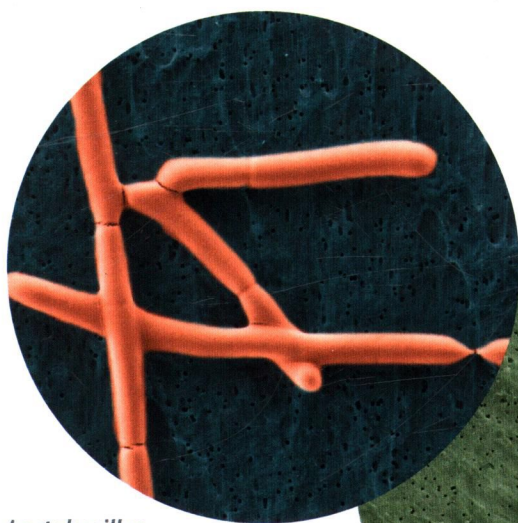


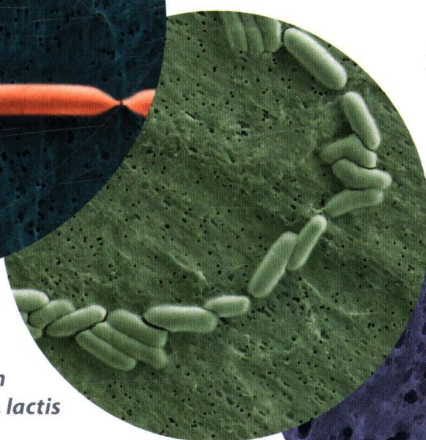
# Probiotic Dairy Products

SECOND EDITION

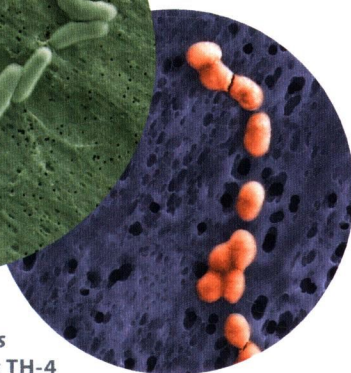
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*Lactobacillus acidophilus* LA-5



*Bifidobacterium animalis* subsp. *lactis* BB-12



*Streptococcus thermophilus* TH-4

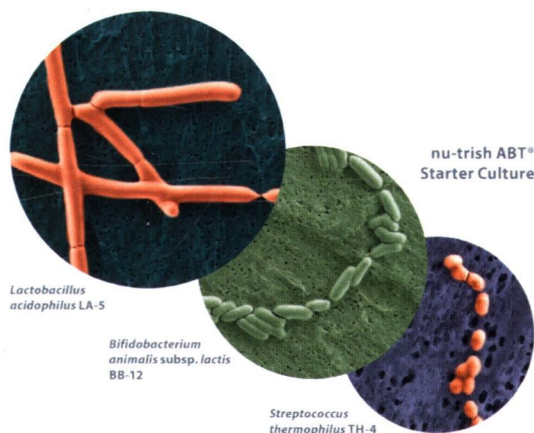
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# Probiotic Dairy Products

SECOND EDITION



## The updated guide to the most current research and developments in probiotic dairy products

The thoroughly revised and updated second edition of *Probiotic Dairy Products* reviews the recent advancements in the dairy industry and includes the latest scientific developments in regard to the 'functional' aspects of dairy and fermented milk products and their ingredients. Since the publication of the first edition of this text, there have been incredible advances in the knowledge and understanding of the human microbiota, mainly due to the development and use of new molecular analysis techniques.

This new edition includes information on the newest developments in the field. It offers information on the new 'omic' technologies that have been used to detect and analyse all the genes, proteins and metabolites of individuals' gut microbiota. The text also includes a description of the history of probiotics and explores the origins of probiotic products and the early pioneers in this field. Other chapters in this resource provide valuable updates on genomic analysis of probiotic strains and aspects of probiotic products' production and quality control. This important resource:

- Offers a completely revised and updated edition to the text that covers the topic of probiotic dairy products
- Contains 4 brand new chapters on the following topics: the history of probiotics, prebiotic components, probiotic research, and the production of vitamins, exopolysaccharides (EPS), and bacteriocins
- Features a new co-editor and a host of new contributors, that offer the latest research findings and expertise
- Is the latest title in Wiley's Society of Dairy Technology Technical Series

*Probiotic Dairy Products* is an essential resource for dairy scientists, dairy technologists and nutritionists. The text includes the results of the most reliable research in the field and offers informed views on the future of, and barriers to, the progress for probiotic dairy products.

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**SDT** Society of  
Dairy Technology

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Edited by  
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# **Probiotic Dairy Products**

**SECOND EDITION**

**WILEY**  
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# Probiotic Dairy Products

Second Edition

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# Probiotic Dairy Products

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## Preface to the Technical Series, Second Edition

For more than 70 years, the Society of Dairy Technology (SDT) has sought to provide education and training in the dairy field, disseminating knowledge and fostering personal development through symposia, conferences, residential courses, publications, and its journal, the *International Journal of Dairy Technology* (previously known as *Journal of the Society of Dairy Technology*).

