotech sector (Table 2), but government funding alone is unlikely to enable most companies to see their products through to the advanced stages of drug development.

In 2001, the government identified ~68 venture capital firms in the country, which together controlled R28 billion (~US$3.7 billion), but few were found to be enthusiastic about funding the emerging biotech sector (http://www.dst.gov.za/). This is not only a South African problem – many countries have experienced that private investors have become cautious with regard to biotech because of a lack of understanding of both the industry and risks involved. To counteract this, since 2004, a national conference called Bio2Biz has been run to address commercialization issues unique to the biotech industry and to provide private investors the opportunity to learn about the industry and to meet with those behind potential projects. As part of this exercise, international speakers and exhibitors have become a more notable feature of the conference.

The problem with government funding of biotechs is that the funding is limited and there can be a long lead-time before it is made available to a start-up biotech (as appears to be the case with the R400 million from 2001). Nevertheless, some private investment is being made available to South Africa's biotech sector in addition to government funds. Bioventures, which is a dedicated South African biotech venture capitalist fund, has invested R55 million (~US$7.26 million) in eight start-up companies since 2001 [5]. It has been looking at listing some of the companies on AltX, the Johannesburg

TABLE 1

South Africa's Biotechnology Regional Innovation Centres (BRICs)

BRIC	Location	Goals
BioPAD (Biotechnology Partnerships and Development)	The Innovation Hub Science Park, Pretoria	The application of biotechnology to industrial growth through process and product development, mining competitiveness and environmental rehabilitation or prevention of adverse environmental effects
Cape Biotech	Black River Business Park, Cape Town	Industry stimulation and capacity creation, and disseminating and managing government funds by investment in promising projects in human health
LIFElab – East Coast Biotechnology Consortium	East coast region (including Durban, Pietermaritzburg, Nelspruit and Grahamstown)	The two primary programme areas are human health and bioprocessing

Securities Exchange's (JSE) market for smaller firms [5]. However, because local investors still remain risk-averse to local biotech, Bioventures has considered the Nasdaq in the US market [5]. Because of the established nature of the biotech industry in the USA, start-ups with promising technologies can receive a more favourable reception from potential investors there. The main problem for South African start-ups is that they will be competing for attention with emerging biotechs from India and China, who are also seeking foreign investment.

Aside from investment, there have been calls for more to be done to attract those with appropriate qualifications to work in the domestic biotech sector. There is a worry that unless the general environment for biotech improves, life science graduates might seek alternative careers, thus stifling growth of the sector (http://www.dst.gov.za/). There is particular concern that those trained in biotechnology disciplines might opt for a career abroad because the average South African postdoctoral bursary is 40% of that in the UK (note: this is estimated from our own personal experiences).

Recognizing these issues, measures are now underway to encourage those at university to consider a career in the domestic biotech sector. For example, Cape Biotech has entered into a partnership with British-based Execute Technologies, to develop a regional bio-entrepreneurship training programme [6]. The aim of The Cape Biotech Trust Bioentrepreneurship Programme is to equip university scientists with appropriate bio-business skills to foster entrepreneurship in an industrial environment [6]. The two-year programme will consist of industrial seminars and workshops, MBA courses and electives, and business skills courses. It will be taught by leading academics, industrialists and entrepreneurs from the Cape, Cambridge, Munich, Boston, San Diego and San Francisco biotech clusters [6]. The hope is that the course will lead to a minimum of

TABLE 2

Biotech activity in the Cape region

Company	Speciality	URL	Location
Capar (Cape Microarray Facility)	Microarray services to the local R&D community	http://www.capar.uct.ac.za	Cape Town, Western Cape
Biovac (Vaccine Platform)	Biotechnology manufacturing facility that will be developing the capability to manufacture clinical doses of developmental biotechnology products for the local and international R&D community	http://www.biovac.co.za	Cape Town, Western Cape
Shimoda Biotech	Biopharmaceutical discovery company that focuses on the development of innovative proprietary drug delivery systems for novel therapeutic compounds.	http://www.shimoda-biotech.com/	Port Elizabeth, Eastern Cape
Synexa Life Sciences	Specializes in the manufacture of difficult to produce microbial secondary metabolites using their unique membrane gradostat fermentation technology	http://www.synexagroup.com/	Cape Town, Western Cape
Genecare Molecular Genetics	Genetic testing company focusing on the commercialization of an advanced strip-technology that will allow for the standardization of genetic testing	http://www.genecare.co.za	Cape Town, Western Cape
SunBio	Develops novel commercial yeast strains with enhanced nutritional benefits for the food and beverage industries	http://academic.sun.ac.za/wine_biotechnology/SunBio.htm	Stellenbosch, Western Cape
Disa Vascular	Medical device company, which develops coronary stents for the treatment of coronary and peripheral disease	http://www.disavascular.com	Cape Town, Western Cape
NCSA (Natural Carotenoids South Africa)	NCSA has a state of the art algal growth and extraction facility and is the first company in the world to have as its sole focus the extraction of carotenoids from microalgae	http://www.ncsagroup.co.za	Northern Cape
Lazeron Biotechnologies (SA) Ltd	Is focused on the discovery, development and commercialization of regenerative cell and medical technologies	http://www.lazaron.co.za	Stellenbosch, Western Cape

