Ketogenic Diet and Deuterium Depleted Water for the Prevention and Treatment of Cancer and Neurodegenerative Conditions

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The central importance of the TCA cycle in many biochemical pathways makes it a critical target for controlling cellular metabolism to prevent disease (1). Metabolic water production in connection with mitochondrial matrix complex-IV function offers a novel mechanism to control deuterium content of cells via ketogenic substrate oxidation known to carry less deuterium from oils and fat. It is proposed that metabolic water production in the mitochondrial matrix, upon ketogenic substrate oxidation, preserves health via low deuterium substrate shuttling from the TCA cycle for gluconeogenesis. For example, metabolic water controls the deuterium content of the nucleotide sugar deoxyribose, from fatty acid chain shortening and redistribution of low-deuterium acetyl-CoA. These reactions involving hydrogen bonds control deuterium related oncoisotopic effects, which might be exploited in anti-cancer, anti-aging and anti-degenerative therapies and prevention. Consistent with the above, the effect of low deuterium ($^2$H) in water has been shown to control cell proliferation in numerous biological systems in vitro and in vivo, as well as in human studies (2-11). The clinical effectiveness of deuterium depleted water (DDW) is discussed herein. Complete or partial tumor regression has been established in mice xenografts with MDA-MB-231, MCF-7 human breast adenocarcinoma cells, and PC-3 human prostate tumor cells and. The anti-cancer effect of $^2$H-depletion has already been confirmed in a double-blind, randomized, 4-month-long, phase II clinical trial on prostate cancer, and the extended follow up suggests that $^2$H-depletion delays disease progression. DDW is a promising new integrative treatment modality in cancer and its prevention by lowering extra-mitochondrial deuterium loading into cellular DNA. Deuterium-depletion, in addition to conventional treatments, improves mean survival in lung cancer even in an advanced disease, complicated by distant brain metastases. In breast cancer patients DDW treatment, in combination with, or as an extension of, conventional therapies, significantly improved survival in advanced disease and was also effective in the prevention of recurrences in early stage breast cancer.

References: