

Diet and breast cancer: Understanding molecular interaction of phytochemicals and PhIP induced cytotoxicity in breast epithelial cells

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Cooking of meat at high temperature such as frying or barbeque causes production of heterocyclic amines (HCAs). At least a dozen of HCAs are found in cooked meat. The 2-amino-1-methyl-6-phenylimidazo[4-5-b]pyridine (PhIP) is abundant and most potent HCA. Several studies have shown that PhIP can induce tumors in breast, prostate and colon cells and in rodent models. It is shown that PhIP causes DNA mutation, promote tumor growth and promote invasiveness of cancer cells. Metabolism of PhIP results in the formation of free radicals (ROS) and PhIP metabolites are known to produce DNA adduct and DNA strand breaks. Phytochemicals are known to inhibit cytotoxic and genotoxic effects. Therefore, we hypothesized that the right combination of antioxidants and or phytochemical (naturally present in fruits, vegetables and spices) along with grilled meat should be capable of suppressing the PhIP induced cytotoxicity and breast cancer. Therefore, a model system using human breast epithelial cells (MCF 10A) was developed to test various antioxidants in presence or absence of PhIP. We have tested four vitamin (C, K3, D3, and E), Gingerol (6 and 10), N-acetyl cysteine, glutathione and curcumin at varying concentrations. The protective effect of these compounds was evaluated using cell viability assay, DCF assay to quantify ROS production, Comet assay to quantify the DNA damage and DNA adduct formation by immunofluorescence method. Results indicate that presence of these compounds improves cell viability as compared to PhIP treated group. However, curcumin co-treated cells showed significant differences and PhIP induced cell cytotoxicity was consistently reverted to normal. Gene expression analysis indicates that curcumin interact via multiple molecular targets, suggesting that curcumin appears to be an effective anti-PhIP food additive.

Biography

Dr. Ashok Jain is a professor of biology at Albany State University, Albany, GA and program coordinator for Biotechnology program. Dr. Jain has received research funding from NIH, DOD and USDA. Dr. Jain is also serving as MARC U*STAR project director. His research focuses on prevention of breast cancer. He has published more than 35 papers in reputed journals and has been serving as reviewer for six journals of international repute.