Is There a Role for Taurine Supplementation in the Management of Diabetes?

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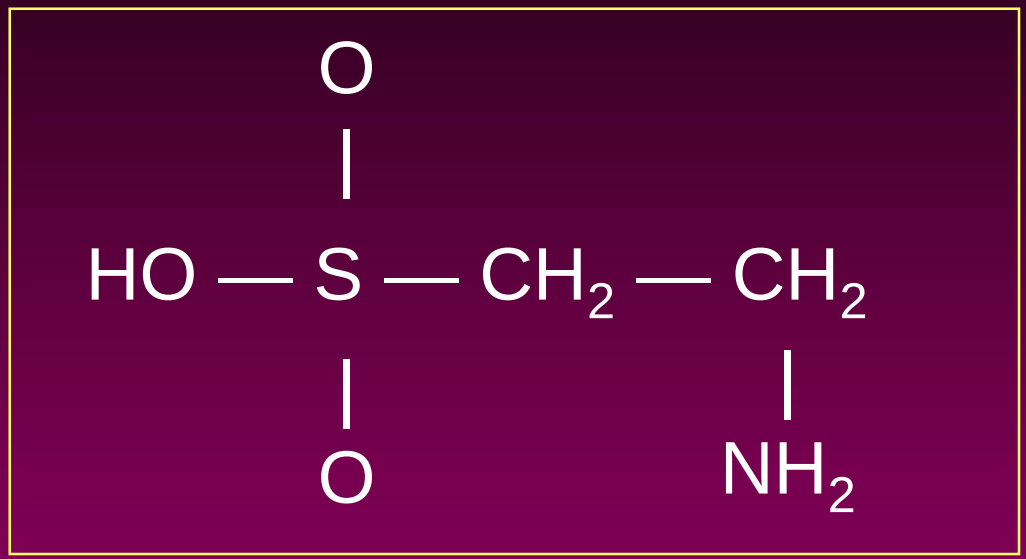
Taurine defined

