'This monograph is dedicated to Gary Milton Whitford, my master and friend, who guided me through the avenues of Fluoride Research.'

Marília Afonso Rabelo Buzalaf
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Contents

IX List of Contributors
XI Foreword
  Robinson, C. (Leeds)

Fluoride Intake, Metabolism and Toxicity
1 Fluoride Intake of Children: Considerations for Dental Caries and Dental Fluorosis
  Buzalaf, M.A.R. (Bauru); Levy, S.M. (Iowa City, Iowa)

20 Fluoride Metabolism
  Buzalaf, M.A.R. (Bauru); Whitford, G.M. (Augusta, Ga.)

37 Contemporary Biological Markers of Exposure to Fluoride
  Rugg-Gunn, A.J. (Newcastle upon Tyne); Villa, A.E. (Santiago); Buzalaf, M.A.R. (Bauru)

52 Historical and Recent Biological Markers of Exposure to Fluoride
  Pessan, J.P. (Araçatuba); Buzalaf, M.A.R. (Bauru)

66 Acute Toxicity of Ingested Fluoride
  Whitford, G.M. (Augusta, Ga.)

81 Chronic Fluoride Toxicity: Dental Fluorosis
  DenBesten, P.; Li, W. (San Francisco, Calif.)

Impact of Fluoride in the Prevention of Caries and Erosion

97 Mechanisms of Action of Fluoride for Caries Control
  Buzalaf, M.A.R. (Bauru); Pessan, J.P. (Araçatuba); Honório, H.M. (Bauru);
  ten Cate, J.M. (Amsterdam)

115 Topical Use of Fluorides for Caries Control
  Pessan, J.P. (Araçatuba); Toumba, K.J. (Leeds); Buzalaf, M.A.R. (Bauru)

133 Systemic Fluoride
  Sampaio, F.C. (João Pessoa); Levy, S.M. (Iowa City, Iowa)
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Working and publishing in the field of skeletal and dental tissues for the past 40 years, in particular on the biology of dental enamel, it became apparent to me at a very early stage that fluoride, a minor tissue constituent, was an inextricably important aspect of this area of study. Indeed the effects of fluoride seemed at odds with the extremely small amounts present. Also, unlike other important minor components of the skeletal and dental tissue mineral, such as carbonate and magnesium, fluoride concentrations vary widely and depend to a great extent on exposure to external sources.

Fluoride came to prominence by virtue of its effect on skeletal tissue development, particularly in relation to environmental exposure. In cases of exposure to relatively high concentrations, its presence during formation – as well as its direct incorporation into the skeletal mineral phase – led to pathological changes in both skeletal and dental tissues. Tooth enamel was found to be particularly sensitive in this respect. The effects can be profound since pathology related to high levels of fluoride exposure involves changes in both tissue structure as well as chemistry.

However, a paradox emerged from this field of study in which it became clear that exposure to smaller amounts of fluoride, while often leading to changes in the dental tissues, conferred considerable protection against the most widely spread and costly of diseases – dental caries. The protection was dramatic and was first ascribed to fluoride-induced changes to the tooth tissues during their development. This concept, however, was later challenged as topical exposure to fluoride in the oral environment was shown to be extremely effective in reducing dental caries. The role of developmentally acquired fluoride in this respect remains intriguingly open to question.

Such an important advantageous clinical effect, together with the concomitant possibility of pathological change, led to a wide range of intense investigations. These centered on how fluoride is obtained from the diet, how it is dealt with after absorption and also its interaction with the calcium phosphate/apatite phase of dental tissues.

The chemistry of biological calcium phosphates is, however, very complex. As a result of this, the deposition and behavior of the highly substituted and defect calcium hydroxyapatite crystals of the skeletal and dental tissues has received an enormous amount of attention. The interaction of fluoride with this system added further to this complexity, and as a consequence studies of fluoride and skeletal and dental mineral have generated a vast literature.

With the obvious potential for improving the protective effect against dental caries, attention was focused upon the effect of fluoride on the developing tooth. Focus then moved towards studies of the role of fluoride in the complex interactions between the tooth tissues and their environment of plaque biofilm, saliva and pellicle. It is from these studies that many of the specific benefits...
of the role of fluoride in caries prevention have emerged.

While mechanisms behind fluoride-induced change to skeletal and dental tissues and the way fluoride behaves in protecting against dental caries are much clearer than they were 40 years ago, the area is still very complex and the plethora of literature is sometimes confusing.

This monograph has brought together current concepts relating to fluoride and its role in relation to the prevention of dental caries. Information from a large and complex field has been assembled in a clear sequence and presented in a very lucid fashion. Of particular note are the diagrams, which are very clear and a great help in presenting highly complex data in an easily understood context.

With this in mind, the text will be valuable for research workers or postgraduate students beginning a career in this or allied fields, and provide a clear up-to-date summary of current thinking in this area. Established researchers and teachers, whether in clinical or basic sciences, will also find the monograph a valuable addition to their libraries.

The value of this text stems from the contributions of distinguished researchers in this field. The editor, whose own laboratory has contributed substantially to this area in recent years, has brought together a number of internationally known authors with an impressive series of publications across the width of the fluoride research area.

With regard to the structure of the monograph, the first section deals with the availability of fluoride and how it is dealt with by the body from a physiological and metabolic standpoint. This forms the basis for and introduction to fluoride toxicity and the subject of fluorosis and the importance of monitoring intake. For the clinician, this highlights and clarifies the advantages of fluoride as well as possible hazards.

The second section focuses in more detail on modes of fluoride application and the way in which fluoride has been and is used to effect the dramatic reductions in dental caries with which it is associated. The complex mechanisms by which fluoride exerts its effects are described with clarity, and the entire text is accompanied by particularly useful illustrations.

Whether to those new to the field or to the established worker, this monograph will prove to be a most valuable resource to the field of fluoride research.

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