

will provide both a comprehensive source of information and a stimulus for researchers in fungal biology.

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Banbury Report 25: Nongenotoxic Mechanisms in Carcinogenesis. Edited by BYRON E. BUTTERWORTH and THOMAS J. SLAGA. New York: Cold Spring Harbor Laboratory. 1987. 397 pages. Cloth \$70.00. ISBN 087969 225 1.

Coincident with the encroaching confusion in genetic toxicology over the role it has to play in carcinogen prediction (Tennant *et al.* (1987), *Science* **236**, 933–941), there has been a resurgence of interest in nongenotoxic factors in carcinogenesis. This interest is encouraged by this book which, wisely, does not narrow its field of view exclusively to so-called nongenotoxic carcinogens. Chemicals thought to be nongenotoxic to-day may very well be demonstrated to have genotoxic potential in the future. Nevertheless, the re-designation of a chemical as genotoxic does not necessarily mean that its carcinogenic activity is through a genotoxic mechanism. For example, trichloroethylene may be a mouse hepatocarcinogen because of its effect on peroxisomes – it is nongenotoxic in a battery of *in vitro* assays – but its metabolites (e.g. chloral) can certainly induce mutation, the absence of a significant response in the *in vitro* assays being a result of the inadequate concentrations of the mutagenic metabolites achieved in those tests. But the mere demonstration of a genotoxic metabolite from trichloroethylene does not imply that it is, after all, a genotoxic carcinogen: the dominant effect may still be peroxisomal proliferation, followed by oxidative initiation and/or promotion, or other process. Conversely, dichloromethane is strongly genotoxic, in bacterial assays, but recent work has shown that the bacterial metabolism of this compound is quite different from its mammalian metabolism and that it does not interact covalently with DNA in rats (Green *et al.* (1988), *Toxicol. Appl. Pharmacol.* **93**, 1–10).

It is not a corollary of nongenotoxic carcinogenesis that the task of anyone concerned with regulation is made easier. The theoretical expectation of a threshold effect is difficult to realise. Thus, amitrole induces rat thyroid tumours at 100 ppm in the diet, but not at 10 or 1 ppm (Steinhoff *et al.* (1983), *Toxicol. Appl. Pharmacol.* **69**, 161–169). Unfortunately, it is very rare for an experimental design to permit risk assessments to be made; experiments are almost always designed only to identify hazard. Consequently, it is difficult to conclude that 10 ppm amitrole is below the thyroid carcinogenic threshold.

The multi-step process of carcinogenesis is influenced by a large number of factors, some of which give the appearance of being at least as important as genotoxicity. This is not a new idea, but the real value of this book lies in its summary of some of these

processes, review of a number of the chemical carcinogens which are nongenotoxic and – most important – stimulation of genotoxicity researchers to consider more seriously *in vivo* responses other than mutation. Dietary factors, such as deficiencies in the lipotropes choline and methionine or over-feeding, can significantly alter tumour incidence. This issue receives well-deserved attention in this book. The role of chronic hyperplasia is addressed in discussion of the hepatocarcinogenesis of many pesticides and di(2-ethylhexyl)phthalate (DEHP), the urinary tract carcinogenesis of nitrilotriacetate and a number of substances which can lead to calculus formation. Promotion and progression naturally are discussed, with particular reference to skin tumours, and foreign-body carcinogenesis occupies two chapters. *In vitro* techniques for the study of these processes, such as disruption of intercellular communication and cell transformation, do not have a current popularity, but they are not neglected here.

Because of the multiplicity of mechanisms which are likely to be involved, the study of nongenotoxic carcinogens lacks the unity of genetic toxicology and must attract researchers from a broad range of specialisations. Such a development is beneficial for the better understanding of neoplasia. This book serves as a focus for diverse activities and it is here that its importance rests. Its contents will not be entirely alien to anyone involved in carcinogenesis prediction or mechanism or carcinogen regulation, but its subject matter is a timely reminder of the complexity of these problems and the need for specialists from different backgrounds to listen to each other.

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Development Biology: A Comprehensive Synthesis Volume 4. Manipulation of Mammalian Development. Edited by R. B. L. GWATKIN. New York: Plenum Press. 1986. 388 pages. Subject index. \$59.50. ISBN 0 306 42166 6.

Dr R. Gwatkin did an excellent job. He invited chapters from many good scientists who had made great contributions to the problems under discussion. As a result, we have a book which deals not only with different ways of manipulating mammalian oocytes and embryos, but also with some theoretical problems likely to be of particular importance for those interested in new ideas and new results in the field of mammalian development.

