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Synergistic anti-cancer effects of docosahexaenoic acid and curcumin on breast cancer initiation and progression

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The major obstacles to the successful use of individual nutritional compounds as preventive or therapeutic agents are their efficacy and bioavailability. One approach to overcoming these problems is to use combinations of nutrients to induce synergistic effects. We investigated the synergistic effects of two dietary components: Docosahexaenoic acid (DHA), an omega-3 fatty acid present in cold-water fish, and curcumin (CCM), an herbal nutrient present in turmeric, on breast cancer using *in vitro* and *in vivo* models. Co-incubation with DHA & CCM had an anti-proliferative effect in SKBR3, MDA-MB-231, MDA-MB-361, MCF7, and MCF10AT cells; the effect was synergistic for SKBR3 (ER^- PR^- $HER2^+$), relative to the two compounds individually. CCM + DHA triggered transcript-level responses in disease-relevant functional categories. These responses were largely non-overlapping with changes caused by CCM or DHA individually. Genes involved in cell cycle arrest, apoptosis, inhibition of metastasis, and cell adhesion were up-regulated, whereas genes involved in cancer development and progression, metastasis, and cell cycle progression were down-regulated. The transcriptomic data show that antiproliferation synergy accompanies many signaling events unique to the combined presence of the two compounds. The *in vivo* studies demonstrated that DHA+ CCM treatment reduced the incidence of breast tumor, delayed tumor initiation, and reduced the development of tumor. The synergistic effects of DHA and CCM were likely mediated by regulating the expression of cytochrome P450 A1/B1 on tumor initiation and by regulating maspin and survivin expression on tumor progression. The combination of DHA and CCM is a potential dietary supplemental treatment for some breast cancers, likely dependent upon the molecular phenotype of the cancer cells.

Biography

Rafat A Siddiqui earned his PhD from Australian National University in Canberra, Australia and completed Postdoctoral studies at Massey University, Palmerston North, New Zealand. He is a Senior Investigator at Methodist Research Institute, Indiana University Health where he directs programs in Cellular Biochemistry and Lipid Biology. He has published more than 100 papers in respected journals and has been serving as an Editorial Board Member on several journals, including the *British Journal of Nutrition* and the *Journal of Nutrition Sciences*.

MicroRNA biomarkers for non-invasive diagnosis in oncology

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MicroRNAs represent a group of short, non-coding RNAs that play an important role in regulating various biological processes by interacting with cellular mRNAs at the posttranscriptional level either through degradation or translational silencing of mRNA genes. Furthermore, from analyses in tissue material it was shown that changes in the expression level of microRNAs correlate well with various pathological conditions including cancer. Recently, it became evident that microRNAs are not only present in tissue material, but also in a broad range of body fluids, including blood, and may be used as non-invasive biomarkers. Starting out from blood as the primary source, microRNA-biomarkers may be measured from the extra-cellular (serum, plasma) as well as from the cellular blood fraction, the first representing biomarkers with a functional relationship to the corresponding pathological condition. Teaming up with clinicians in the fields of cancer, a broad screening on microRNAs derived from the cellular blood fraction was conducted. Case studies will be presented to demonstrate the potential of microRNA biomarkers for use in non-invasive diagnosis of Lung Cancer and Prostate Cancer.