publication. However, in view of ongoing research, changes in government regulations, and the constant flow of information relating to drug therapy and drug reactions, the reader is urged to check the package insert for each drug for any change in indications and dosage and for added warnings and precautions. This is particularly important when the recommended agent is a new and/or infrequently employed drug.

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The present state of molecular biology studies in relation to the oral region

The tremendous advances which have taken place in the understanding of the complex molecular events involved in the development and continuing metabolism of tissues, particularly in relation to the transmission of information from genetic material, have opened up new fields of research in all the biomedical sciences. Oral biology is no exception to this. I began
planning this volume some 2 years ago; the delay in its appearance springs from the many refusals of my invitations to contribute to it. These refusals had a common theme: the volume was too early because the research was still in progress and much work remained to be done. The tone of these letters confirmed my view that molecular biology was the subject of choice for a volume in a series with the word frontiers in its title. There is a risk that the contents of this volume will rapidly become dated because of their very topicality, but the quality of the contributors makes that less likely.

The techniques and discoveries of molecular biology have developed with remarkable speed and there now exists a situation in which undergraduates are being taught facts and methods outside the repertoire of many experienced research workers in the general field of oral biology. This book is intended in part to improve that situation. The chapters contributed by Dr. Russell and myself are written partly with that in mind. If this is insufficient the reader will find it worthwhile to consult one of the excellent textbooks of molecular biology now available - the second edition of 'Molecular Biology of the Cell', by Alberts, Bray, Lewis, Raff, Roberts and Watson, published by Garland Publishing Inc., New York and London, 1989, is an excellent example.

The term 'molecular biology' or 'molecular cell biology' is now used to describe a subject area which includes traditional biochemistry, cell ultrastructure and physiology (cell biology), and genetics. Within these broader areas there has been a concentration on molecular genetics, dealing with the transcription of genetic information, the translation into protein molecules and the post-translational modification of these proteins, and on developmental signals such as growth factors and the molecules associated with tissue interactions during development. Many of the techniques of molecular biology are those of traditional biochemistry. To these have been added immunological methods for identification of molecules. However, the techniques which are more specific to molecular biology are those which have been developed for working with DNA and RNA, and in particular the techniques for cloning these molecules in host bacterial cells.

The chapters of this book have been arranged according to the tissues which have been studied - first the dentition, with specific chapters on enamel and dentine, then the oral bacteria, and finally the salivary components, enzymes, proline-rich proteins and glycoproteins. In this overview I shall consider them in terms of technique. In considering the genetic control of the dentition, Dr. Lesot ranges widely over inheritance studies, identification of genes linked to the development of the dentition and tooth types, cellmatrix and cell-cell interactions, and the localization of specific proteins such
as epidermal growth factor, fibronectin, cadherins, actin and talin. All these may be implicated in the development of a dentition correctly situated in the jaw, with the different tooth types correctly arranged.

The three chapters on the dental tissues concentrate on molecules specifically associated with their development. Drs. Termine and Young give an account of the differences between the enamelines and the amelogenins, and describe how primary amino acid sequences have been established for the amelogenins and the products of bovine ameloblast mRNA have been identified. Drs. Herold and Rosenbloom extend these observations by describing the localization of amelogenins and enamelines in mammalian and nonmammalian species, using monoclonal antibodies to bovine proteins. Dr. Thesleff and her co-workers have explored the molecular basis of the differentiation of the dental mesenchyme which will eventually produce dentine. They have looked at the expression of a number of key molecules in the developing mesenchyme-binding sites for epidermal growth factor (EGF), the matrix protein tenascin, a cell-surface proteoglycan, and a protein found in high concentration in the dental papilla at the bell stage of development. Tenascin and the cell-surface proteoglycan seem to result from the interaction of the dental mesenchyme with epithelium.

Dr. Russell’s contribution on the impact of molecular genetic methods on oral microbiology moves the focus away from developmental studies to an area where the application of new techniques based on DNA and RNA analysis and cloning has begun to answer some previously insoluble problems. Thus, studies of chromosomal DNA have facilitated species identification and enabled the relationships between oral bacterial species to be determined. Genetic probes have been developed to identify species. Cloning of genes from streptococci has been used to study their cell surface proteins and to examine their metabolism, particularly in relation to enzymes such as the glucosyl transferases.

The sequencing of proteins and identification and cloning of genes for these proteins has transformed the world of salivary research also. Extensive studies of inheritance, structure and genetic coding of salivary proteins have been developing over some 15 years. Dr. Kam ranges over this expanding field of knowledge with a chapter on salivary enzymes. Salivary amylase has been sequenced and its genes identified in human and rodent tissue. Both salivary and pancreatic amylase have been studied and the human genome is now known to contain three salivary and two pancreatic amylase genes together with two pseudogenes, all situated on human chromosome 1 (lp21). In the mouse they lie on chromosome 3. The genetics of other salivary
proteins - in particular the proline-rich proteins (further described in the next chapter), statherin, histatin, cystatin and the mouse androgen-binding protein - have also been explored. In another chapter (chapter 7) I give an account of present knowledge of the salivary proline-rich proteins. This group of closely similar proteins probably comprises almost all the proteins of saliva apart from those with enzymatic activity and the more complex glycoproteins usually termed mucins. They are virtually unique to saliva. The major proline-rich proteins have been sequenced and shown to consist of a small number of repeat sequences of amino acids with very small variations between the different proteins. Their genes have been identified and located on chromosome 12 (12p 13.2) in humans. Finally, Dr. Tabak contributes a chapter on the complex and interesting field of salivary mucin research. Progress here has been slower because, as he points out, the very properties which make these glycoproteins of value in protecting the oral mucosa also make them very resistant to analysis. Despite this, the routes by which these glycoproteins are synthesized are being delineated and the post-translational processing mechanisms are becoming better understood. The effect of different stimuli on glycoprotein synthesis has been examined. However, the fundamental genetic control of mucin formation is still being explored. It will be apparent from the reviews in this book that much progress has been made in the study of the molecular events which occur in the development of the dental tissues and the dentition as a whole, in the characterization of oral microorganisms by their genetic fingerprint, and in the study of salivary protein genetics, composition and synthesis. There are still many unsolved problems but, if the state of knowledge revealed here is compared with that of only 5 years ago, the pace of discovery is such that it seems likely that their number will be greatly reduced within the next few years.

D.B. Ferguson