Potential anticancer activity of phytosterols and CLA

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Phytosterols exist as naturally occurring plant sterols that are present in the nonsaponifiable fraction of plant oils. They are plant components that have a chemical structure similar to cholesterol except for the addition of an extra methyl or ethyl group. The efficacy of phytosterols as cholesterol-lowering agents has been shown in numerous clinical trials. Additionally, it has been suggested that phytosterols may possess anti-carcinogenic activity. Conjugated Linoleic Acid (CLA) is a collective term for isomers of linoleic acid that have conjugated double bonds. Depending on the position and geometry of the double bonds, several isomers of CLA have been identified. CLA has received considerable attention as a potential anti-cancer agent. Most of the published studies have used a mixture of CLA isomers. Ruminant meat and dairy products are the major dietary sources of CLA, but partially hydrogenated oils such as shortenings and margarines contain different isomers of CLA. Recent reports suggest that each CLA isomer may have different potential biological effects. In this study we used a range of assays to assess the potential anti-cancer activity of phytosterols and CLA isomers in cells. These included: effects of phytosterols and CLA on the viability and growth of human adenocarcinoma Caco-2 cells using the MTT and lactate dehydrogenase (LDH) release assays; potential genoprotective (comet assay), COX-2 modulatory (ELISA) and apoptotic activity (Hoechst staining). Caco-2 cells were supplemented for 48 with increasing concentrations of the phytosterols campesterol, β-sitosterol and β-sitostanol, or a CLA mixture, or individual CLA isomers (c10t12-CLA, t9t11-CLA). The three phytosterols, at the highest levels tested, reduced both the viability and growth of Caco-2 cells while CLA exhibited isomer-specific effects. None of the phytosterols protected against DNA damage induced by the food mutagen, MNNG, or the oxidant, hydrogen peroxide (H_2O_2). At a concentration of 25 µmol/l, both c10t12-CLA and t9t11-CLA enhanced H_2O_2-induced DNA damage but had no effect on DNA strand breakage caused by MNNG. Neither the phytosterols nor CLA induced apoptosis or modulated basal- or interleukin-1β-induced COX-2 production. In conclusion, the phytosterols or CLA isomers tested were not toxic to Caco-2 cells at lower levels and did not possess anti-carcinogenic activity.