Chapter 31

Biotechnology Information: An Introduction

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Biotechnology, no matter how broadly or narrowly defined, is a major activity in the U.S. involving industry, government, and non-profit institutions (1). Many different definitions of biotechnology exist, and like the term information resource, it is more readily recognized when encountered than defined. Biotechnology may be defined as the controlled application of intact biological organisms or isolated cellular components to solve problems or obtain desirable benefits (2). This usually involves use of microorganisms, plant or animal cells, organelles, enzymes, or other constituents to obtain a transformation or product. Many make distinctions between "old biotechnology," such as baking, brewing, cheesemaking, composting, and other processes which have been used for millenia, and "new biotechnology" involving more precise genetic and cellular manipulation and control, based on current knowledge of biology and chemistry. This papers, like most discussions of biotechnology, concentrates on newer biotechnology.

An information resource may be broadly defined as an organized information source which may be used systematically to obtain information meeting a specific need. Generally, this definition includes the full variety of information systems and services available, but excludes most primary sources of information, such as particular journals, technical reports, and proceedings. Many types and forms of information resources are available, including: bibliographic, numeric, and factual databases; information centers and libraries; index and abstract services and publications; bibliographies; culture, germplasm, and specimen collections; referral centers and clearinghouses; directories and guides; and management information systems. Note that use of an information resource may involve interaction with databases, hard copy documentation, and/or individuals. In all cases, a limiting factor in the value and utility of an information resource is the ability of the user to interact with the resource.

As demonstrated by two recent books, Information Sources in Biotechnology (3) including descriptions of most commercially available information resources, and the Federal Biotechnology Information Resources Directory (4) covering U.S. government sponsored

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biotechnology-relevant information resources, there is a wealth of information available to support biotechnology. This consists primarily of the mature infrastructure of information resources in the chemical, biomedical and life sciences. However, problems and pitfalls arise when trying to obtain specific, desired information, especially in biotechnology. Here, information resource accessibility, organization, relevance, costs, ease of use, format, subject orientation, and a multitude of other factors affect their value and uses. These factors affect both use of internal and external information resources. Most successfull organizations eventually establish in-house dedicated information resources, such as an information center/library, and/or employ at least one partially dedicated employee to deal with their information retrieval and organization needs and problems.

This is the first collection of papers concerning biotechnology information published in the U.S. Papers discuss:

1) The overall status of the infrastructure of information resources supporting U.S. biotechnology efforts.
2) The critical role and potential contributions of information specialists to biotechnology, especially when integrated into the research and development process.
3) Information resources for the assessment of hazards from biotechnology products, and especially for genetically engineered, novel organisms to be released into the environment, from the perspective of the Environmental Protection Agency.

Considerable investments have propelled U.S. biotechnology and related sciences and industries to a current position of world preeminence. To a large extent, biotechnology and genetic engineering developed from federally funded research programs. Currently, federal agencies spend over $2 billion in biotechnology and related areas (5-6). Private industry probably spends on the order of twice or more this amount annually. Much innovative biotechnology research and development occurs in small start-up companies, usually founded by scientists with venture capital funding. Large established chemical, pharmaceutical and other companies have become involved in biotechnology through acquisitions of successfull start-ups, joint ventures, licencing of technology, and establishment of in-house research and development efforts.

The reader should note, that the information resources, services and expertise provided within the authors' organizations are not those typically found in most biotechnology-intensive organizations. The companies represented here are among the elite of U.S. biotechnology. They are well funded, have large staffs, have major products and technologies entering the market, and function competitively on a worldwide basis (7). Similarly, the Environmental Protection Agency has considerable resources.

Literature Cited

1. Office of Technology Assessment, Commercial Biotechnology: An International Analysis, OTA-BA-218, Government Printing Office, January 19, 1986.

2. Definition from BioInvention (formerly Biotechnology Patent Digest), OMEC International, Washington, DC (functionally the same as the many other definitions in use).
3. Crafts-Lighty, A., Information Sources in Biotechnology, 2nd edit., Nature Press, New York, 1986.
4. OMEC International, Federal Biotechnology Information Resources Directory, Washington, DC, 1987.
5. Office of Technology Assessment, Public Funding of Biotechnology Research and Training, workshop held Sept. 9, 1986, Washington, DC (in press).
6. Perpich, J. G., "A Federal Strategy for International Industrial Competiveness," Bio/Technology, vol. 4, pp. 522-525, June, 1986.
7. OMEC International, Inc. is a member of the Porton International Group, the largest private investor-held biotechnology company in the world.

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