Chapter 8
Probiotics, Gut Microbiota, and Epigenomics: A Review of Pre-Clinical and Clinical Investigations

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ABSTRACT

Probiotics therapy has emerged as a popular, potential alternative therapy utilized in combating disorders associated with mammalian gut and visceral organs. Ongoing research suggests that probiotics directly or indirectly modulate host epigenomic signatures that in turn affect the host functional outcome. Data obtained from experimental studies indicate that microbiota, diet, and pharmaceuticals affect host epigenetic machinery subsequently resulting in specific physiological responses. Thus, molecular designing of epigenetic-based therapeutic agents may provide a valid pathway to rectifying aberrant changes and managing disease risk and progression. Recent investigations show that probiotic intervention mitigates uncharacteristic epigenetic changes that are associated with many health complications. However, stakeholders need to recognize that probiotic research is an emerging field; therefore, this science must undergo extensive mechanistic investigation. This chapter highlights the potential probiotic mediated host epigenomic interventions in disease therapy and management.

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INTRODUCTION

Functional foods are a vital part of man's diet. Scientific researchers have copiously investigated and documented the tremendous health benefits of functional foods (Das et al., 2016). Today, probiotic enriched foods are the most prevalent functional food type. Probiotic microbes are used extensively in the production of various forms of fermented foods or cultured milk products. Furthermore, probiotics has gained considerable resurgence in many developed and developing societies as it is utilised in many modern nutritional applications (Bhat et al., 2019a). A plethora of research establish a correlation between human diet and well-being. This has invariably resulted in the development of novel functional food nutrition-based therapies that prevent disease onset, progression and distribution (Tapsell et al., 2016). Recent breakthroughs in food science and technology enable researchers demonstrate unequivocally that food is a veritable resource needed to meet the body's energy requirement for the execution of metabolic activities. Food contributes immensely to the biological and physiological well-being of humans. Functional food supplementation improves host health, mitigates risk of certain chronic diseases and treats and/or manages ailments such as hypertension, cancer, hypercholesterolaemia diabetes, anaemia, platelet aggregation etc., (Mitsuoka, 2014). Presently, programs involving experimentation on special foods enriched with specific bioactive components are conducted with the singular objective of producing nourishment that could be used to improve quality of human life. There is a preponderance of evidence that indicates that probiotic food consumption has a positive impact on host gut microbial diversity. A 2019 study determined that the supplementation of diet with a triple probiotic formulation improved gut microbiota composition of individuals who were previously fed with a high-fat diet (Qian et al., 2019). Similarly, a randomised placebo-controlled double-blind multi-centre clinical trial involving triple viable probiotics: *Bifidobacterium longum, Bifidobacterium infantis*and *Lactobacillus acidophilus* showed that the trifecta prevented gut dysbiosis in pre-term infants. Another study found that commensal microbes such as *Megasphaeramassiliensis* MRx0029 and its derivatives influenced host epigenetic processes that modulate functional outcomes in individuals. These are considered unique remedies for disease areas involving host epigenetic aberrations (Yuille et al., 2018).