

SYNBIOTICS IN METABOLIC DISORDERS

MECHANISMS, THERAPEUTIC POTENTIAL, AND FUTURE PERSPECTIVES



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5 Exploring Gut Microbiota as Therapeutic Target to Maintain Metabolic Health

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5.1 INTRODUCTION

Metabolic disorders include diseases characterized by abnormal metabolic processes in the body, resulting in many health complications (Liu et al., 2020). These diseases undermine the breakdown and processing of nutrients and cause imbalances affecting energy production, hormone regulation, and various metabolic functions (Raposo et al., 2017). The symptoms encompass a variety of common conditions including obesity, type 2 diabetes (T2D), and cardiovascular disease (Pasdar et al., 2017). Metabolic diseases are a major global health concern that affect millions of people globally. The complicated bacteria that live in our intestines and may have an impact on the development and treatment of certain diseases have received special attention in recent studies (Zhu et al., 2022).

Gut microbiota may be influenced by a number of variables, but nutrition is one important element that has the potential to drastically modify the configuration of gut microbiota (Marco et al., 2020). Additionally, research has shown how the gut bacteria plays a function in the metabolic digestion of food, namely, in the conversion of carnitine and choline to trimethylamine. This process has a significant impact on metabolic diseases (Li et al., 2022). Empirical data connects alterations in gut microbiota composition to many health conditions, such as metabolic disorders and obesity. We still don't completely understand the exact processes at play in the development of many diseases, nor the extent of causation. Even though the body of research on this subject is growing, more investigation is required to establish a clear link between metabolic illnesses and disordered gut flora.

Changing the diet and adjusting the microbiota are two ways to investigate the possible therapeutic benefits of the gut microbiota for metabolic diseases. The extant research indicates that some dietary modifications and the utilization of probiotics have exhibited efficacy in modifying the makeup of gut microbiota and influencing metabolic consequences. These methods are intended to promote the synthesis of advantageous metabolites like short-chain fatty acids (SCFAs) and restore equilibrium to the gut flora. By focusing on interventions like dietary modifications, prebiotics, probiotics, and possibly pharmaceutical treatments targeted at the gut microbiota, there is a possibility for preventing and easing metabolic diseases (Zhang et al., 2015). Current investigations on the connection

among the microbiota of the gut and metabolic disorders might lead to novel treatments and prophylactic measures (Han et al., 2023).

5.1.1 SIGNIFICANCE OF GUT MICROBIOTA IN METABOLIC HEALTH

The bacteria in the gut have a big impact on the metabolism's health. It does this by a number of processes, one of which is the synthesis of SCFA, which is crucial for controlling insulin sensitivity, glucose metabolism, and host energy balance (Longo et al., 2023). The metabolic effects are caused by the complicated relationships involving intestinal hormones like GLP-1 and gut microorganisms. Together with affecting hunger, this hormonal interaction also controls the glucose balance (Longo et al., 2023).

According to research, dysbiosis, which is brought on by disparity in the microbiota of gut, is connected to metabolic illnesses (Longo et al., 2023). Dysbiosis, in particular, can compromise gut permeability and elevate circulating levels of LPS, fostering low-grade inflammation that ultimately contributes to metabolic disorders (Abidi and Rtibi, 2023).

However, there is hope for improving metabolic health through dietary interventions and physical activity. Research indicates that interventions like intermittent fasting can enhance gut microbiota diversity and reduce the presence of pathogenic bacteria, resulting in reduced inflammation and improved metabolic health (Zhang et al., 2023). Likewise, it has been discovered that physical exercise, especially moderate-intensity and prolonged duration, modifies the gut microbiota's composition. This means that the beneficial bacteria that create butyrate will proliferate while the bacteria linked to metabolic disorders will decline (Zhang et al., 2023). These verdicts highlight the potential for lifestyle modifications to positively impact metabolic health.

This chapter aims to provide an in-depth analysis of the important role the gut microbiota plays in maintaining metabolic health. It seeks to clarify the ways in which the gut microbiota affects insulin sensitivity, glucose metabolism, host energy homeostasis, and gut hormones including GLP-1. This chapter tries to highlight how important it is to comprehend the function of gut microbiota in common illnesses like obesity and type 2 diabetes mellitus (T2DM) by looking at dysbiosis and its relationship to metabolic