

Biotechnology Portals in Medicine

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INTRODUCTION

The 2005 global revenues of publicly traded biotechnology companies have grown by 18.1% to \$63.1 billion (Donn, 2006). Many countries are now investing in research and development in the biotechnology industry as it is believed this 30 year-old industry is moving toward profitability. The stock value in this industry has outperformed the average stock value in many countries. In the pre-genomic era, a typical life sciences company would have marketed diagnostic kits, assays, chemicals, measuring equipment, and research products to name a few. In the genomic era, a new range of products is marketed focusing on molecular medicine. Among these new products are bioinformatics software solutions, storage systems, biotechnology systems, and solutions researching into genes and proteins, tools for analysis of genetic sequence data, integrated systems and solutions for disease research, and new drug discovery (Cader, 2004). The need for biotechnology portals is now more than justified and will be a useful information and knowledge source.

A biotechnology portal is a gateway of comprehensive source of information and knowledge to those interested in knowing about biotechnology and the benefits this industry is offering. It should be considered as the first point of reference for those seeking reliable, quality, and current information and knowledge about issues in biotechnology. In addition, it should be interactive and have the appropriate tools to enable a community of users to share information and knowledge among them. There should also be a commercial component to the biotechnology portal, which should be to generate revenue through advertisements and offers to its target visitors. This revenue is essential to ensure the maintenance and survival of the portal and offer value to all its stakeholders. A biotechnology portal will not be complete unless it provides information on biotechnology stocks to potential investors seeking insights into this industry. A biotechnology portal is like any online business with various objectives such as profits, growth, market share, and innovation.

BIOTECHNOLOGY IN MEDICINE

This article will concentrate on biotechnology in medicine although the benefits of biotechnology have influenced other disciplinary areas such as agriculture and environmental sciences. In medicine, hundreds of biotechnology drug

products and vaccines are currently in human clinical trials in advanced countries with many more in the new product development stage.

Linking to Web Sites

A good starting point is to link up with the site <http://www.ornl.gov/hgmis/> sponsored by the U.S. Department of Energy Office of Science, Office of Biological and Environmental Research, Human Genome Program. This site gives information on the Human Genome Project (HGP), news and announcements, planned user facilities, educational resources, research progress, impacts of research, GTL documents (potential microbial documents), science, technologies behind GTL, Gene Gateway (tools for exploring the sequence), and related department of energy sites. There are also links to related sites.

The biotechnology portal should also link up to an excellent Web site, which makes available several DNA and Gene images (<http://www.ornl.gov/hgmis/graphics/slides/images1.html>) in an image gallery.

The Wellcome Foundation in the UK (<http://genome.wellcome.ac.uk/>) gives the latest news, features, and background, and a lot of information about the human genome—exploring genes and its impact on health, disease, and society. The Wellcome foundation is also the primary funding source for the Sanger Institute at Cambridge University (<http://www.sanger.ac.uk/>). The Sanger Institute is a genome research institute whose aim is to further the knowledge of genomes, particularly through large scale sequencing and analysis.

Another interesting site in the UK that should be included is <http://www.geneservice.co.uk/>. Geneservice Limited is a contract research organisation and biological resource centre, which supplies genomic products and technical services to both academic and commercial research organisations. These services include whole genome amplification, DNA sequencing, micro-satellite, and SNP genotyping including 10K and 100K mapping, and expression array analysis.

An interesting European Web site is <http://www.litbio.org/>. This is a Laboratory for Interdisciplinary Technologies in Bioinformatics (LITBIO) applied to genomics, transcriptomics, proteomics, and metabolomics providing international research and development programs with the new analysis strategies of biomedical and biotechnological data. The laboratory consists of five collaborating partners whose links are listed as follows:

- CILEA (<http://www.litbio.org/cilea.htm>)
- CNR/IEIIT (<http://www.litbio.org/ieiit.htm>)
- Universita' degli Studi di CAMERINO (<http://www.litbio.org/camerino.htm>)
- Universita' degli Studi di GENOVA (<http://www.litbio.org/genova.htm>)
- Eurotech S.p.A. (<http://www.litbio.org/eurotech.htm>)

Another interesting link is to this Japanese Web site <http://www.genome.ad.jp/kegg/>. The Kyoto Encyclopaedia of Genes and Genomes (KEGG) is a bioinformatics resource developed by the Kanehisa Laboratories in the Bioinformatics Center of Koyoto University and the Human Genome Center of the University of Tokyo. They are working toward representing a complete computer representation of the cell, the organism, and the biosphere. This will enable computational prediction of higher-level complexity of cellular processes and organism behaviours from genomic and molecular information.

