Effect of Antioxidant Supplements on Human Cancers: Novel Observation on Expression Profiles of Intronic RNA

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The notion that antioxidants can help fight cancer is popular. However, the mechanism(s) for the effect of antioxidants in cancer is unclear. The goal of this project is to study the effect of antioxidant supplements in human cancers. PolyA-enriched RNA-Seq data characterizes spliced mRNA; however, there are reports of RNA-Seq data including reads from the non-coding regions. Recent studies highlight the critical functional roles for the RNAs expressed from the non-coding regions. For this study, using a publicly available RNA-Seq data set from tumor tissues of mouse model of lung cancer, we analyzed the effect of antioxidant supplements including Vitamin E and n-Acetyl cysteine (NAC) on the non-coding intronic RNA expression. Despite a stringent cutoff of q-value < 0.001 and fold change > 1.5, we found high intronic expression for many genes in the supplement treated group compared to control. The genes with significant deferentially expressed intronic read counts were enriched for immune processes, trans-membrane transport and biological oxidation. The intronic expression of many genes that are known to be over-expressed in KRAS mutant lung cancers were significantly higher in antioxidant supplement treated tumors compared to control tumor. In addition to the bioinformatic analyses, we also validated by in-vitro analysis that breast and lung cancer cells grown in medium containing antioxidant for 48 hours had decreased antioxidant enzyme activity compared to cancer cells in medium without supplements. Thus, this study reveals the novel effects of antioxidant supplements that may have a significant role in tumor processes .

Awards Won:
Third Award of $1,000