The Relationship Between Gut Microbiome Estrobolome and Breast Cancer: A Systematic Review of Current Evidences

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Abstract Breast cancer is the most frequent kind of cancer and the second leading cause of mortality worldwide, behind heart disease. Next-generation sequencing technologies enables for unprecedented enumeration of human resident gut microorganisms, conferring novel insights into the role of the microbiota in health and individuals with breast cancer. A growing body of research on microbial dysbiosis seems to indicate an elevated risk of health complications including cancer. Although several dysbiosis indices have been proposed, their underlying methodology, as well as the cohorts and conditions of breast cancer patients are significantly different. To date, these indices have not yet been thoroughly reviewed especially when it comes to researching the estrogen-gut microbiota axis. Instead of providing a thorough rating of the most effective diversity measurements, the current work aims to be used to assess the relevance of each study's findings across the demographic data, different subtypes, and stages of breast cancer, and tie them to the estrobolome, which controls the amount of oestrogen that circulates through humans. This review will cover 11 studies which will go into a detailed discussion for the microbiome results of the mentioned studies, leaving to the user the final choice of the most suited indices as well as highlight the observed bacteria found to be related to the estrobolome in hopes of giving the reader a better understanding for the biological cross-talk between gut microbiome and breast cancer progression.

Keywords Breast cancer · Gut · Microbiome · Alpha-diversity · Beta-diversity · Dysbiosis · Estrobolome · β-Glucuronidase

Noor Ezmas Mahno and Darren Dean Tay have contributed equally to this work.

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Introduction

Breast cancer is the leading cause of global cancer incidence in 2022, with an estimate of 287,850 cases were diagnosed in women [59]. It is the fifth leading cause of mortality worldwide estimated around 685,000 deaths [56]. While the incidence is higher (> 80 per 100,000) in developed countries such as Australia, Western Europe, North America, and North Europe, the rate is lower within developing countries (< 40 per 100,000) such as Central America, Middle Africa, and Southeast Asia [1, 56]. Human breast cancer is a highly heterogeneous illness, and there is a lot of variation in how it develops, progresses, and metastasizes even within particular subtypes of the disease [58].

Although a mix of genetic, epigenetic, and environmental variables has been identified, the actual cause of breast cancer is still unclear despite extensive study was performed.