The biotechnology portal should also be linked to other informative Web sites in other countries including the Australian Web sites.

This Web site (<http://www.csiro.au/pubgenesite/index.htm>) explains what Australian scientists are doing in the area of biotechnology research. For information about gene technology, policy, and regulations, there should be a link to biotechnology Australia's gateway site at www.biotechnology.gov.au. Another useful link should be to the Victorian government biotechnology Web site. This Web site offers an overview of biotechnology in Victoria and links to industry sectors and biotechnology centres. It also includes the biotechnology strategic development plan for Victoria.

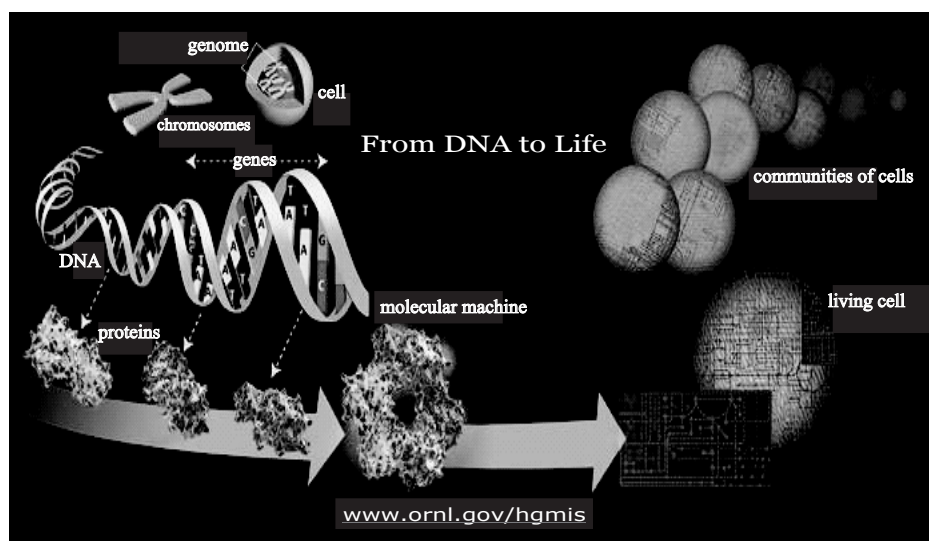
This Web site (http://www.business.vic.gov.au/BUS-VIC.458954/INDUSTRY/1226260600/PC_60362.html) offers an overview of biotechnology in Victoria and links to industry sectors and biotechnology centres. It also includes the biotechnology strategic development plan for Victoria. Another useful link would be to <http://www.ausbiotech.org>. Ausbiotech is the industry body representing the Australian biotechnology sector.

The molecular biology database collection is a public online resource listing key databases. The online version of this journal (Nucleic Acids Research) article has been published under an open access model (Galprin, 2006). The biotechnology portal must definitely be linked to this up-to-date database, which is intended to serve as the initial point from which to find specialised databases that may be of use in biological research. This database includes 858 updates in the 2006 version. It includes major public sequence repositories, gene expression, gene identification and structure, genetic and physical maps, genomic databases, intermolecular interactions, metabolic pathways and cellular regulations, mutation databases, pathology, protein databases, protein sequence motifs, proteome resources, retrieval systems and database structure, and varied biomedical content.

Icelandic's "Decode Genetics"

This is an Icelandic biopharmaceutical company. Its Web site (<http://www.decode.com/>) shows the type of work it does. The nature of work became of much interest worldwide because the company started developing a genealogical database. When the information from this database is combined with

Figure 1. Courtesy of the U.S. Department of Energy Human Genome Program



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