frontiers in Cellular and Infection Microbiology

REVIEW
published: 13 December 2021
doi: 10.3389/fcimb.2021.744606

Gut Dysbiosis and Intestinal Barrier Dysfunction: Potential Explanation for Early-Onset Colorectal Cancer

Siti Maryam Ahmad Kendong[1,2], *Raja Affendi Raja Ali*[3,4], *Khairul Najmi Muhammad Nawawi*[3,4], *Hajar Fauzan Ahmad*[5,6] *and Norfilza Mohd Mokhtar*[1,4*]

[1] Department of Physiology, Faculty of Medicine, Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia, [2] Department of Basic Medical Sciences, Faculty of Medicine and Health Sciences, Universiti Malaysia Sarawak, Sarawak, Malaysia, [3] Gastroenterology Unit, Department of Medicine, Faculty of Medicine, Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia, [4] GUT Research Group, Faculty of Medicine, Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia, [5] Department of Industrial Biotechnology, Faculty of Industrial Sciences and Technology, Universiti Malaysia Pahang, Gambang, Malaysia, [6] Center for Research in Advanced Tropical Bioscience, Universiti Malaysia Pahang, Gambang, Malaysia

OPEN ACCESS

Edited by:
Clara G. De Los Reyes-Gavilan, Spanish National Research Council (CSIC), Spain

Reviewed by:
Linda Chia-Hui Yu, National Taiwan University, Taiwan
Almagul Kushugulova, Nazarbayev University, Kazakhstan

***Correspondence:**
Norfilza Mohd Mokhtar
norfilza@ppukm.ukm.edu.my

Specialty section:
This article was submitted to Microbiome in Health and Disease, a section of the journal Frontiers in Cellular and Infection Microbiology

Received: *20 July 2021*
Accepted: *22 November 2021*
Published: *13 December 2021*

Citation:
Ahmad Kendong SM, Raja Ali RA, Nawawi KNM, Ahmad HF and Mokhtar NM (2021) Gut Dysbiosis and Intestinal Barrier Dysfunction: Potential Explanation for Early-Onset Colorectal Cancer. Front. Cell. Infect. Microbiol. 11:744606. doi: 10.3389/fcimb.2021.744606

Colorectal cancer (CRC) is a heterogeneous disease that commonly affects individuals aged more than 50 years old globally. Regular colorectal screening, which is recommended for individuals aged 50 and above, has decreased the number of cancer death toll over the years. However, CRC incidence has increased among younger population (below 50 years old). Environmental factors, such as smoking, dietary factor, urbanization, sedentary lifestyle, and obesity, may contribute to the rising trend of early-onset colorectal cancer (EOCRC) because of the lack of genetic susceptibility. Research has focused on the role of gut microbiota and its interaction with epithelial barrier genes in sporadic CRC. Population with increased consumption of grain and vegetables showed high abundance of *Prevotella*, which reduces the risk of CRC. Microbes, such as *Fusobacterium nucleatum*, *Bacteroides fragilis* and *Escherichia coli* deteriorate in the intestinal barrier, which leads to the infiltration of inflammatory mediators and chemokines. Gut dysbiosis may also occur following inflammation as clearly observed in animal model. Both gut dysbiosis pre- or post-inflammatory process may cause major alteration in the morphology and functional properties of the gut tissue and explain the pathological outcome of EOCRC. The precise mechanism of disease progression from an early stage until cancer establishment is not fully understood. We hypothesized that gut dysbiosis, which may be influenced by environmental factors, may induce changes in the genome, metabolome, and immunome that could destruct the intestinal barrier function. Also, the possible underlying inflammation may give impact microbial community leading to disruption of physical and functional role of intestinal barrier. This review explains the potential role of the interaction among host factors, gut microenvironment, and gut microbiota, which may provide an answer to EOCRC.

Keywords: early onset, colorectal cancer, microbiota, tight junction proteins, host microbial interaction