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Lactic Acid Bacteria

Methods and Protocols

Edited by

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 **Humana Press**

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ISSN 1064-3745 ISSN 1940-6029 (electronic)
Methods in Molecular Biology
ISBN 978-1-4939-8906-5 ISBN 978-1-4939-8907-2 (eBook)
<https://doi.org/10.1007/978-1-4939-8907-2>

Library of Congress Control Number: 2018960875

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The registered company address is: 233 Spring Street, New York, NY 10013, U.S.A.

Preface

Lactic acid bacteria have traditionally been used in food production as important fermentative bacteria. They have been used to prepare dairy products such as yogurt and cheese, alcoholic beverages such as wine and whisky, and seasonings such as soy sauce and fish products.

In 1908, Metchnikoff reported that lactic acid bacteria in yogurt improve intestinal conditions. As a result of that benefit, lifespan extension can be expected as an influence from the bacteria. Research into lactic acid bacteria for probiotic use advanced after Metchnikoff's reports. Generally, hundreds of species, 100 trillion cells of bacteria, are present as intestinal flora in human intestines. Many researchers have reported on the role of bacteria as a component of the bacterial flora in human intestines. Recently, the bacteria have been used in medicine as an intestinal medicine. Moreover, immunobiotics using lactic acid bacteria have been investigated recently by many scholars. Consequently, lactic acid bacteria are used widely for human life. Many scholars hope to know more about how professional researchers evaluate the various lactic acid bacteria functions.

This volume of the *Methods in Molecular Biology* series provides a collection of protocols for numerous experimental approaches used by the authors for lactic acid bacteria research, such as the isolation of lactic acid, along with applications of lactic acid for food production and healthy function, in 16 chapters divided into three parts. All authors have contributed in the format used in the *Methods in Molecular Biology* series. In these explanations, the *Materials* sections list all the chemicals, reagents, buffers, and other materials used for the protocols. Furthermore, detailed descriptions of every protocol are provided in the *Methods* section. They are expected to lead to the successful completion of each method. Some emergent difficulties or techniques for each protocol are presented in the *Notes* section.

In Part I, we explain bacteria metabolism, methods of isolating lactic acid bacteria from natural substances, and bacteriocin as antibacterial substances produced by lactic acid bacteria. Bacteriocin is a noteworthy substance that is recognized throughout the world for its use as an antibacterial substance in food. Therefore, methods of selecting a lactic acid bacteria strain to produce bacteriocin and evaluation of bacteriocin produced from the bacteria are described. Furthermore, lactic acid bacteria produces lactic acid from sugar, but the bacteria are also in a stress condition. As a result of the stress response to acid, internal pH changes considerably. Actually, internal pH is an important indication for the food industry and microbiology using the bacteria. Therefore, methods of assaying pH are also described in this section.

Secondly, we present an application for the food industry in Part II. An author provides methods for counting microorganisms such as lactic acid bacteria, yeast, and mold in yogurt, and methods for quality analysis or texture. Furthermore, the polysaccharide produced from lactic acid bacteria is mentioned successively in three chapters. The polysaccharide not only has a relation to yogurt texture but also has a role in improving immunity. The authors provide evaluation methods and analytical methods for the polysaccharide and the production of lactic acid bacteria. Furthermore, in food production, the growth of lactic acid bacteria is known to spoil the quality of food. Detection of spoilage of lactic acid bacteria in beer using PCR method is demonstrated by the authors.

Finally, beneficial effects of lactic acid bacteria are presented in Part III. The authors describe methods for the evaluation of detoxification by biosorption of heavy metals by lactic acid bacteria, production of immunobiotics by the bacteria, adhesion of the bacteria to intestinal mucosa, and neutralization of lipopolysaccharides (LPS) by the bacteria. Many lactic acid bacteria have healthy function after oral ingestion as prebiotics. We hope to apply the results to many research efforts in the domains of food science and health science.

I would like to acknowledge all authors for kindly contributing their chapters. We are especially grateful to the Series Editor Dr. John Walker and the Editor of Springer Protocols, David C. Casey, for their assistance, and to the information technology department for providing the requisite framework, which greatly enhanced the compilation of the book chapters.

Sendai, Japan

Makoto Kanauchi

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