



## Review

# Protective and therapeutic effectiveness of taurine in diabetes mellitus: A rationale for antioxidant supplementation



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## ABSTRACT

Taurine, 2-amino ethanesulfonic acid, is a conditionally essential  $\beta$  amino acid which is not utilized in protein synthesis. Taurine is one of the most abundant free amino acids in mammals tissues and is one of the three well-known sulfur-containing amino acids; the others are methionine and cysteine which are considered as the precursors for taurine synthesis. Different scientific studies emphasize on the cytoprotective properties of taurine which included antioxidation, antiapoptosis, membrane stabilization, osmoregulation, and neurotransmission. Protective and therapeutic ameliorations of oxidative stress-induced pathologies were also attributed to taurine both in experimental and human models. Data demonstrating the beneficial effectiveness of taurine against type 1 and type 2 diabetes mellitus and their complications are growing and providing a better understanding of the underlying molecular mechanisms. Although the clinical studies are limited compared to the experimental ones, the present updated systematic review of the literature is set up to provide experimental and clinical evidences regarding the effectiveness of taurine in the context of diabetes mellitus and its complications. Gathering these scientific effects of taurine on diabetes mellitus could provide the physicians and specially the endocrinologists with a comprehensive overview on possible trends in the prevention and management of the disease and its complications through antioxidant supplementation.

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## 1. Introduction

Taurine (2-aminoethanesulfonic acid  $\text{NH}_2\text{CH}_2\text{CH}_2\text{SO}_3\text{H}$ ) is a naturally occurring  $\beta$ -sulphonated amino acid. Taurine is a

conditionally essential amino acid which is not utilized in protein synthesis and never incorporated into muscle proteins, and hence, occurs in the body as a free molecule or in simple peptides. Along with methionine and cysteine, taurine is a sulfur containing amino acid (Fig. 1) with a molecular weight of 125.2 and two  $\text{pK}_a$  values (at 25 °C) of 1.5 and 8.82. Biosynthesis and dietary intake are the only sources of taurine in our bodies. The precursors of taurine biosynthesis are methionine and cysteine which occurs mainly in liver. However, consumption of sea foods, very rich in taurine, and

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