

FUNCTIONAL FOODS IN THE PREVENTION AND MANAGEMENT OF METABOLIC SYNDROME

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EFFECT OF DEUTERIUM OXIDE (D₂O) CONTENT OF DRINKING WATER ON GLUCOSE METABOLISM IN STZ-INDUCED DIABETIC RATS

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Background: Deuterium, a stable isotope of hydrogen, binds to oxygen to form D₂O. D₂O exist in the environment at 1/6700 of H₂O (150 ppm) and is expected to have some biological effects. Several lines of evidences suggest that D₂O inhibits insulin release from pancreatic islets. Very little or no data is available on the action of lowering D₂O content of the cellular environment. Some experimental and clinical observations suggest that depletion of D₂O has anti-mitotic effect in various tumor cells. Some clinical observations also suggest that depletion D₂O interfere with glucose metabolism in diabetic patients.

Objective: In our experiments we wanted to test the effect of removal of D₂O on the glucose metabolism in streptozotocin (STZ)-induced diabetic rat model.

Methods: Diabetes was induced by a single ip. injection of 60mg/kg body weight of STZ. After 2 weeks, animals were randomly

distributed into several groups to test the effect of D2O (25-150 ppm) on glucose metabolism in diabetic animals with or without 2x1 U/day insulin treatment. The following parameters were tested: serum glucose, -fructose amine, -HbA1C, -creatinine, -TBARS and -insulin; urine glucose, -creatinine and -protein. At the end of the experiments, 8 weeks of treatment, membrane associated GLUT-4 content was estimated by western-blot technique from m. soleus.

Results: Our results indicate that STZ treatment significantly increased serum glucose, fructose amine, HbA1C and TBARS concentration. Depletion of D2O did not influence any of the measured parameters in animals not received insulin. However the measured parameters were significantly lower in those animals received lower D2O containing drinking water and insulin treatment. The membrane associated GLUT-4 was significantly higher in these animals also.

Conclusion: These data suggest that D2O depletion enhance insulin effect on GLUT-4 translocation and potentiate glucose uptake in diabetic animals. The major characteristic feature of metabolic syndrome is the decreased insulin sensitivity. Insulin resistance/hyper-insulinemia is strongly associated with hyperlipidemia and hypertension, two major risk factors of coronary heart disease. Based on our experimental data, deuterium depleted water could be used to treat patients with MS by increasing the insulin sensitivity. further experiments to elucidate this question.