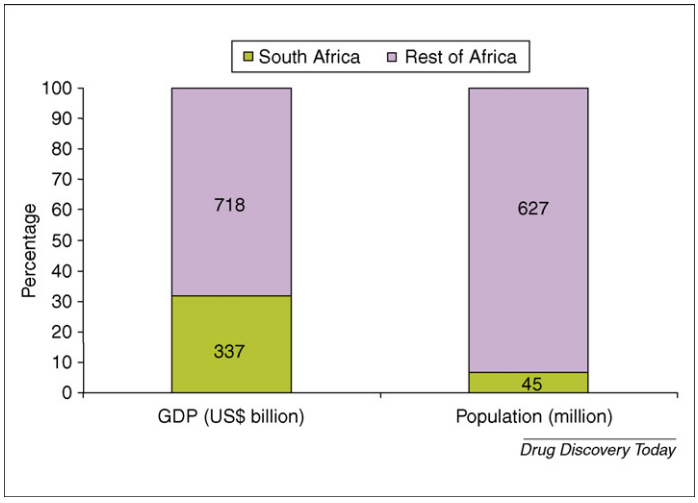

FIGURE 3

South Africa in relation to the rest of Africa.

10 students graduating from the programme each year and that their bio-business skills can be retained to facilitate aid growth of the Western Cape's biotech industry [6].

Another problem for graduates is finding information on available positions in the biotech industry. Human Alliance, a professional human resources and recruitment company, and the Cape Biotech Trust have jointly launched BioCareers, an online life-science career portal [7]. BioCareers is described as a dedicated national recruitment and career guidance tool for job seekers and employers within the life science and biotechnology sectors.

Outlook

The initial approach to developing the biotech industry in South Africa was overly influenced by a general optimism within the country about its future economic and political prospects. In the past it was found that many groups in South Africa were actually involved in new areas of biotech research, but that their findings were rarely taken beyond academic circles. However, since 2001, steps have been taken to formalize collaborations and communication between institutions that are focused on technologies that are relevant to a modern biotech sector and provide adequate funding to commercialize them.

Although the South African National Biotech Strategy hopes to develop a commercially successful industry, its slant will also be influenced by political factors. The government is under considerable pressure to tackle areas of unmet medical need amongst the poorer sections of society (who make up a majority of the electorate) and thus there is a desire to use biotechnology to solve these problems. For example, South African research groups are being urged to work in areas such as AIDS, dengue fever, tuberculosis and other tropical diseases [8]. By having more domestic input into these fields, rather than relying on foreign efforts, the government hopes to be able to provide affordable treatments. In addition, it is hoped that the strong economic position of South Africa (Figure 3) will enable it to become the biotech pioneer for the African continent and other emerging global regions. In July 2005, the African Union announced that it was setting up a biotechnology advisory panel [9]. The panel hopes to draw upon the expertise of South Africa's biotech sector [9].

References

1 Hawthorne, P. (2001) Christiaan Barnard: Heart to Heart, *TIME Magazine* 3 September
2 Scholtz, H. and Pretorius, S. (2005) Discovering South Africa. *Applied Clinical Trials*. 1 June
3 Gillbert, G. (2005) Can the biotech industry take off in SA? *Science in Africa* March (http://www.scienceinafrica.co.za/2005/march/biotechindustry.htm)
4 Cloete, T.E. (2003) Biotechnology – the next wave. *Science in Africa* May (http://www.scienceinafrica.co.za/2003/may/biotech.htm)
5 Bisseker, C. (2006) Stuck in first gear. *Financial Mail* 3 February
6 Anon (2005). British company to help initiate bio-entrepreneurship programme for the Western Cape. *Cape Biotech Press Release* November
7 Anon (2006). Graduates and professionals to benefit from life sciences career portal – also an IT first in South Africa. *Biol. Careers Press Release* 23 January
8 Philipkoski, K. (2002). Cure for South Africa's ills. *Cape Information Technology Initiative* 9 June (http://www.citi.org.za/Article/1000/1005/1162.html)
9 Chege, K. (2005). African Union sets up biotechnology advisory panel. *The Science and Development Network* (SciDev.Net) 21 July (http://www.scidev.net/news/index.cfm?fuseaction=readnews&itemid=2238&language=1)

Britt Akermann
Faiz Kermani
Chiltern International,
171 Bath Road, Slough,
SL1 4AA, UK