

Pathogenic fungi of *rhodotorula dairenensis* is linked with colorectal cancer patients in Malaysia

Aisyah Yunus¹, Norfilza Mohd Mokhtar², Raja Affendi Raja Ali³, Siti Maryam Ahmad Kendong², Dennis Sandris Nielsen⁴, Hajar Fauzan Ahmad¹

¹Faculty of Industrial Sciences and Technology, Universiti Malaysia Pahang, Lebuhraya Tun Razak, Gambang, Pahang, Malaysia

²Department of Physiology, Faculty of Medicine, Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia

³School of Medical and Life Sciences, Sunway University, Subang Jaya, Selangor, Malaysia

⁴Department of Food Science, University of Copenhagen, Rolighedsvej 26, 1958 Frederiksberg, Copenhagen, Denmark

ABSTRACT

Background: Colorectal cancer (CRC) is the second most lethal disease with about 1.9 million new cases and 0.9 million fatalities worldwide in 2020. It is expected that the CRC prevalence to rise steadily each year. Several studies have linked the gut microbiome to CRC, particularly emphasizing the prokaryotic communities' functions. However, it is unclear how other gut microbiota components, such as fungal communities, could be related to the pathogenesis of CRC. Hence, we aimed to explore the role of opportunistic fungal pathogens and the host's phenotypes among CRC patients. **Methods:** Biopsy samples were obtained during colonoscopy sessions from 64 individuals. Of which, 32 are colorectal cancer patients comprising the early-onset CRC, and late-onset CRC groups, 22 are diagnosed with polyps during colonoscopy and the remaining are rectal swabs from normal individuals without any previous disease history. Informed consents were obtained from all patients before collecting their biopsy samples. The gDNA were extracted using Ultra Deep Microbiome Prep Kit. Prior to sequencing, the amplicons of microbial genome libraries were by targeting the ITS1 regions. Finally, the microbial genomic data were analysed using state-of-art bioinformatic tools. **Results:** A total of 6,477,706 read counts were generated, representing 1,364 amplicon sequence variants of fungi. At phyla, *Ascomycota*, *Basidiomycota*, *Mortierellomycota*, and *Chytridiomycota* were mainly found in both early and late-onset CRC patients. Moreover, the alpha-diversity showed significant differences between early and late-onset CRC patients, polyps, and normal individuals; Chao1 diversity (p-value = 0.0017509). Based on Linear discriminant analysis Effect Size analysis, the species *Rhodotorula dairenensis* was found to have a positive correlation for both early and late-onset colorectal cancer patients. **Conclusions:** Our findings imply the correlation between the presence of opportunistic fungal species *Rhodotorula* among CRC patients in Malaysia. Previous studies reported that cancer patients are at higher risk

for *Rhodotorula* infection. However, further study is needed in order to elucidate the role of the opportunistic pathogen during disease progression.

KEYWORDS:

Colorectal cancer; CRC; Malaysia; *Rhodotorula dairenensis*