



Microbiome-Based Hippocratic Perspective for Cancer Prevention and Treatment

Mehmet Varol^{1,2*}

¹Department of Molecular Biology and Genetics, Kotekli Campus, Mugla Sitki Kocman University, Mugla TR 48000, Turkey

²Department of Biology, Faculty of Science, Yunusemre Campus, Anadolu University, Eskisehir TR26470, Turkey

*Correspondence Author: Varol M, Department of Molecular Biology and Genetics, Faculty of Science, Kotekli Campus, Mugla Sitki Kocman University, Mugla TR48000, Turkey, Tel: 0090-252-211-31-32; Fax: +90-252-211-92-80; E-mail: mehmetvarol@mu.edu.tr

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Opinion

Cancer diseases still preserve their importance as the main causes of morbidity and mortality rate increasing worldwide [1-3]. The major research effort of scientists and a respectable slice of the research funds, therefore, have been spent on the discovery and development of new cancer treatment strategies and drug ingredients to improve the life quality and lifespan of patients [4-6]. However, the possible side effects and ineffective results of the conventional treatments draw the attention of clinicians and patients to alternative and complementary treatment preferences such as using natural supplements, probiotics or prebiotics [7,8]. It is also well known that life routines such as dietary habits, drinking and smoking habits are tightly associated with the occurrence of cancer and many other diseases as indicated around 400 B.C by the Greek physician Hippocrates that he said “poor digestion is the origin of all evil” and “death is in the bowels” [9-11]. Although Hippocrates predicted the strong association among eating habits, gut health, microbiota and diseases, we barely noticed the importance of the unexpected link between cancer and microbiota [12,13]. Many clinical outputs and published papers showed up and corrected that lifestyle changing for a healthier digestive tract have a great influence on the other body systems such as the immune system, endocrine system, neural system, etc., which are desired to be balanced, activated and reinforced for recognition, prevention and regression of cancer [14-16]. For instance, the relationship of obesity, endocrine system and cancer has been well studied [17,18]. To have a robust digestive tract, the microbial ecosystem should be in balanced form named eubiosis that, if disrupted, turns to dysbiosis, meaning the bacteria in microbial ecosystem no longer live together in mutual harmony [9]. Probiotics are known the live microorganisms such as *Lactobacillus* and *Bifidobacterium* species which provide a health benefit as “good-for-you bacteria” on the host, when they are administered in adequate amounts [19,20].

Similarly, prebiotics are defined as the indigestible and selectively fermented food ingredients such as inulin, pyrodextrins, fructooligosaccharides, soya-oligosaccharides, isomaltoligosaccharides, galactooligosaccharides, glucooligosaccharides, lactosucrose and sugar alcohols that encourage specific alterations in the composition, activity and/or growth of the gastrointestinal microbiota that provide some benefits upon host health [21,22]. Although the probiotics and prebiotics are beneficial for the host health, and preventers for tumorigenesis, some studies showed that pathogenic microorganisms such as *Escherichia coli*, *Enterococcus faecalis*, and *Bacteroides fragilis* might initiate and perpetuate cancer diseases via their genotoxic features. These researches showed us that the microbial ecosystem

should not turn to dysbiotic structure [23]. However, it is not exactly known how should the optimal microbial ecosystem structure be to have a robust and beneficial digestive tract for avoiding from cancer diseases [24]. There is a great effort of NIH Human Microbiome Project to identify the microbiome in healthy individuals. However, it should be strictly considered that the elements of microbial ecosystems in a robust digestive tract might display a variation depending on age, ethnicity, eating habits and other variables due to the coevolution of the human and microbiota [25,26]. Nevertheless, the advances in DNA sequencing technologies developed the ability to recognize and understand the interaction between one's microbiome and their association with various cancer types across the body [23]. Consequently, we think that the existing data is not enough and more research should be applied especially in the context of age, ethnicity and cultural eating habits to understand and define the ideal microbial ecosystem which certainly provide us important information to determine probiotics, prebiotics and functional food in the combinational strategies for cancer prevention and treatment.

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