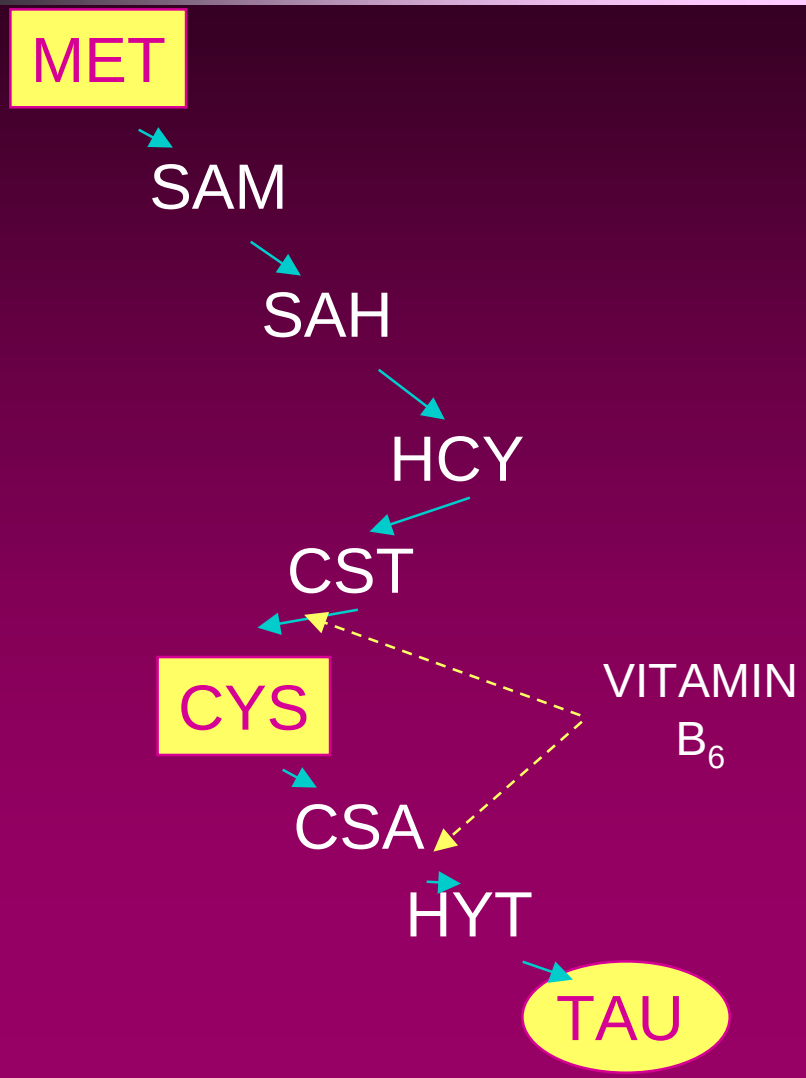


- 2-aminoethanesulfonic acid
- A small sulfur-containing amino acid present in the intracellular space of many tissues

History

- First isolated from ox bile in 1827 and named Gallen-Asparagin
- Later named for the ox, *Bos taurus*
- In 1838, the term “taurine” first appeared in the literature
- Only amino acid with its own zodiac sign

Synthesis of Taurine



- Taurine can be synthesized from methionine and cysteine with the help of vitamin B_6

Nutritional Essentiality?

- Real importance of taurine has only been recognized with the past 25 years
- Once considered non-essential, taurine now considered “conditionally essential”
