



Book Reviews

Clostridium botulinum: Ecology and Control in Foods. Edited by A. H. W. Hauschild & K. L. Dodds. Marcel Dekker, New York, 1993. 420 pp. ISBN 0-8247-8748X. Price: US\$ 135.00.

The bacterium *Clostridium botulinum* is of great interest to the food industry. It must be absent from food, or its growth must be suppressed so that the potent neurotoxin cannot be produced, or its toxin must be destroyed. Thus any book claiming to present a broad survey of *C. botulinum* in the context of the industry is of considerable potential interest; this book does not disappoint. It consists of fourteen chapters by sixteen authors from North America, Europe and the Far East. The first five chapters survey the nature of *C. botulinum*, and of other clostridia that produce the botulinum neurotoxin in its various forms, the occurrence of *C. botulinum* in the environment and foods, the epidemiology of human foodborne botulism, and the phenomenon of infant botulism. Infant botulism is of particular interest because it has been known only since 1976 and because it is unlike other forms of botulism in that the causative organism is able to grow and produce toxin in the gut of babies but not of other human beings.

The main part of the book consists of nine chapters dealing with the control of *C. botulinum* in foods. The principles of control and the ways in which heat, chemicals and irradiation act to kill the spores of the organism are discussed. The manufacturer has to choose between harsh methods, which kill organisms but reduce the organoleptic and nutritional quality of the food, and milder methods, which merely stop organisms from germinating or growing in the food. These latter methods are more prone to become ineffective, for example, through failure to refrigerate below 3°C. Chapters deal with control procedures and hazards relating to various foods (meat, fish, fruit and vegetables, dairy products, refrigerated processed foods of extended durability—REFPDS, traditional arctic foods). Finally, ways to destroy preformed toxin in food and water are given, along with an extensive approach to making computer models to predict the risk of botulism from various foods.

I found much of interest in the book. Lysozyme, or

egg yolk as a source of lysozyme, in media for enumeration of *C. botulinum* may improve detection by up to ten thousand times, presumably because it lyses the spore cortex so enhancing germination. Failure to include lysozyme may therefore cause a dangerous optimism in those assessing the quality of a product or the efficiency of a process. Spores present in pasteurized cured meats may be unable to grow in the meats and yet able to grow readily on laboratory media. Conversely, spores produced on laboratory media have no difficulty in growing in the meats. These and other unwelcome complexities in effective recovery and enumeration add to the already difficult problem of predicting growth and safety in foods, and help in part to explain why there is still no unifying concept that is universally accepted of the means of control of *C. botulinum* in meat products. Furthermore, many laboratory experiments to investigate control are undertaken with concentrations of spores up to a thousand times greater than those found naturally, and there is evidence that results thus obtained may be misleading.

The assay of botulinum toxin is also complex. Trypsin may be required to activate the toxin but when the toxin has already been activated, for example by similar enzymes produced by bacteria in the sample, trypsin may actually reduce activity by destroying the activated toxin. Workers therefore perform duplicate assays, with and without trypsin, and take the higher value.

Many outbreaks of botulism have occurred because of some new ill-considered manufacturing process or the failure of caterers to follow safe procedures; numerous examples of such outbreaks are given. In one restaurant a commercial preparation of chopped garlic in soybean oil, labelled as requiring refrigeration, was kept for several months at ambient temperature in the kitchen. It was used to make garlic butter for sandwiches and 36 cases of botulism resulted. One should never assume that particular products are safe. Dairy products carry very few *C. botulinum* spores, the intrinsic and extrinsic properties of the products are generally unfavourable to *C. botulinum*, and they have a good record. Nevertheless such products have been the cause of some serious outbreaks. It is a surprise to realize that the true extent of botulism in human beings is probably not known. Examples are presented of failures to make correct diagnosis, the disease being mistaken for chemical intoxication, staphylococcal

food poisoning, stroke, and Guillain-Barré syndrome. The chapter on traditional procedures used by arctic natives for 'preserving' foods makes fascinating (dare one say 'chilling') reading—many outbreaks of botulism have occurred but, because many of the procedures are dangerous, one is left wondering how *any* natives have survived!

The book has a business-like, rather than a sparkling style. It is well-bound and efficiently though by no means lavishly produced. The index is of limited value. Each chapter has an extensive list of references (20 pages in one case). I recommend the book as a useful addition to libraries of food companies and of relevant higher education establishments, regulatory agencies and research institutes.

R. W. A. Park

Ullmann's Encyclopedia of Industrial Chemistry, Fifth Completely Revised Edition. Volume A20: Photography to Processing of Plastics (1992, 758 pp. 393 figures, 144 tables); Volume A21: Plastics to Polyvinyl Compounds (1992, 758 pp. 388 figures, 1991 tables). Both VCH Weinheim. Price: £219.00.

It will come as no surprise that since these two new volumes of this excellent encyclopedia proceed from 'PHO to POL', there is very substantial coverage of photography, pigments, plastics and polymers. As with the previous 19 volumes, it is the authority and comprehensive nature of the articles that is most impressive. Volume A20 commences with a 159 page article on photography and describes all of the chemistry associated with the various types of film, the capture and developments of the image, together with the mechanics and physics of film production and development. There is an abundance of chemical structures, diagrams (some in colour) and tables, and a mass of information ranging from the historical to the highly technical.

Much of the rest of this volume is taken up by articles on inorganic pigments (125 pp.), organic pigments (43 pp.), and plastics (300 pp. in volume A20 and a further 73 pp. in volume A21). A comprehensive discussion of the chemistry and the methods of industrial production is included in each instance. The articles on plastics range from the chemistry of additives through analysis, a massive section on general aspects, processing, properties, to a timely article on recycling of plastics—a growing problem given that the world production is now in excess of 100 million tonnes per annum.

Sandwiched between the pigments and the plastics is a short article on plant growth regulators, both natural and synthetic, and this concentrates on subtle control with an article on herbicides promised for a future volume under the heading 'weed control'.

Volume A21 is almost entirely given over to polymers and polymerisation, but there is room for a fascinating article on the platinum group metals: isolation, purification, chemistry and uses—though I was surprised to see no mention of the use of *cis*-platin as an effective anti-cancer drug in this last section. There is also a highly technical article on plutonium, but the real business of the volume concerns all aspects of polymers from polyacrylamides to polyvinyl compounds. This massive 615 page compilation of facts and figures includes all types of polymers and polymerisation processes. The short article (20 pp.) on electrically conducting polymers is especially timely and this includes a brief mention of buckminsterfullerene—surely destined to have a whole article to itself in the next edition of *Ullmann*.

This encyclopedia is an essential purchase for any library where chemists (and other scientists) need information about the industrial applications of their science(s). The volumes are well-produced, a mine of information, and at around 30 pence per page, an absolute bargain.

John Mann