# The Effects of Alcohol, Caffeine, and Fructose on Liver Cell Growth and Death

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Dietary substances are major contributors to the formation and maintenance of tumors. Caffeine has been shown to inhibit tumor growth in certain cell lines while acetaldehyde, the primary carcinogen in alcohol metabolism, and fructose increase tumor cell proliferation. However, very little is known about potential crosstalk or synergistic effects. We demonstrated that average and high amounts of caffeine is able to decrease the tumor proliferation rate in Lewis Lung Carcinoma (LLC), mouse Hepatoma (Hepa1-6), and human Hepatoma (HU7), but its effects are not affected by acetaldehyde or fructose. Additionally, we showed that the inhibitory effects of caffeine were due to its role as an antagonist to adenosine by binding to various isomers of the adenosine receptors, isoform A2A in Hepa1-6 and A2B in LLC, and decreases the expression of the gene encoding connective tissue growth factor (CTGF). CTGF mutation using CRISPR technology mimicked the inhibitory effects of caffeine on tumor cell growth. These results elucidate the pathway by which caffeine hinders tumor progression and introduces caffeine's potential to treat diseases involving an overexpression of CTGF, including cancer.

**Awards Won:**