Through this time, there have been major advances in our understanding of milk systems, probably the most complex natural food available to man. Improvements in process technology have been accompanied by massive changes in the scale and efficiency of many milk and dairy processing operations, accompanied by an ever widening range of sophisticated dairy and other related products.

In 2005, the Society embarked on a project to produce a Technical Series of dairy-related books, to provide an invaluable source of information for practicing dairy scientists and technologists, covering the range from traditional to modern large-scale operations. The 2nd edition of 'Probiotic Dairy Products', under the editorship of Drs Adnan Tamime and Linda Thomas, provides a timely update on the advances that have been made in the understanding of the human gut microbiota, the characterisation, enumeration and production of probiotics together with their relationship with prebiotics and the commercial implications for dairy and other products within the legislative constraints.

Andrew Wilbey  
Chairman of the Publications Committee, SDT  
October 2016



# **Preface to the Technical Series, First Edition**

For more than 60 years, the Society of Dairy Technology (SDT) has sought to provide education and training in the dairy field, disseminating knowledge and fostering personal development through symposia, conferences, residential courses, publications, and its journal, the International Journal of Dairy Technology (previously known as Journal of the Society of Dairy Technology).

In recent years, there have been significant advances in our understanding of milk systems, probably the most complex natural food available to man. Improvements in process technology have been accompanied by massive changes in the scale of many milk/dairy processing operations, and the manufacture of a wide range of dairy and other related products.

The Society has now embarked on a project with Blackwell Publishing to produce a Technical Series of dairy-related books to provide an invaluable source of information for practising dairy scientists and technologists, covering the range from traditional to modern large-scale operations. This, the first volume in the series, on 'Probiotic Dairy Products', under the editorship of Dr Adnan Tamime, complements the second volume on 'Fermented Milks' in providing a wide-ranging review of this group of micro-organisms, which are increasingly recognised as playing a vital role in the maintenance of our health while also contributing to the microbiology of many fermented dairy products.

Andrew Wilbey  
President, SDT  
February 2005





## Preface to the Second Edition

Since the publication of the first edition of this book in 2005, we have witnessed incredible advances in our knowledge and understanding of the human microbiota, mainly due to the development and use of new molecular analysis techniques. One example is the new ‘omic’ technologies that have been used to detect and analyse all the genes, proteins and metabolites of individuals’ gut microbiota. Studies investigating different population groups in various states of health that have used such methods have given a better overall picture of the composition and functions of the gut microbiota. This new edition of ‘Probiotic Dairy Products’ reflects this scientific interest by incorporating a new chapter on the human gut microbiota (see Chapter 1), which reviews current knowledge.

The vast amount of research that has been conducted in this field, which has included several multi-national projects, has resulted in numerous high-profile scientific papers that have helped to drive medical and consumer interest in probiotics, because of their influences on the gut, its microbiota and overall health. Another new chapter for this edition describes the history of probiotics (see Chapter 2), reminding us of the origins of these products and the early pioneers in this field. It is generally acknowledged that the probiotic concept started with Metchnikoff’s idea that a long healthy life could be promoted by increasing numbers of lactic acid bacteria in the colon at the expense of ‘putrefying’ bacteria that were injurious to health. In the twenty-first century, probiotic benefits have been reported for an extraordinary range of health and disease areas (see Chapter 8), and it is important to note that clinical studies have been conducted not just with tablets or powders but also with probiotic dairy products, in the form of fermented milk drinks and yoghurts. One great advantage of dairy products over pharmaceuticals is that the former can be incorporated readily into one’s daily diet, and thus can quite easily be part of a proactive strategy for health maintenance.

It is an absolute requirement that manufacturers can assure product quality and safety. Probiotic products must contain adequate numbers of live microbial strains, and other chapters in this book provide valuable updates on genomic analysis of probiotic strains (Chapter 3) and aspects of probiotic products’ production and quality control (Chapter 4). The new molecular technologies can now be applied for the identification and enumeration of the live probiotic strains in dairy products, although culture methods remain important. These methods are reviewed in Chapter 6.

Since the first edition of the book, the sale and marketing of probiotics have expanded to around the world, which has led to regulatory changes to ensure that, among other

things, probiotic health claims are substantiated by scientific evidence. This is reviewed in Chapter 5. Probiotics are sometimes combined with prebiotics to make synbiotic products, and the research behind prebiotics is discussed in Chapter 7, whilst Chapter 9 gives an overview of the different metabolites that can be produced by probiotic strains that have potential health benefits. Finally, Chapter 10 speculates on the future for probiotic dairy products, and the current barriers to progress.

A.Y. Tamime and Linda V. Thomas  
December 2016