- Research has uncovered an amazing variety of phenomena involving taurine
- Mechanism of actions of some of these phenomena remain to be elucidated

Functions and Possible Roles for Taurine

- Intestinal absorption of fat
- Osmoregulation
- Energy storage
- Pigmentation
- Reproduction
- Hypoglycemic agent
- Neurotransmitter & Neuromodulator
- Antiepileptic agent
- Antiarrythmic agent & Cardiac effects
- Calcium Ion Fluxes
- Protein Phosphorylation

Proposed Glucose Effects

- Ackerman & Heinsen (1935) found taurine was a potent hypoglycemic agent; finding has been confirmed

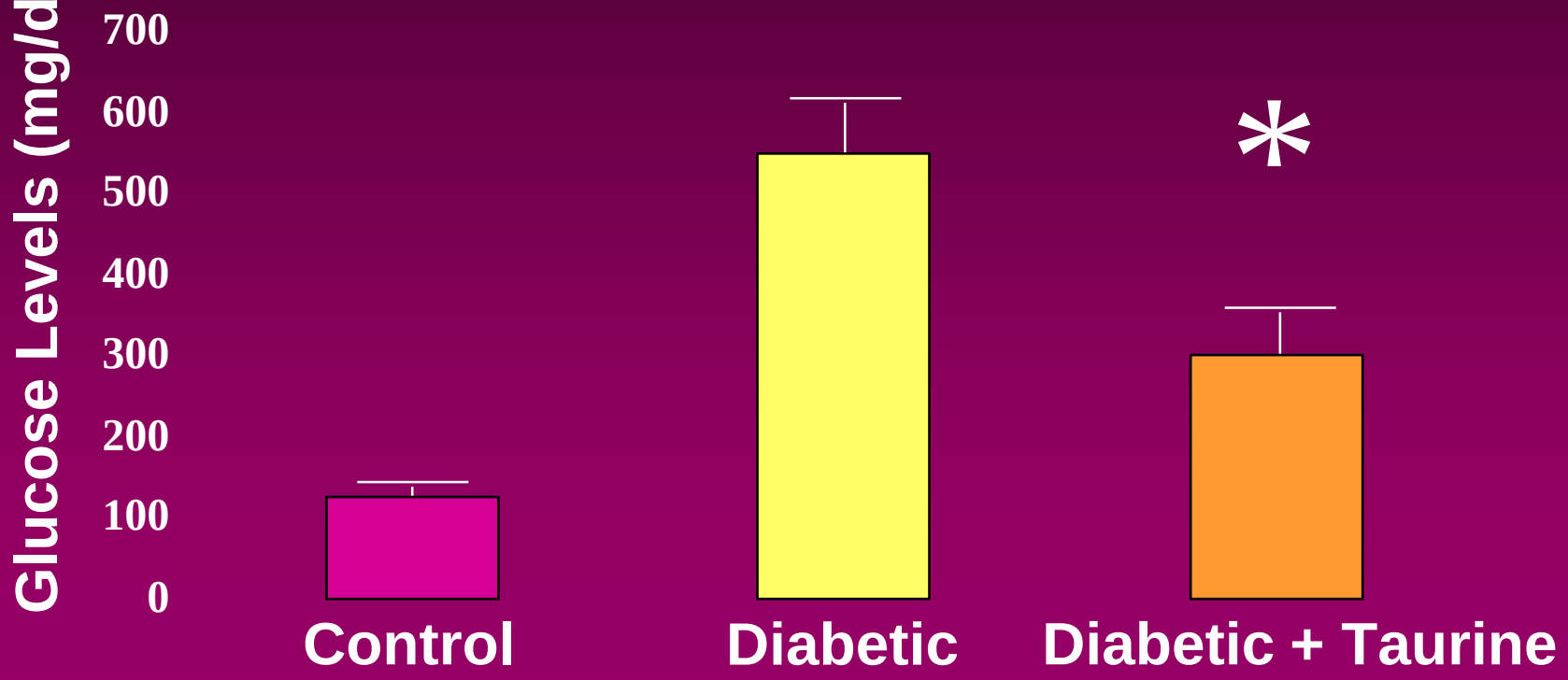
- Lampson (1983) reported taurine capable of enhancing the effect of insulin

