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Original article

Taurine enhances spermatogenic function and antioxidant defense mechanisms in testes and epididymis of L-NAME-induced hypertensive rats

Isaac A. Adedara[a], Sanmi E. Alake[a], Mercy O. Adeyemo[a], Laide O. Olajide[a], Temitayo O. Ajibade[b], Ebenezer O. Farombi[a,*]

[a] Drug Metabolism and Toxicology Research Laboratories, Department of Biochemistry, College of Medicine, University of Ibadan, Ibadan, Nigeria
[b] Department of Veterinary Physiology, Biochemistry and Pharmacology, Faculty of Veterinary Medicine, University of Ibadan, Nigeria

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ABSTRACT

The beneficial health effects of taurine on hypertension have been demonstrated previously in both experimental and epidemiological studies. However, the role of taurine in reproductive dysfunction associated with hypertension has not been investigated. The present study evaluated the therapeutic efficacy of taurine on reproductive deficits in N-nitro-L-arginine methyl ester (L-NAME)-induced hypertensive rats. Sixty male Wistar rats were randomly assigned into six groups namely control, taurine alone, L-NAME alone (40 mg/kg) or L-NAME treated with either taurine (100 and 200 mg/kg) or reference drug atenolol (10 mg/kg) for 28 consecutive days. Results indicated that taurine treatment significantly abrogated L-NAME-induced increase in systolic, diastolic and mean arterial pressures when compared with hypertensive control. Administration of taurine markedly increased antioxidant enzymes activities and glutathione level whereas it suppressed the increase in biomarkers of oxidative stress in the testes and epididymis of L-NAME-induced hypertensive rats. Moreover, taurine significantly reversed hypertension mediated decreases in circulatory concentrations of luteinizing hormone, follicle-stimulating hormone and testosterone whereas it increased testicular sperm number, epididymal sperm number and sperm progressive motility in the hypertensive rats. Furthermore, taurine abrogated the suppression of marker enzymes of testicular function namely acid phosphatase, alkaline phosphatase and lactate dehydrogenase and preserved the histo-architectures of the testes and epididymis in L-NAME-induced hypertensive rats. Taken together, the findings from this study highlight the beneficial role of taurine in reproductive system of L-NAME-induced male hypertensive rats. Taurine supplementation may be a good clinical approach to prevent reproductive deficits in male hypertensive patients.

1. Introduction

Hypertension is a global burden due to its association with several health challenges including stroke, heart failure and chronic kidney disease [1,2]. Unlike developed countries, there is a high prevalence of hypertension in developing countries with insufficient awareness, control and treatment. Although hypertension is a well-established risk factor for reproductive dysfunction, its relationship with testicular damage and male fertility is not fully understood. Previous epidemiological studies indicated that circulatory concentrations of sex hormone-binding globulin and total testosterone level decreased in male hypertensive patients [3,4], thus suggesting alterations in the testicular morphology and reproductive function in those patients. Human hypertension is associated with decreased antioxidant enzyme activities, elevated reactive oxygen species (ROS) generation and oxidative damage to lipid and DNA [5,6].

In fact, numerous animal models of hypertension demonstrated increased ROS in multiple organs including the brain, heart and the kidney [7]. Previous studies demonstrated that hypertensive rats exhibited reproductive dysfunction involving marked reduction in testosterone level, sperm motility and antioxidant status in the testes and epididymis [8] in addition to some histological changes in the intratesticular arteries and seminiferous tubules [9]. Thus, drug candidates capable of regulating blood pressure, inflammation and oxidative stress are desirable in both basic and clinical research to regulate and treat hypertension [10]. Hitherto, there are few animal studies investigating the impact of anti-hypertensive agents on the reproductive function in male hypertensive animals.

Taurine (2-aminoethane sulfonic acid) is a free intracellular sulfur-containing β-amino acid. Epidemiological studies showed that

* Corresponding author.
E-mail address: olatunde_farombi@yahoo.com (E.O. Farombi).

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