



Research review paper

## A special report on India's biotech scenario: Advancement in biopharmaceutical and health care sectors

Chiranjib Chakraborty<sup>a</sup>, Govindasamy Agoram<sup>b,\*</sup><sup>a</sup> Department of Biotechnology, College of Engineering and Technology, IILM Academy of Higher Learning, Greater Noida, India<sup>b</sup> College of Environmental and Health Sciences, Tajen University, Yanpu, Pingtung 907, Taiwan

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## ABSTRACT

India's biotechnology industry has been growing towards new heights in conjunction with the recent economic outburst. The country has the potential to revolutionize biopharmaceutical and healthcare sectors. In this review, we have highlighted the achievements of India's biotechnology industry, especially biopharmaceutical and healthcare sectors that include therapeutics, diagnostics, stem cell research, human healthcare related bioinformatics and animal health care. We have also described regulatory mechanisms involved in India's health care biotech including manpower development.

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### 1. Introduction

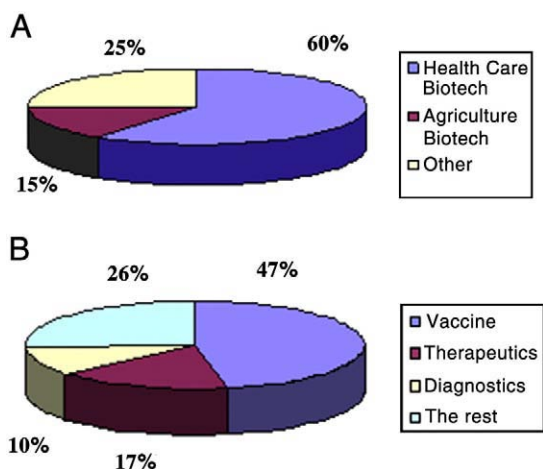
India's biotechnology industry is moving towards new heights keeping with the pace of global development. The center of con-

centration of India's Biotech industry is biopharmaceuticals since India is one among the global manufacturers of generic drugs. As a result, Indian companies are increasingly under pressure to join the bandwagon of the biopharmaceutical global market, and the biopharmaceutical segment alone has contributed 77% of the total biotech market between 2005 and 2006.

India is steadily increasing its efforts to become a global player in biotech activities and investments supported by manpower, knowledge,

\* Corresponding author. Tel.: +886 916752019.

E-mail address: [agoram@mail.tajen.edu.tw](mailto:agoram@mail.tajen.edu.tw) (G. Agoram).



**Fig. 1.** Presence of different segments of biotechnology in India. (A) Healthcare-biotech contribution is the highest among total biotech sector in India. (B) Break up of different segments of the healthcare biotech sector.

biodiversity and technology. Presently, the government is focusing on biotech investment in countries such as USA, EU and Japan. In 1986, the Department of Biotechnology was created with an investment of USD 210 million to support several research institutions across India (Arora, 2005).

India ranks among the top 12 nations in the long list of biotech companies (Ernst and Young, 2004) and pharmaceutical and healthcare sectors lead the biotech industry, which is similar to other countries ([www.biotech.com/market.php](http://www.biotech.com/market.php)). The Confederation of Indian Industry (CII) has estimated that biotech will dominate biopharmaceuticals, which is employing at present 20,000 people with a global market contribution of 2%. Among the biotech industry, healthcare sector dominates (60%), followed by the service sector (25%) and agricultural biotech (15%) (Fig. 1A).

In this review, we have highlighted the contributions of India's biotech industry with respect to biopharmaceutical and healthcare, and we have emphasized the achievements of different segments of biopharmaceutical and healthcare sectors such as therapeutics, diagnostics, stem cell research, healthcare related bioinformatics and animal health care.

