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Exploring & exploiting the homeostasis network orchestration & biomarkers in human health: Disease prevention

Background: The implications of disease in human are mostly addressed from the progression stage. For instance, colorectal cancer is mostly diagnosed at age 50 years and above for non-hereditary colorectal cancer. Insufficient attention has been focused on understanding the early progression of diseases, particularly colorectal cancer, prior to the age in which most diagnosis occurs. Homeostasis biomarkers have not been given enough attention. Importantly, one of the key elements in homeostasis, glutathione, and its associated operating genes, has not been well elucidated in disease initiation, promotion, and progression. Additionally, the interplay the glutathione pathway has with other physiological functions and how they orchestrate in homeostasis is yet to be fully elucidated.

Methods: Targeted quantitative analysis was performed on 41 samples of colon cancer and normal cell lines using capillary electrophoresis mass spectrometry (CE-TOFMS and CE-QqQMS) in the cation and anion analysis modes for analysing cationic and anionic metabolites, respectively. A total of 116 metabolites (54 and 62 metabolites in the cation and anion mode, respectively) involved in glycolysis, pentose phosphate pathway, tricarboxylic acid (TCA) cycle, urea cycle, and polyamine, creatine, purine, glutathione, nicotinamide, choline, and amino acid metabolisms were annotated based on the HMT metabolite database.

Results: In both colon cancer cell lines, HCT-116 and HT-29, there were treatment effects from the addition of fiber and bile acids. Bile acid-A alone appeared to increase oxidative stress, osmotic stress, drive ATP demand and increase NAD^+/NADH ratio consistent with a tumor promoter role. Bile acid-B alone decreased levels of oxidative and osmotic stress and energy demand. Bile acid-B magnified decrease levels of oxidative and osmotic stress and energy demand when Bile acid-A and/or Fiber was added. The effects were similar between HCT-116 and HT-29, but not duplicative, as these are two different cancer cell lines.

Conclusion: HCT-116 and HT-29 are colon cancer cell lines that exhibit proliferation in culture. Metabolomics profiling exhibits osmotic, energy and oxidative stress in these cell lines compared to normal colon cells. With different combinations of bile acids and fibres, it has been demonstrated that cellular stress in the colon cancer cells can be reduced to more normal levels.

Biography

Bene Ekine-Afolabi is a graduate of River State University of Science & Technology in Applied Biology (Medical Microbiology option); with an MRes degree at University of East London, UK. She had her PhD study & worked at the Department of Natural Sciences, Middlesex University, UK. She trained in practical approach to toxicology in drug development (American College of Toxicology/British Toxicology Society). Bene does research in Microbiology, Molecular Biology and Cancer. Her current focus of research (which has yielded eight designed models), is on the Investigation of molecular mechanism of colorectal cancer and due to the current pandemic, has been involved in drug development for COVID-19. Bene had Harvard University part-sponsored training in therapeutic research in Cancer Biology & Therapeutic. Bene has been involved in three published peer reviewed article, two manuscript awaiting publication, among which one is on COVID-19 and was submitted to the Chief Medical Officer of UK to assist in response to the pandemic.

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