

DiFiCol: Diarrhea, fiber and colon cancer: Environmental contributions to low colon cancer risk in sub-Saharan Africa

Project type

interdisciplinary pilot project cross-sector project global health postdoc fellowship

Research areas involved

Biomedical sciences Public health
 Social sciences and humanities Engineering and other sciences

Project duration

April 2021 – September 2023

Project team

Name	Organization	Discipline(s)
Sören Ocvirk	German Institute of Human Nutrition Potsdam-Rehbruecke and Technical University of Munich	Nutrition Science
Stephen O’Keefe	Stellenbosch University and University of Pittsburgh	Gastroenterology
Leo Katsidzira	University of Zimbabwe	Tropical Gastroenterology





Case study

Colorectal cancer (CRC) is one of the leading causes of cancer deaths worldwide and it is estimated that CRC incidence will increase in low- and middle-income countries that adopt a Western lifestyle. Sporadic CRC is predominantly caused by adverse environmental factors, in particular diet. Recent large-scale prospective studies and meta-analyses confirmed that a high intake of dietary fiber correlates with low CRC risk, whereas consumption of foods low in fiber is linked to higher CRC rates. Dietary fiber is indigestible for humans, but fermented by gut bacteria to short-chain fatty acids (SCFA), including butyrate that has anti-neoplastic effects in the gut. Thus, high fiber intake promotes a composition and function of the microbiota that is associated with intestinal health. Here, we investigate how the high fiber intake of different rural and urban communities in Sub-Saharan Africa (e.g., South Africa, Zimbabwe, Zambia) affects their gut microbiota composition and function.

In a recently published cross-sectional study in healthy rural and urban Xhosa people in South Africa (Ramaboli, Ocvirk et al. *Nature Communications*, 2024, *in press*), we were able to identify how urbanization and the transition towards a Western lifestyle is associated with an overall higher energy intake, a higher consumption of fat and meat, and a lower intake of plant foods. Differences in food samples taken from rural and urban Xhosa people in South Africa indicated the use of different ingredients and (traditional) food processing methods. The differences in dietary intake were associated with a lower diversity of the gut microbiota and shifts from bacteria groups involved in the breakdown of dietary fiber (more abundant in rural individuals) to bacteria associated with fat intake and CRC risk (more abundant in urban individuals). Together with the results from other study populations, we were able to demonstrate that many bacteria groups, which were frequently detected in rural settings of Sub-Saharan Africa, are not sufficiently characterized in detail, yet. This highlights the important need for more studies investigating the gut microbiota in diverse rural Sub-Saharan communities.

Our ongoing research projects follow the finding that dietary fiber consumption may promote the presence of enteric pathogenic bacteria in the gut, which, paradoxically, may have beneficial effects on intestinal health. By this, we aim to identify a novel mechanism for CRC prevention using high intake of dietary fiber for gut microbiota modulation.

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