

A stylized illustration of a cow with large black spots on a reddish-brown background. The cow is shown in profile, facing left, with its head lowered as if grazing. The illustration uses bold black outlines and solid black spots of varying sizes.

biology of lactation

Jack Martinet
Louis-Marie Houdebine
Herbert H. Head, editors

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Foreword

The first edition of this book was written in French mostly but not exclusively by French scientists. The chapters that were written originally in English were translated into French. The editors of this first edition were Jack Martinet and Louis-Marie Houdebine. The book was entitled *Biologie de la Lactation* and it was published by the INRA – INSERM Editions in 1993.

After passage of several years, it was suggested that a new updated version should be written and published in English to fill a need and to enlarge the prospective audience. The editors of the first version were fortunate to obtain the collaboration of H. Herbert Head of the Department of Dairy and Poultry Sciences at the University of Florida (IFAS), Gainesville, USA as an editor. His collaboration, in addition to writing several chapters, was to ensure that the translated versions for the second edition were as intended by the original authors and this collaboration was very welcome. The authors of the second version are essentially those of the first version who expanded and updated their chapters. They updated their manuscripts over the course of a year but for technical reasons, the printing of the book was interrupted for some time and was temporarily abandoned while a new publisher was located. After more than a year the authors again updated and revised their chapters before the situation became clear and a new publisher was found. The editors suggested to the authors to update once more their chapters and all except but a few completed this task and those that could not include the most recent data and information is indicated in the text versions.

Jack Martinet retired from INRA after a long and distinguished career before the completion of the final English version and died in 1998. This book is dedicated to him and to his many contributions, collaborations and friendships throughout the scientific community interested in various aspects of Physiology of Lactation in France, Europe and the world.

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Introduction

Lactation was one of the last biological functions to appear during evolution. It became so important that a category of animals, the mammals, is defined by this function. Lactation provides a greater chance for the newborn to survive, in what often is a hostile environment, because its food and a large part of its protection against pathogens are provided through ingestion of colostrum and milk. This strategy often has a great cost for the mother; the price being the production of milk, a complex product. Lactation may be limiting for mother and the newborn, although it obviously is a priority after parturition. In many mammalian species females may carry more fetuses than they can suckle after birth, but the cost to the mother to carry a fetus until it is born is relatively low in comparison to her cost to produce milk. Thus, the mammary glands are of great interest and full of contrasts because they use a marginal proportion of body energy intake and reserves during nonreproductive periods but they become priority users of nutrients during a lactation. For the mammary glands to function they first must be subjected to an intense growth phase, one that represents real organogenesis during pregnancy and results in the formation of a complex tissue made up of various cell types, including nerve cells. These cells that accumulated during growth largely disappear after the young are weaned. At parturition, the large quantities of nutritional components that are found in milk begin to be synthesized and their synthesis is maintained for a relatively long period; the actual time period varies across species. Lactation, therefore, is an attractive biological model to study organogenesis and the functional relationships between different cell types, secretion mechanisms, transduction of hormonal messages (particularly of the prolactin message), hormone receptors, hormonal control of gene expression, molecular genetics of milk protein genes, maternal metabolism, maternal behavior, immunological mechanisms controlling the mammary gland, transfer of protection to the newborn, and oncogenesis. Moreover, milk from domestic animals is one of the essential foods of humans and it has been and continues to be the subject of intense studies of paramount importance. Recent research studies also strongly suggests that the mammary gland can even be used as a living fermentor to produce recombinant proteins for pharmaceutical and veterinary use in large amounts and at relatively low cost.

The different chapters of this book address all these problems with the aim of being comprehensive and prospective rather than exhaustive.

