Understanding Dental Caries
1 Etiology and Mechanisms
Basic and Clinical Aspects

Gordon Nikiforuk
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KARGER

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Drug Dosage
The authors and publisher have exerted every effort to ensure that drug selection and dosage set forth in this text are
in accord with current recommendations and practice at the time of 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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Early in the genesis of this book, it became apparent that one person cannot assimilate all the literature on dental caries. However, the visible fragmentation and isolation of chapters, one from the other, in many multi-authored books led me to a decision to write most of the text myself - an exercise in masochism. Subsequently the chapters were submitted to chapter reviewers*, listed below, for a critical evaluation. Some chapters or parts thereof were written de novo and these authors are designated as contributors**. The works of the contributors and reviewers has been vital and I gratefully acknowledge their assistance. Collating their contributions has been an arduous but rewarding task.

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Professor G.N. Jenkins, Rosenstadt Visiting Professor at the University of Toronto, contributed generously of his time and energy in editing the entire book in addition to writing several sections. His congenial temperament, editing skills and scholarly criticisms did much to lighten the load in writing this text.

Thanks are due to Professors A.M. Hunt, D. Smith, H.J. Sandham, E. Fillery, N. Camerman, from the University of Toronto; B. Bibby (Rochester University), G.. Whitford (Georgia Medical College) and B. Krasse (University of Gteborg) for many useful suggestions and for reading portions of the draft manuscripts. The administrative support of Dr. D. Kenney, Chief of Dentistry of the Hospital for Sick Children, Toronto, over several years of writing is gratefully acknowledged.

Mrs. M. Hearn, Mr. S. Burgny, Mrs. R. Bauer helped greatly in the artwork and photography and Mrs. M. Shaw started the word-processing ordeal.

Members of ORCA (European Organization for Caries Research) have played an important role in providing a forum for numerous discussions on the subject. I am grateful to each and all for numerous ideas and suggestions.

Ms. Slavka Murray typed and retyped the manuscript, mastered the word-processor, and in an untiring manner persevered until the textbook was totally assembled.

The staff of the publisher and Dr. T. Karger have been most helpful in offering and accepting suggestions. I am grateful for the manner in which they have expedited this publication.

Gordon Nikiforuk

Preface

This is an age of specialization, the age of the expert, the pursuit of a narrow field without universalizing. Compartmentalization of knowledge into specialties is a natural outgrowth of the knowledge explosion. Specialization
has the advantage of permitting one individual to master the intricacies of a specific problem. It has the disadvantage of producing an expert who knows "more and more about less and less". As specialization increases the need to transcend it becomes even greater.

During the past 25 years there has been an increasing tempo of papers and symposia on dental caries resulting in a large amount of fragmented information. Facts and concepts from such diverse fields as crystallography (hard tissues), immunology, microbiology, physiology, nutrition and diet, epidemiology, spectroscopy, and others are available in unmanageable numbers. These disciplines have contributed important information but the total picture cannot be more than gleamed at unless the different pieces are properly fitted together. That is what this book will attempt to do.

Rather than produce a single voluminous book this work is divided into two shorter volumes. In Volume 1, the basic aspects of the etiology and mechanism of dental caries are presented; Volume 2 deals with clinical aspects of prevention. While each volume stands alone, Volume 1 is a desirable companion to Volume 2. In Volume 1 the nature of tooth substance, the role played by oral and plaque microflora and the contribution of diet and nutrition, as well as secondary factors such as saliva, fluorides and nutrition are presented. In Volume 2, the synthesis achieved in Volume 1 is applied to the practical, clinical aspects of prevention of caries.

The contents and the sequence of chapters in this textbook have formed the basis for the teaching of the subject of Caries at the University of Toronto. This has led to a more unified teaching of the subject and has eliminated the fragmentary approach characteristic of past efforts. It is hoped it may assist others in developing a course in Cariology. Although this book is primarily designed for undergraduate students of dentistry, the comprehensive nature of its contents should appeal to graduate students as well as to students of dental hygiene and dental assisting who wish to augment their knowledge of the caries process.

Preface XII

Undergraduate students too often ignore historical aspects of a subject, and feel massive bibliographies are asphyxiating. While references have been winnowed, and historical aspects compressed, some history and bibliography is essential for growth of learning. The subject of caries should be an exciting learning experience.

Caries, because of its uniqueness as a disease, its ubiquitous nature, and its stubborn resistance to resolution remains as one of man's most common, oldest, and singly costliest ailment. The total health handicap due to dental caries is staggering. In western countries there has been a
dramatic decline in caries over the past decade but in the economically
developing countries caries prevalence is increasing as dietary habits of
industrialized nations are adopted. For this reason, it is important that the
subject of dental caries is given as broad a readership as possible. Recognition
of the enormity of the problem should spur efforts to reduce the ravages,
the pain and the cost of this disease.
This book is obviously not the last word on the subject, nor is it the
first. I hope it may compete with the best. The French philosopher Montaigne
said it best: 'I have gathered a posie of other men's flowers and
nothing but the thread which binds them is mine.'
Gordon Nikiforuk

To Marge Jordis, Andrew and Christian
for making intellectual pursuits a way of life

To my Saskatchewan farm heritage
where the love of learning was always nourished