## 2. Biopharmaceutical and healthcare

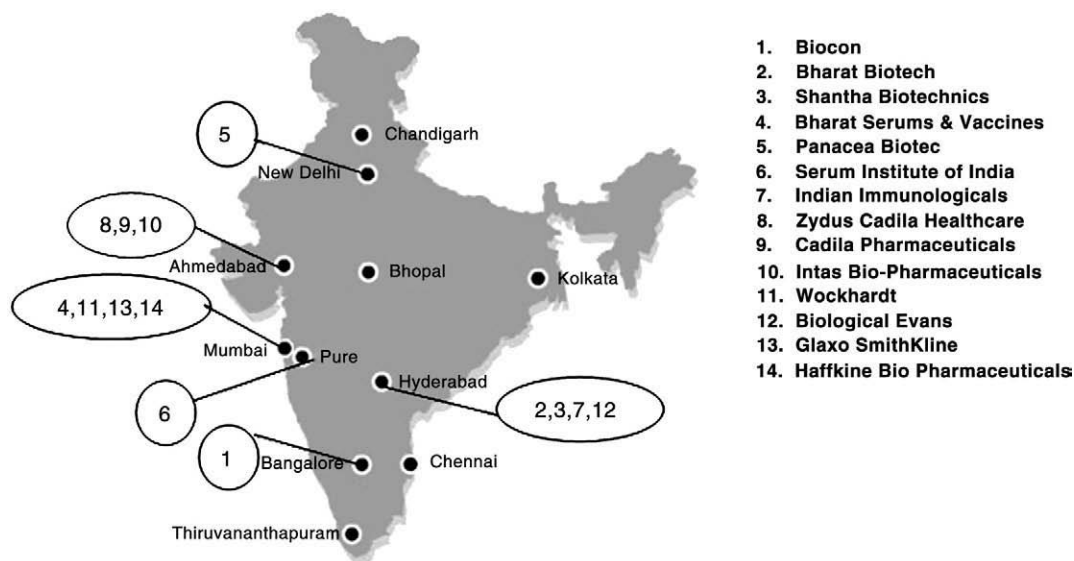
India maintains a strong grip in the pharmaceutical market potential due to its large and rapidly expanding population supported by R&D, sales, commercialization, and alliance of biopharmaceutical firms (Visalakshi and Sandhya, 1997; Sandhya and Visalakshi, 2000; Ramani, 2002; Ghosh, 2004).

### 2.1. Therapeutics

Corporations that are playing a leading role in scouting the pharmaceutical market potential in India are Biocon, Bharat Biotech, Shantha Biotechnics, Wockhardt, Panacea Biotech, Bharat Serums and Vaccines, Serum Institute of India, Indian Immunologicals, Cadila Healthcare, Cadila Pharmaceuticals, Intas Pharmaceuticals, and Novo Nordisk are (Fig. 2 and Table 1). Biocon appeared to be the single most profitable one, and it has generated huge revenues (US\$148 million in 2004–2005 and US\$115 in 2003–2004), and ultimately reaching a record growth of 29%. Another impressive performer is Serum Institute of India, which started to manufacture small amount of tetanus toxoid, but at present it makes 80% of the vaccines for measles and DTP (diphtheria, tetanus and pertussis) for the global market (Jayaraman, 2005).

Lately, India has developed a recombinant hepatitis B vaccine, insulin, erythropoietin, granulocyte colony-stimulating factor, interferon, and streptokinase with remarkable success. The first locally developed recombinant hepatitis B vaccine named "Sanvac" (Shantha Biotechnics, Hyderabad) has drastically reduced the cost (50 cents) to local consumers compared to imported price (USD 16/dose; BCIL, 2003).

Several companies have developed biotech products in collaboration with global manufacturers to enter into the market. India now leads the world in the manufacturing of recombinant hepatitis B vaccine due to the collective corporate strength of Shantha Biotechnics, Bharat Biotech, Panacea Biotech, Wockhardt and Serum Institute. Besides, India is an emerging global player in recombinant human insulin, and companies such as Biocon and Wockhardt are already leading the market. Streptokinase, granulocyte colony-stimulating factor (GCSF), interferon and erythropoietin are all well placed to expand the market shares globally. The total biopharma business is expected to grow by 35–40% during the coming years (BioSpectrum-ABLE, 2004).



**Fig. 2.** Location of India's major biopharmaceutical companies.

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