DEUTERIUM DEPLETED WATER ALTERS GLUCOSE-DERIVED FATTY ACID AND CHOLESTEROL SYNTHESIS OF TUMOR CELLS

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INTRODUCTION
- Deuterium (D) is the heavy stable non-radiating isotope of hydrogen (H) that carries one extra neutron in the atomic nucleus. Therefore deuterium’s atomic mass is twice of that of H.
- Hydrogen atoms of water participate in virtually all ion exchange and substrate production transport reactions through the cell membrane and hydrogen also acts as the reducing equivalent in energy producing as well as reductive macromolecular synthesis reactions in all living cells. Deuterium is also involved in epigenetic events (changes in gene activity that are not caused by changes in the DNA sequence).
- Deuterium depletion of water in cell culture media or body fluids temporarily deacelerates cell growth in vitro and induces tumor regression in vivo.
- The exact mechanism and the effects of deuterium depletion on mammalian cell intermediary metabolism are not fully known.

HYPOTHESES
- Deuterium incorporation from common water into DNA decreases its fragility than accelerates mutations, aging and cancer.
- Deuterium affects the kinectics of reductive synthesis and the generation of NADPH thus altering membrane fatty acid and cholesteral synthesis.
- Deuterium alters tricarboxylic acid cycle and intermediary metabolism by altering carbon flow and the rate of product synthesis and energy production.
- Desteriation of DNA with adjacent nuclear membrane structures is an important epigenetic event directly involved in driving oncogenesis to alter gene expression, replication and growth.

AIM
- To determine metabolic flux-modifying effects of deuterium depleted water (DDW) (100, 50, and 25 ppm) as compared to normal deuterium-containing water (150 ppm) on 1,2-13C-D-glucose metabolism in cultured pancreatic (MIA-PaCa), lung (H-441) and breast (MCF-7) ductal carcinoma cells.

RESULTS & CONCLUSIONS
- Deuterium depleted water (DDW) did not significantly alter glucose uptake, oxidation and glycogen synthesis in any of the cell lines (Figure 1).
- Pyruvate cycle flux relative to glycolysis decreased in MIA-PaCa cells (Figure 2).
- RNA cholesteral synthesis and turnover also decreased in MIA-PaCa cells after 25 ppm treatment (Figure 3).
- TCA cycle substrate flux decreased in MCF-7 breast tumor cells (Figure 4).
- Lignocerate (C24) and palmitate synthesized were decreased in MIA-PaCa cells and cholesteral synthesis was decreased in MCF-7 breast tumor cells (Figure 5).

Based on this data decreased deuterium to hydrogen ratios regulate stored and fatty acid precursor synthesis, which likely affects the rate of divisions and cellular proliferation via the regulation of reductive synthesis and new membrane formation.

Deuterium depletion in cytoplasmic water may control cancer formation similarly to water containing deuterium depleted mitochondrial matrix metabolic water use for reductive synthesis, which is the natural intracellular deuterium depleting mechanism to control epigenetic DNA destabilization as the time requiring event during meiosis for mammalian cells.

Deuterium depletion in water and food may have a well defined role in cancer prevention and to improve public health.