

Functional foods: Metabolic health, gut, precision nutrition.

Maya Shah*

Department of Clinical Nutrition, University of Delhi, India

Introduction

This comprehensive review synthesizes findings from randomized controlled trials, highlighting the potential of various probiotics to positively impact metabolic syndrome markers such as glucose metabolism, lipid profiles, and inflammatory status. It suggests that specific probiotic strains could serve as functional food components to aid in managing metabolic health[1].

The article delves into the roles of various polyphenols found in functional foods in modulating metabolic syndrome. It discusses their mechanisms of action, including antioxidant and anti-inflammatory properties, and critically evaluates current evidence, challenges in research, and future directions for integrating polyphenols into clinical nutrition strategies[2].

This review explores the landscape of precision nutrition, emphasizing its potential to tailor dietary recommendations, including functional food incorporation, based on individual metabolic profiles, genetics, and lifestyle. It outlines the current scientific understanding and future technological advancements needed to personalize nutrition for optimal metabolic health outcomes[3].

The paper provides an overview of omega-3 fatty acids as critical functional ingredients in food, detailing their numerous health benefits, particularly in metabolic regulation. It also discusses various food applications and advanced encapsulation technologies aimed at preserving their stability and enhancing their bioavailability within functional food matrices[4].

This review examines how functional foods can be strategically used to modulate the gut microbiota composition and function, ultimately impacting metabolic syndrome. It highlights the intricate connections between specific dietary components, gut microbial communities, and host metabolism, proposing targeted nutritional interventions[5].

The article systematically reviews the anti-inflammatory properties of various functional foods and their bioactive components relevant to metabolic diseases. It explores the mechanisms through which these foods can mitigate chronic low-grade inflammation, a key driver in metabolic dysfunction, offering insights for clinical nu-

tritional strategies[6].

This systematic review critically assesses the role of functional foods in the prevention and management of type 2 diabetes mellitus. It synthesizes evidence on how specific food components can improve glycemic control, insulin sensitivity, and mitigate complications, positioning them as valuable tools in dietary management[7].

The paper reviews the production, applications, and health benefits of bioactive peptides derived from various food sources, specifically focusing on their therapeutic potential against metabolic syndrome. It details how these peptides can influence blood pressure, glucose metabolism, and lipid profiles, suggesting their importance in functional food development[8].

This comprehensive review examines the role of whole grains as functional foods in combating metabolic syndrome. It discusses the various bioactive compounds within whole grains, their mechanisms of action in improving glucose homeostasis, lipid metabolism, and reducing inflammation, and offers insights into their preventive and therapeutic applications[9].

This review explores various functional lipids and their significant roles in human nutrition and metabolism, with a particular focus on their potential to prevent and manage metabolic diseases. It details how specific lipids can modulate inflammatory pathways, energy metabolism, and cellular signaling, offering new avenues for clinical dietary interventions[10].

Conclusion

The available research underscores the profound impact of functional foods and their bioactive components on metabolic health. This includes the demonstrated ability of specific probiotic strains to improve metabolic syndrome markers such as glucose metabolism, lipid profiles, and inflammation. Polyphenols, another crucial component found in functional foods, contribute through their antioxidant and anti-inflammatory properties, playing a vital role in modulating metabolic syndrome. The concept of precision nutrition is emerging, suggesting tailored dietary recommendations, including functional food incorporation, based on individual

*Correspondence to: Maya Shah, Department of Clinical Nutrition, University of Delhi, India. E-mail: maya.shah@delhi.edu

Received: 01-Sep-2025, Manuscript No. AAAFN-25-281; Editor assigned: 03-Sep-2025, Pre QC No. AAAFN-25-281 (PQ); Reviewed: 23-Sep-2025, QC No. AAAFN-25-281; Revised: 02-Oct-2025, Manuscript No. AAAFN-25-281 (R); Published: 13-Oct-2025, DOI: 10.35841/aaafn-8.4.281

metabolic and genetic profiles for optimal health outcomes.

Furthermore, omega-3 fatty acids are highlighted for their broad health benefits in metabolic regulation, with ongoing innovations in their application and bioavailability in foods. The gut microbiota's intricate connection to host metabolism is a key focus, with functional foods offering targeted interventions to modulate its composition and function. Many functional foods also exhibit significant anti-inflammatory properties, crucial for mitigating chronic low-grade inflammation linked to metabolic dysfunction. Specific reviews delve into their role in managing type 2 diabetes mellitus, showcasing their potential to improve glycemic control and insulin sensitivity. Bioactive peptides derived from food sources are identified for their therapeutic effects on blood pressure, glucose, and lipid profiles. Finally, whole grains are recognized for their bioactive compounds that enhance glucose homeostasis and reduce inflammation, while functional lipids are explored for their roles in modulating inflammatory pathways and energy metabolism, all contributing to the prevention and management of metabolic diseases.

References

1. Peng L, Sheng H, Tiantian W. Effect of Probiotics on Metabolic Syndrome: An Updated Review of Randomized Controlled Trials. *Front Pharmacol.* 2022;13:864500.
2. Min-Hsiung P, Chi-Tang H, Chih-Shiang L. Polyphenols and Metabolic Syndrome: Current Evidence, Challenges, and Future Directions. *Annu Rev Food Sci Technol.* 2021;12:337-361.
3. Jose M O, Dariush M, Martin K. Precision nutrition for metabolic health: Current knowledge and future perspectives. *Nat Rev Endocrinol.* 2022;18:43-57.
4. Hamed Z, Mojtaba M, Maryam G. Omega-3 Fatty Acids as Functional Ingredients in Food: Health Benefits, Applications, and Encapsulation Technologies. *Food Rev Int.* 2023;39:4627-4654.
5. Ziyuan F, Tianwen L, Qijun Z. Targeting the Gut Microbiota With Functional Foods for Metabolic Syndrome: A Narrative Review. *Front Nutr.* 2022;9:850438.
6. Amit S, Rajesh K, Preeti S. Anti-inflammatory Properties of Functional Foods and Their Components in Metabolic Diseases: A Review. *Int J Mol Sci.* 2021;22:10619.
7. Yu L, Min W, Xin W. Functional foods in the prevention and management of type 2 diabetes mellitus: A systematic review. *Food Chem X.* 2022;16:100455.
8. Neeraj K, Deepak S, Gurpreet K. Bioactive Peptides from Food Sources: Production, Applications, and Health Benefits for Metabolic Syndrome. *J Agric Food Chem.* 2023;71:17791-17805.
9. Qian M, Hongjuan W, Lina M. Whole Grains as Functional Foods in Metabolic Syndrome: A Comprehensive Review. *Food Funct.* 2022;13:7091-7108.
10. Soo-Yeon K, Young-Hyun P, Sang-Chul L. Functional Lipids for Prevention and Management of Metabolic Diseases: A Review. *Nutrients.* 2023;15:1667.

Citation: Shah M. Functional foods: Metabolic health, gut, precision nutrition. *Arch Food Nutr.* 2025;08(04):281.