

Current Topics on
**Bioprocesses in
Food Industry**

Volume II

Editors

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Preface

This book is the outcome of the second international congress on the Bioprocess in Food Industries held at Patras, Greece during June 2006, organized by the ICBF Forum (www.icbforum.org). It comprises an advanced contribution on the food bioprocessing and other disciplines of the Food Science, made by the large number experts from the Europe, Asia, America and Australia. Most of the contributors are university professors, well-known academic staff and respected researchers in the internationally recognized research centers. Authors join the International Forum on Food Bioprocessing, which aims on the advancement of the food production through the environmentally-friendly technology development, reduction in the size of the food production plants, substitution of the chemical preservatives with modifying the processes or substituting them with the natural products. The improvement of the nutritional value of the foods through the increase of the nutritive compounds and eliminating the undesirable substances is another aim of the research and has been analyzed in these articles.

This book aims in providing the readers the most recent approaches of the food bioprocessing .More specifically, it provides knowledge on the enzymes and bio-catalysis in the food biotechnology, applications of fermentation technology in the food production, bioprocess engineering for the process and food development and bioreactor design. Aspects on the genetically modified foods are also reported. Furthermore, in the frame of the recent knowledge of the food science, this book focuses on the aspects of food microbiology, nutritional, chemical and rheological properties. New knowledge of the major significance comprises the biotechnology of the flavors, biotransformation of the processes, the significance and perspectives of the indigenous enzymes in the milk, strategies for the yeasts and lactic acid bacteria improvements by the genetic modification and the biotechnological production of various compounds. Likewise, new and comprehensive knowledge for the immobilized cells and enzymes is reviewed for the brewing, wine making, baking and cereal by-products exploitation. The sterilization and deodorization, monitoring and citric acid production processes are discussed, while value-added products via fermentation and aspects of the safety, antimicrobials and hygiene in the food industry improving human health provide an important base of the knowledge in the food production. The nutraceutical and the pharmaceutical from the mushrooms affect the healthy diet, in combination with their effects on the food, health and environmental technology development. Microbial cell signaling,

nano-bioprocessing in the food industry and the probiotic food and lactic acid bacteria in combination with the intestinal flora are very important aspects for the food scientists. Natural microflora on the olives correlated with the risk assessment provides knowledge for this important Mediterranean food. Furthermore, there are articles on the food colors obtained by the extraction, chemical synthesis and biosynthesis and on the degradation of the plant polyphenols using the enzymes. After the aforementioned presentation, this book contributes to reveal the new knowledge in the most up-to-date areas of the biotechnological applications in the food production as that are related with the global sustainable development.

It is hoped that the readers would find the book useful.

Athanasios Koutinas

Ashok Pandey

Christian Larroche

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Section 1

Biocatalysis and Food Biotechnology

The principal indigenous enzymes in milk

Patrick F. Fox* & A.L. Kelly

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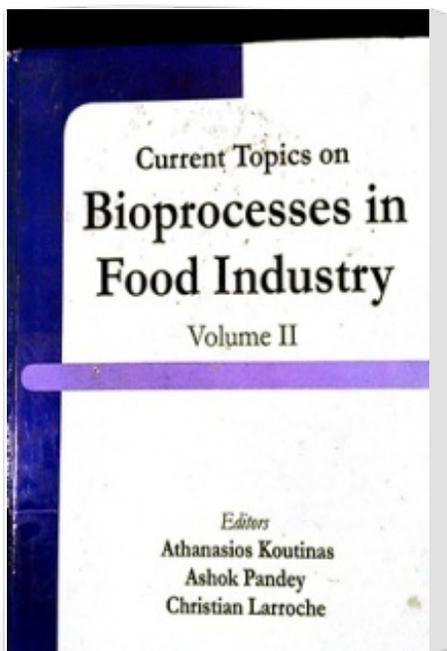
The indigenous enzymes in milk have been the subject of research since 1881, when the first report on an indigenous enzyme (lactoperoxidase) appeared. Enzymes in milk originate from the animal's blood plasma, leucocytes (somatic cells) and the apical membrane or cytoplasm of the secretory cells. By the early 20th Century, seven indigenous enzymes had been identified in milk: (lacto)peroxidase, catalase, xanthine oxidase, proteinase, lipase, salolase (arylesterase) and amylase. These enzymes were relatively easily assayed and were technologically important; they have now been isolated and well characterised. Between 1924 and about 1970, nine more important indigenous enzymes were identified in milk, isolated and characterised. These were important as indicators of pasteurisation of milk (alkaline phosphatase, γ -glutamyl transferase) or of mastitis (N-acetylglucosaminidase, acid phosphatase) or were considered to be important for the stability of milk (superoxidase dismutase, sulphhydryl oxidase). Milk is also rich in ribonuclease and lysozyme. In addition to these major enzymes, about fifty other enzyme activities have been detected in milk but have not been isolated and are considered not to be important.

Reflecting changes in dairy technology and other factors, the focus of attention in dairy enzymology has varied over the years. Although dairy enzymology has a long history, many questions about the nature and significance of milk enzymes remain to be answered definitively. Most of the research has been on bovine milk and to a lesser extent on human milk. There has been only occasional work on enzymes in the milk of other species but this has shown that there are large inter-species differences in the level of many enzymes.

1. INTRODUCTION

Milk was a popular early subject for studies on enzymology, possibly because it is relatively rich in several enzymes, is susceptible to spoilage by these enzymes, and since it is a liquid, it is relatively amenable to the assay of enzymes. Several enzymes were identified in milk before the nature of enzymes was recognised. Today, more than 70 enzymes have been identified in milk and the principal ones have been isolated and characterised and their significance in milk and dairy products studied in considerable detail.

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