Only a few years have passed since the publication of the 5-volume series on the development of mammals edited by M. H. Johnson. The achievements made in this field since then have led to a breakthrough in our basic understanding, as well as to advances in animal breeding and in medicine. The book under review

adequately covers most contemporary problems in the developmental biology of mammals. Thus, chapter 1 provides a detailed description of the present status of gene transfer into mouse embryos. Though many laboratories use the transgenic mouse as a standard experimental object, and much has been written about this, the reader will find original approaches here, and much new data on transgenic mice.

Chapter 2 is written by Drs J. McGrath and Davor Solter, who pioneered a new and very effective method of nuclear transplantation in early mammalian embryos. The authors detail their technique of enucleating newly fertilized mouse eggs and introducing into them pronuclei from other eggs. Some further problems where this technique may well be applicable are mentioned.

Chapter 3 is devoted to mouse oocyte fusion. Although only a few laboratories use this technique at present, there is no doubt that it can give interesting results in the study of nuclear-cytoplasmic relationships in early mammalian development.

Chapters 4 and 5 cover the problem of *in vitro* fertilization. Chapter 4 contains a thorough analysis of the results obtained by *in vitro* fertilization of eggs from laboratory and domesticated animals, while chapter 5 is devoted to the recent progress in human *in vitro* fertilization and embryo transfer. Both chapters include interesting and important information on the *in vitro* fertilization problem including the practical aspects, i.e. its application in farm animal breeding and in medicine. To my regret, however, no detailed technical protocols are given. The authors are very well qualified and could have shared their technical knowledge and experience to help to overcome the numerous difficulties that still exist in the application of *in vitro* fertilization and embryo transfer, especially in our own species.

Chapter 6 deals with approaches to sex regulation in mammals, namely prefertilization sexing, pre-implantation sexing and post-implantation sexing in laboratory and farm animals. One cannot but agree with the author that knowledge of the sex of embryos could be economically advantageous. However, it is hardly likely that a great profit could be expected if the total outlay on modern technology is taken into account.

Chapter 7 is a review of cryopreservation of mammalian eggs and embryos. The pioneering works of Drs D. Whittingham and I. Wilmut on reliable methods of freezing mouse embryos were published 15 or more years ago. Since then, embryo cryopreservation has come to be a standard procedure not only in laboratory studies, but also in farm animal breeding, and even for human embryos. It has had a considerable economic impact, which gives added assurance of the validity of the author's recommendations.

In chapter 8 the reader finds a detailed description of the present state of embryo transfer in animals. The introduction of these procedures was responsible for a

revolution in farm animal breeding, and as a result there has sprung up a whole embryo transfer industry. I do not dare to judge how much better the commercial application of embryo transfer techniques would be in the hands of those who have read this chapter. There is a selected list of references which the reader will undoubtedly find very useful.

Chapters 9–13 are devoted to the theoretical aspects of mammalian development. In chapter 9 Dr M. H. Johnson comments on the results obtained in his laboratory concerning the role of cell interactions in generating cell diversity in early mouse embryos. Even those who are familiar with other recent reviews of Dr Johnson on the same subject will find here new ideas in support of his polarization hypothesis.

Chapter 10 concentrates on tissue interactions in developing skin, teeth and related ectodermal derivatives, and chapter 11 on epithelial–mesenchymal interactions in the embryonic development of the mammary gland. Both chapters adequately describe the present state of these far from simple problems and contain information useful for those who are interested in new ideas and modern methods in morphogenesis.

Chapters 12 and 13 discuss immunological and immunogenetic approaches to the analysis of mammalian development. These are relatively new approaches, and the reader will find many things to attract his attention.

On the whole, this book leaves a good impression. It should find a place, if not on the scientist's desk, then on the library shelves. Although the developmental biology of mammals is a fast-moving and competitive field, with a great number of books devoted to it, this particular volume is not only a source of interesting and helpful information now, but it will undoubtedly remain so for some years to come.

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Gene Structure in Eukaryotic Microbes. Special publications of the Society for General Microbiology, vol. 22. Edited by J. R. KINGHORN. Oxford: IRL Press. 1987. 312 pages. Soft cover £27.50/US\$52.00. ISBN 1 85221 0400.

Even given the title of this book, it is not reasonable to expect the same aspects of genes to be discussed in depth for each of the diverse organisms loosely grouped as microbes. Nevertheless the reader has some expectation that different organisms will be compared in terms of the structure of 'typical' genes. At the very least one hopes for the sort of overall structure that permits the reader to draw his own conclusions. This book is unfortunately not particularly successful on these counts. Only in the final chapter (P. Montagu), nominally comparing 'lower'