

# Foreword

To the mammalian neonate, milk is more than a source of nutrients. It furnishes a broad range of molecules that protect the neonate against a more or less hostile environment. In human neonates, the incidence of digestive and respiratory diseases, which is significantly lower in breastfed infants than in those who have been formula-fed, has been attributed to the immune globulins, antimicrobial proteins, and antibacterial peptides present in maternal milk.

For humans, particularly in Western countries, milk is a source of both food and substances beneficial to growth and health in children and adults. For example, the calcium supplied by milk, acknowledged for its role in bone accretion, is also involved in controlling body weight and blood pressure.

Advances in the analysis of milk composition have led to the identification and characterization of a large number of its components. Current interest in human nutrition and health has made it possible to demonstrate that many of these components are biologically active and exert beneficial effects. Recently, however, the highly publicized negative health impact of excessive milk consumption has raised questions as to the value of dairy products. It remains necessary to clarify the different arguments advanced to support the benefits of milk and dairy products.

The purpose of this volume is to report advances in our knowledge of bioactive milk constituents, in a series of comprehensive reviews by internationally reputed scientists.

The first two parts concern the activities and properties of milk lipids and native milk proteins. An overview of the nutritional factors controlling lipogenic gene expression in ruminant mammary glands may help us to understand the nutritional importance of modifying milk fat composition to enable a positive health impact for milk. Important findings are presented on the role of the milk fat fraction as a source of lipophilic microconstituents (vitamins, phytosterols, etc.). Advances in proteomic technologies are being used to explore the protein content of the milk fat globule membrane. Another source of membrane proteins in milk (milk serum lipoprotein membrane vesicles) is also discussed. Although they only represent a small proportion of milk proteins, through their protein-protein interactions and enzymatic activities, these

proteins may assume specific functions in both the mammary gland and the gastrointestinal environment of newborns.

The antimicrobial, anti-inflammatory, and anticancer activities of lacto-serum proteins such as lactoferrin, CD14,  $\alpha$ -lactalbumin, and oligosaccharide, and the immunomodulatory activities of polypeptide from colostrum, are discussed. The structure-function relationship of these molecules, the occurrence of active complexes with other molecules present in either milk or the neonatal gastrointestinal system, and their ability to promote the maturation of cells in the immune response constitute very interesting new orientations for the development of novel therapeutic approaches.

Bioactive peptides encrypted in native proteins are released following the hydrolysis of precursor proteins by specific enzymes. An overview of different *in vivo* and *in vitro* studies concerning the effects of milk peptides on the maturation of the neonatal immune system is presented in the third part of the book. Antimicrobial and antitumor peptides derived from milk during digestion may be of physiological significance in suckling neonates and also supply valuable dietary proteins and peptides that will contribute to human well-being. Genetic engineering in animals now enables the production of biologically active proteins or modifications to milk composition. The fourth part of this volume will serve as a comprehensive guide to this recent but highly active field of producing biologically active foreign proteins in the milk of livestock animals.

Colostrum and milk provide hormones and growth factors to the neonate: Their roles are exhaustively described and discussed. Part V presents information on probiotics in milk and epidemiological aspects of breastfeeding and allergic diseases.

This volume offers a very complete survey of current ideas on this active and rapidly evolving field of research. In addition to achieving an admirable summary regarding biologically active components in milk, it underlines the importance of evaluating the role of these different components as interacting molecules. It does not constitute a definitive view of the subject but reflects current thinking, providing a wealth of information and numerous suggestions for future research related to milk composition, the impact of dairy products on health, and applications for the design of dietary products or pharmaceutical preparations.

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