Molecular mechanisms of toxin damage

Specificity and Action of Animal, Bacterial and Plant Toxins. (Receptors and Recognition, Series B, Vol. 1.) Edited by P. Cuatrecasas. Pp. 345. (Chapman and Hall: London, 1978.) £15.

THAT some bacteria can kill without grossly invading their animal or human hosts has impressed and intrigued workers for half a century. The emergence of satisfactory explanations of the molecular means by which the toxins produced by such micro-organisms wreak their damage is described in this book. It has been a long and tortuous path and for some of these highly poisonous proteins one suspects that many a twist and turn lie ahead.

To start this review by talking of bacterial toxins is not to denigrate two chapters in the book, one of which by Albuquerque and Daly deals with steroid alkaloid toxins and the other by Olsnes and Pihl with abrin and ricin of plant origin, but rather to emphasise that six out of the eight chapters deal with bacterial products.

A first and striking impression on reading through the book is that of the very different levels of explanation reached for the different bacterial products. Where the excellence of molecular biological understanding can be used, as for example in the actions of choleragen or diphtheria toxins, satisfyingly complete pictures can be drawn. When our knowledge of molecular events involved in nerve function is tested, as in the actions of tetanus or botulinum toxin, then we have to stop short of a rounded picture at the molecular level. Undoubtedly the work on the two former toxins is among the triumphs of combined biological research and the chapters by Bennett and Cuatrecasas on cholera toxin and by R. J. Collier on diphtheria and *Pseudonomonas aeruginosa* toxins are models of clarity in telling the exciting stories.

In a chapter on the large number of toxins that act on cell membranes, Alouf collects a wide range of interesting and important facts. Many years ago when α toxin of *Clostridium perfringens* was first shown by Macfarlane and Knight to be a lecithinase, high hopes were felt that this example was the first of many. Indeed a number of such haemolysins have been shown to attack phospholipids but perhaps an even larger number are likely to exert their effect by being surface-active agents whose precise mechanism of action is uncertain.

Work on the nerve toxin of botulinum is described with great clarity by L. L. Simpson. One is inclined to exclaim only at the perverseness of nature. This peripheral nerve toxin has for many years been suspected to interfere with acetylcholine action. It is surely perverse that it interferes neither with the manufacture nor with receptors for the substance, but, as is now strongly suspected, with its release.

A spirit of adventure must have inspired the inclusion of a chapter on colicins into a book on toxins. It is, however, a very apt and long-sighted action. The chapter by Holland clearly shows that investigation of colicin E3, a "toxin" for *Escherichia coli*, in many ways parallels those of the toxins for animals, with specific receptors in the outer membrane of the bacteria, albeit protein instead of gangliosides, and subsequent penetration of the cell to disrupt a ribosonal RNA.

The book, or at least parts of it, could be read with profit by most biologists interested in molecular mechanisms, including more advanced students. It is on the whole well produced, with excellent diagrams. A little more careful proof-reading would have eliminated the rather large number of typographical errors, sometimes two or three on a page. The book is up-to-date, as far as one can expect of books, the references reaching 1976.

H. J. Rogers

H. J. Rogers is Head of the Microbiology Division at the National Institute for Medical Research, London, UK.

High performance liquid chromatography

Introduction to High Performance Liquid Chromatography. R. J. Hamilton and P. A. Sewell. Pp.183. (Chapman and Hall: London; Halsted: New York, 1978.) £8.

HIGH performance (or high pressure) liquid chromatography (HPLC) is one of main 'high growth' areas in modern instrumental chemical analysis. It is based on the practical realisation of the theoretical prediction that a spectacular increase in chromatographic column efficiency could be obtained by a reduction in the mean particle size of column packing materials to the order of 10–40 μm. This increase could be translated into a 20- to 100-fold reduction in analysis time, or into a corresponding improvement in chromatographic separation. These benefits were obtained only by an increase in operating pressures up to 5000-6000 lb in^{-2} and usually by a decrease in effective column load to the microgram scale. These requirements have been met by the development over the past decade of complex (and expensive) instrumentation and of a series of new, specially designed stationary phases.

These developments have been reviewed in several books, and the present volume attempts to compress the theory, practice and applications of HPLC into 172 pages. Although the coverage is reasonably complete, the attempt is only partially successful. The limitations of space have necessitated a rather terse and dogmatic style which is effective only so far as the information conveyed is accurate. Unfortunately there are several lapses in both text and illustrations. These may be due to an imperfect acquaintance with the subject as "agarose . . . is very resistant to compressive strain" (p92); or carelessness in material, "If $K_o = 1$ (i.e. all molecules are excluded)" is incompatible with the preceding equation (2.66) (pp34–35); or in proof-reading, (equations 2.20 and 2.16); and on p30 "R_s is proportional to N" (actually to $N^{\frac{1}{2}}$, see equation (2.55)). Some of the diagrams are also misleading: for example, Fig. 3.5 shows a pump in which the piston cannot follow the cam, and in which only the piston stem actually causes liquid movement. In Fig. 7.5 illustrating the re-cycle technique, no pump is included in the re-cycle circuit.

The most useful part of the book is chapter 4 which provides an excellent tabulated guide to the majority of high performance stationary phases now available, with comments on the packing, care and operation of HPLC columns. The relatively new technique of preparative HPLC is dealt with in chapter 7, and the concluding chapter 8 provides more than 80 examples of the applications of the method in a useful standardised format. About half of these were taken from manufacturers' literature.

Although this book provides a bird's-eye view of the whole field, it presents relatively little new material and anyone wishing to acquire a practical knowledge of HPLC would need to consult a more comprehensive and authoritative text.

C. J. O. R. Morris

C. J. O. R. Morris is Emeritus Professor of Experimental Biochemistry in the University of London, UK.