Systematic Review / Meta-analysis

Unraveling the role of medicinal plants and Gut microbiota in colon cancer: Towards microbiota- based strategies for prevention and treatment

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ABSTRACT

Colon cancer remains one of the leading causes of morbidity and mortality worldwide. Given its widespread prevalence, the identification of new anticancer drugs is crucial. Medicinal plants have provided many natural products that have proven to be successful anticancer drugs in clinical use and have shown significant efficacy. Over the last decade, researchers have gathered significant information regarding the contribution of gut microbiota to the development and progression of colon cancer. Manipulating the gut microbiota to reverse microbial dysbiosis is an innovative strategy for addressing human diseases and intestinal disorders. Recent scientific findings have shown that this approach has a significant positive impact on the prevention and treatment of colon cancer. This review aims to provide a comprehensive understanding of the fundamental concepts related to intestinal microbiota and dysbiosis, as well as the interactions between microbiota and phytochemicals that can affect the bioavailability and bioactivity of these compounds. The primary components of the gut, including carbohydrates, enzymes, lipids, vitamins, and secondary metabolites such as alkaloids, flavonoids, polyphenols, and terpenoids, can activate gut dysbiosis. While these strategies show promising outcomes by rectifying microbiota proportion, modifying innate immune systems, emphasizing gut barrier operation, inhibiting pathogen colonization, and exhibiting selective cytotoxicity against colon cancer cells, further research is necessary to fully understand their mechanisms of action. This review also highlights the relationship between medicinal plants, gut microbiota, and colon cancer, which may lead to the development and clinical translation of potential microbiota-based strategies for cancer prevention.

1. Introduction

Cancer is a complex malignancy and a major cause of morbidity and mortality worldwide. There are many different types of cancer, among which, colorectal cancer found in the colon or rectum and ranks as the third most common cause of cancer-related deaths in both men and women [1]. The exact cause of colon cancer is not fully understood, but it is believed to develop as a result of a combination of genetic, environmental, and lifestyle factors. Some known risk factors for colon cancer include age, inherited genetic mutations, inflammatory bowel disease, and unhealthy dietary choices [2]. In particular, a diet that includes red and processed meats has been shown to increase the risk of colon cancer. Excessive smoking and alcohol consumption are increasing the risk of cancerous growth by disrupting the lining of the colon and damaging the structure or sequence of Deoxyribonucleic acid (DNA) in colon cells [3]. According to estimates from the world health organization (WHO), there will be 20 million new cancer cases projected in 2025 [4]. Colon cancer is becoming increasingly prevalent in India, with a higher incidence rate in urban areas compared to rural areas. In fact, according to the Indian Council of Medical Research (ICMR), the incidence of colon cancer in India is expected to be 4.4 and 4.1 per 1,00, 000 in men by the year 2025 [5]. There is a stigma attached to discussing health issues related to the colon, which can make people reluctant to seek medical attention for symptoms such as abdominal pain, changes in bowel habits, or rectal bleeding [6]. To address the increasing incidence of colon cancer, it is important to raise awareness about the risk factors