Opinion

Back to basic – dietary microbial modulation for colorectal cancer prevention – for Hong Kong Chinese

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Received: 06 October, 2020
Accepted: 16 November, 2020
Published: 18 November, 2020

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Keywords: Colorectal cancer; Dietary; Microbiota; Diversified diet; Modulation

https://www.peertechz.com

CRC incidence and impact

Colorectal cancer [CRC] is one of the most common malignancies worldwide [1]. According to Globocan 2018, there were 18 million newly diagnosed cancer cases worldwide, while CRC made up 10.2%, topped the third highest cancer incidence. In the same year, CRC had the second highest mortality rate with more than 880,000 lives lost to it [2]. The environmental and heritable factors of colorectal cancer [CRC] is around 35% [3]. Up to 3%-5% of all CRC are represented by the hereditary syndromes [4]. Meanwhile, a higher incidence of CRC is observed in more developed regions than under developed regions, and changes in lifestyle and dietary habits are believed to attribute to an increased incidence [1,5]. In Hong Kong, CRC has been the most common cancer since 2013 [6], with more than 5,000 new diagnoses annually, accounts for 50.8% male, 31.5% female with an upward trend in 2017 [7]. The dietary habits of people in Hong Kong have steered away from the traditional Chinese diet, to fast-pace dining comprised of processed food and reduced diversity. Although the association between microbiota and the risk of CRC is indistinct, the undoubted fact is that CRC patients have less diverse microbiota than their healthy counter parts [8]. In this commentary, we would like to discuss the potential benefits of resuming a traditional diet which is relatively similar to the Mediterranean diet to modulate microbial risk in CRC in Hong Kong Chinese.

Microbial risk in developing CRC

Most microbial species in the gastrointestinal tract belong to Firmicutes, Bacteroidetes, Proteobacteria and Actinobacteria. Gut microbiota has a highly complex ecosystem composed of thousands of species and strains [9] which interacts with one another, the substrates, and the host that form a microbial–diet-host interaction. CRC risk may be determined through microbial profile with recent evidence showing that altered microbiome environment, or dysbiosis, in the gut and pathogenic bacterial colonies overgrowth has implication in cancer development [10-12]. Some gut microbiomes are even identified, known as CRC microbial markers, to promote colorectal tumorigenesis [12,13]. Certain unfavorable bacteria namely Fusobacterium nucleatum, Escherichia coli, Bacteroides fragilis, Clostridium hathewayi, and Bacteroides clarus are identified to be more abundant in CRC patients [14-18], while the beneficial bacteria are reduced [19]. Moreover, dysbiosis is observed in patients with CRC, among a cluster of chronic diseases, i.e. inflammatory bowel disease, diabetes mellitus, obesity [20–22]. The commonality amongst the diseases is chronic inflammation, which is critical factor in the development of CRC [23]. Some microbiomes induce inflammation via lipopolysaccharides [LPS], while the others are correlated with elevated serum C-Reactive Protein [CRP] [24–27]. Despite whether the shift in microbiota was a result of disease development, the abnormality in its composition has been implicated as a potentially important etiological factor in the initiation and progression of CRC [28] that diet is undeniably a key player.
Westernization is a global phenomenon

Hong Kong has a long history of westernization since her colonial era began in the 19th century, but many Chinese Hong Kong residents retained a traditional Chinese diet [cite]. As recommended by American Institute for Cancer Research and World Cancer Fund in the report Recommendations and Public Health and Policy Implication [Recommendations], diets high in fiber, rich in whole grains, and reduced or absent of red meats and processed meats reduce the risk of cancer development [29]. In contrast, in the recent decades, contemporary diets in Hong Kong [30] and many developed regions have shifted away from such diets to ones that are low in fibers and high in processed foods with exposure to food additives, refined sugar and hydrogenated fats [31]. In a prominent study compared cancer risks in rural and American Africans, the dietary habits of higher fibers, lower animal fats and protein in the rural Africans were associated with reduced cancer risks [32,33]. With that said, the reduced food diversity affects gut microbiota through dietary factors like high-fat, high-protein, low fiber that can trigger colon cancer . Ou et al. also reported microbial metabolite moderated by dietary intake can influence CRC risk [32]. Different dietary components may have various effects on the potential to develop CRC . Literature as of today is confusing on overall discussion of microbial–diet–host interaction involves metabolic cross-feeding of microbes, substrate degradation of dietary fibers, and microbiome as modulator to host physiology and behavior [34–36].

Traditional Chinese diet

Dietary patterns and nutrients shape and reshape our gut microbiomes across lifespan, of which contribute to the initiation, development, or prevention of CRC [37–40]. One dietary approach in reducing CRC risk is directed at restoring the beneficial microbiota that leads to strengthening intestinal barrier against pathogenic bacteria, increasing intestinal motility, and lowering a pro-inflammatory state by adopting a diversified diet such like the Mediterranean diet [41–46]. Food diversity implies a wide range of food options covering the major food groups, such as described in the Mediterranean diet [30], are [i] high in vegetables and legumes, [ii] high in fruits, [iii] high in grains, [iv] moderate proteins from plants over animal, and [v] moderate dairy, which shares some characteristics of a traditional Chinese diet and translates to providing great sources of proteins, carbohydrates, fats, and the equally important micronutrients to optimize the bodily functions. Woo et al. revealed the dietary habits of Chinese population in four major cities, evaluated using the Mediterranean Diet Score, were compatible if not more adhering to the Mediterranean diet than the Greek population, whilst the cuisines varied yet remained culturally distinctive. The only sub-population with less adherence was the younger generation and men in Hong Kong, with 50% and 51% scored high, respectively [30]. The MDS described in Woo’s stool was indicative of the preservation of a more traditional Chinese dietary habit, being the population with 80% high scores resided in a rural Chinese region.

Conclusion

Considering a global westernization, many of the dietary and lifestyle recommendations are to promote a diversified dietary pattern to strengthen gut health, which is closely related to gut microbiota. Hippocrates once said, “All disease begins in the gut.” while not absolutely but it remains true to many diseases that trillions of microbes live on our skin and within our body are crucial to human health. Despite the lack of causation between microbiota and cancer, no single food can one-handedly prevent inflammation but relies on the synergetic effect of a diversified food consumption in compliance with the dietary guidelines to improve the overall anti-inflammatory prospects of the host [47–51] and advances the success rate of cultivating a healthy gut by creating a balancing microbiota environment. With further mechanistic studies to understand the multi-axial microbial–diet–host interaction, we hope to deduce a microbiota–driven dietary recommendation decision tree to optimize the growth and balance of gut microbiota soon.

Author contributions

WL was responsible for the conception, literature review, drafting and revising the manuscript. All authors reviewed and commented on subsequent drafts of the manuscript.

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Citation: Lin W, Ng SC, KL Chan F (2020) Back to basic – dietary microbial modulation for colorectal cancer prevention – for Hong Kong Chinese. Arch Community Med Public Health 6(2): 257-260. DOI: https://dx.doi.org/10.17352/2455-5479.000117
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