Beneficial Microalgae

LEE YUAN KUN

The demand for additional food supplies, the need for more effective waste disposal, and the shortage of raw materials and energy sources have led people to search for viable solutions to these problems. One of the most promising is using unconventional microbial sources such as microalgae. These microorganisms have proven to be valuable research tools in many fields, especially in food production, waste treatment, medicine, and biochemical studies.

In *Microalgae: Biotechnology and Microbiology*, E.W. Becker attempts to present current information on methods and applications of algal cultures, and he does so in a simple and concise form.

Chapter 10 is the most well-written chapter. It covers most of the culture systems available for the artificial cultivation of microalgae, with substantial emphasis on outdoor cultivation systems. It also describes various pond and bioreactor designs—and the types of materials that are used—and mentions natural ponds, such as Lake Texcoco in the valley of Mexico City. The author discusses both conventional and experimental devices for agitation, paying special attention to the use of unconventional methods, such as wind mills and solar cells, to power the systems. He includes a good collection of photographs of the actual systems in operation.

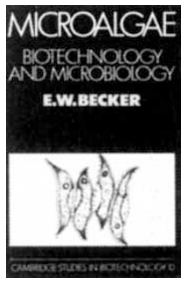
Contamination, especially in open pond algal cultivation systems, is inevitable. It is therefore necessary to keep contaminants at the lowest possible level in order to maintain a healthy and viable culture. The author discusses the major types of contaminants in chapter 10, and includes a brief description of possible strategies that can be used to combat and control contamination.

He also includes a chapter containing several recipes for culture media, in which he describes inexpensive raw or waste materials that are used to decrease the cost of obtaining different required minerals. Such materials include unconventional nutrient sources such as cowdung, bone meal, urine, and whole blood. For example, bone meal can be used as a substitute for calcium and phosphorus salts. Sea water is another useful unconventional source of nutrients. However, it is doubtful whether sea water can be used for the cultivation of freshwater microalgae, especially since most freshwater microalgae species are neither halotolerant nor haloduric. This chapter reflects the initial interest and emphasis of algal biotechnology on algal biomass as a source of cheap food and feed. However, as concluded by the author, "the alga still cannot compete economically with conventional plant protein (soya)," and, "it cannot be expected that there is much prospect for the large scale production of algae as a source of single-cell protein in the near future." This may serve as a cue for budding applied phycologists who are looking for new research directions.

Included are several studies showing that microalgae are good nutritional sources and are easily digestible—provided that they are properly processed. Toxicological studies performed reveal no toxic effects of the microalgae tested. However, only three algal species—*Scenedesmus* sp., *Spirulina* sp., and *Microactinium* sp.—are mentioned. The chapter discussing these studies gives readers the impression that algal biomass, perhaps with the exception of *Spirulina*, has not undergone thorough toxicological evaluations.

Becker offers a good chapter on the applications of microalgae, with numerous good descriptions of the therapeutic properties of marine microalgae. Particularly interesting properties include appetite-reducing effects, hypocholesterolemic effects, antitumor activities, and antiviral activities, especially against the HIV-1 virus. Microalgae can be used, for instance, to remove heavy metals because of their ability to concentrate them. Indeed, immobilized algal cells have led to the development of research projects in a variety of different fields because of an increased awareness of the potential uses of these microorganisms.

This 293-page book will be useful reading material for the advanced undergraduate and for those who are thinking of conducting research in the field of algal biotechnology. However, it is a little less than thorough in the citation of references and at times (especially in chapter 11) there are too many personal views on the subject, which makes the book a less comprehensive reference book for students, as well as less than impartial. Overall though, *Microalgae: Biotechnology and Microbiology* offers good coverage of the state of microalgae research today. ///



Microalgae: Biotechnology and Microbiology, *E.W. Becker, Cambridge University Press New York, $69.95.*

Lee Yuan Kun is in the department of microbiology at the National University of Singapore, 10 Lower Kent Ridge Road, Singapore 0511.