Proposed Glucose Effects

- Kulakowski & Maturo (1984) observed that when fasting rats were given a bolus injection of glucose
- Taurine alone was capable of reducing glucose levels without an increase in insulin levels

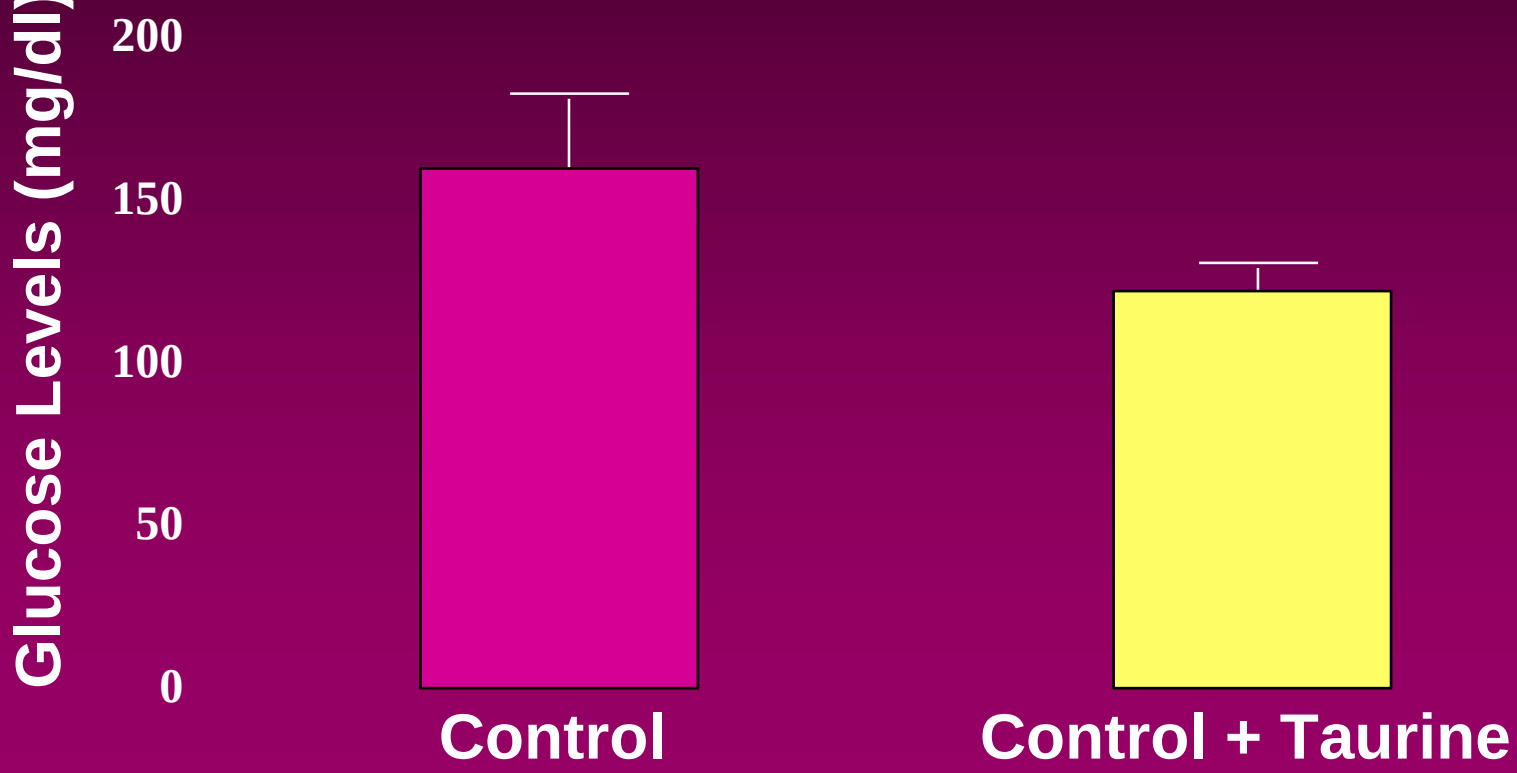
Proposed Glucose Effects

- Longitudinal study of rabbit plasma glucose (Tenner & Lombardini)



Proposed Glucose Effects

- Longitudinal study of taurine on plasma glucose in control rabbits (Tenner & Lombardini)



Proposed Lipid Effects

- Elizarova & Nedosugova (1996) outlined a study where human diabetic patients were given 0.5 g taurine twice a day for one month
- After 10-12 days, insulin had to be reduced as a result of taurine-induced hypoglycemia
- This was accompanied by reductions in cholesterol and triglycerides

TTUHSC Study Objectives

- To determine whether taurine supplementation has a hypoglycemic effect in patients with Type 2 DM
- To determine if taurine supplementation can reduce the oxidative stress normally observed in plasma of patients with Type 2 diabetes mellitus

Methods

- Randomized, double-blind, placebo controlled clinical trial
- 45 subjects: 15 control and 30 intervention
- 832 patients with the primary diagnosis of diabetes mellitus were screened
- 3000 mg. taurine or placebo daily for four months

Biomarkers or Outcome Measures

- Fasting glucose
- $HgbA_{1c}$
- Lipid profile, Tchol, HDL-C,LDL-C, VLDL-C, TG
- Insulin levels
- Taurine levels
- TBARS

Current Status of Study

- Study in progress with 42 subjects recruited in mid-September
- Most challenging task has been subject recruitment
- Planned 4-6 months to recruit study subjects; has taken one year
  - Insulin therapy
  - Lipid lowering meds
  - $HgbA_{1c}$

Take Home Message-Taurine

- Although underestimated in the past, taurine is now considered “conditionally essential” in the human
- Taurine *may* have hypoglycemic effects in patients with diabetes
- It is much too early to recommend taurine as a dietary supplement for patients with diabetes

Take Home Message-Research

- Research to assess the effects of a dietary supplement in humans is hard work, will take longer than you think, and will cost more than you budget
- Clinical trials require a qualified investigative team
- Human clinical trials are necessary before recommendations for dietary supplements can be made