Betaine Potentials to Prevent Diabetes and Diabetic Complications: What Hindered the Favorable Clinical Trial Outcomes and What to do?

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Editorial

Betaine, also known as trimethylglycine, is a major water-soluble component of Lycium chinense and widely distributed in animals, plants, and microorganisms. It acts mainly as an important osmoprotectant as well as oxidative metabolite of choline by suppressing superoxide-induced free radicals through donation of methyl groups and was suggested to have beneficial actions in several human diseases, such as obesity, diabetes, cancer, and Alzheimer’s disease [1,2]. In 2013, researchers have inversely associated serum choline in diabetic patients with the risks of diabetes and its microangiopathic complications (p < 0.001) and though serum betaine was not associated with the risk of diabetes, it had a significant inverse association with the risk of diabetes. It was observed in preclinical studies that betaine supplementation, 3300 mg orally twice daily for 10 days, then 4950 mg twice daily for 12 weeks, in prediabetes to have a little metabolic effect and further studies were suggested to elucidate the reason [7]. From my point of view, the administered dose of betaine may contribute to this lack of efficacy as betaine aldehyde at concentrations above 500 μM is known to behave as a non-competitive inhibitor against nicotinamide adenine dinucleotide (NAD+) which is an essential pyridine nucleotide that serves as an essential cofactor and substrate for a number of critical cellular processes involved in oxidative phosphorylation and ATP production, DNA repair, epigenetically modulated gene expression, intracellular calcium signaling, and immunological functions and is depleted in response to either excessive DNA damage due to free radical or ultraviolet attack [8,9]. I also wish to try to look for or synthesize betaine aldehyde dehydrogenase inhibitor(s) to explore the potential of increasing the endogenous betaine concentrations rather than administering betaine supplemements.

References


