

original article

Low protein diet enhances the toxicity of combined ethanol and chloroquine administration on gonadal weight, seminiferous tubular diameter and epithelial height of male Sprague-Dawley rats: A morphometric study

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ABSTRACT

Background

Testicular/reproductive effects of concurrent ethanol (E) and chloroquine (Q) administration with protein malnutrition, a prevalent condition in Third World malaria-endemic communities, were investigated. In malaria-endemic Third World countries, plagued with malnutrition, the abuse of chloroquine and alcohol is commonplace. This may present with some reproductive health problems.

Material -Methods

Adult male Sprague-Dawley rats fed normal protein (NP, 15%) or low protein diet (LP, 6%) were treated with ethanol (NPE, LPE groups; 6% in drinking water ad libitum), chloroquine (NPQ, LPQ groups; 10mg, kg⁻¹ body weight per rat, intramuscularly), or both (NPEQ, LPEQ) and controls (NPC, LPC). After 10days (repeated at 20D, 30D and 40D) 5 – 7 rats randomly selected from each group were sacrificed under ether anaesthesia.

Results

The loss in body weight gain and relative gonadal weights were generally increased in LP-groups compared with NP-groups. The LPEQ-rats recorded actual-body (in contrast to NPEQ rats which gained weight) and gonadal weight losses ($p < 0.05$), greater progressive reductions in seminiferous tubular diameter (STD) and epithelial height (SEH) (10D to 40D). The reduction at 40days sacrifice in SEH (-36.77%) and STD (-24.20%) of LPEQ-rats relative to NPEQ-rats (-26.89% and -13.14% respectively) suggests greater testicular toxicity of combined E and Q administration with low protein diet.

Conclusions

Low protein diet enhanced the toxicity of concurrent ethanol and chloroquine intake on testicular/reproductive function of male rats. Further investigations will include the female reproductive aspect and exploring the possible mechanisms of toxicity.

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INTRODUCTION

Alcohol is a generally abused drug, with attendant male reproductive dysfunction that has been recognized in experimental animals and humans.^{1,2} It has also been shown that chloroquine (Q) adversely affects spermatogenesis when used chronically.³ Impairment of testicular function has been reported in male rats following short- and long-term exposure to chloroquine.⁴⁻⁶ However, chloroquine remains the drug of choice for the treatment of malaria in most malaria-endemic and impoverished Third World countries primarily because it is cheap, rapidly effective and readily available.⁷ It has been reported that over 2 billion people (over 40% of the world's population) living in more than 100 countries are exposed to the risk of malaria, and that 270 million of these are infected with malaria, with 110 million clinical cases and 1 million deaths annually.^{8,9}

In these malaria-endemic areas, malarious or rheumatoid arthritic patients undergoing Q treatment on a prolonged basis also tend to consume alcohol regularly.¹⁰ For instance, in Western Uganda, misuse of drugs such as chloroquine through self medication constitute about 87.2 – 94.6% of drug use.¹¹ Additionally, these countries are plagued with poverty and malnutrition.¹² Thus, concurrent ingestion of Q, alcohol and protein-deficient diets is common in these regions of the world. There are apparently no reports on the possible effects of combined ingestion of ethanol and chloroquine on a state of malnutrition, on the testis and the relative weights of the epididymis and prostate gland. The present experimental protocol was designed in an attempt to mimic this condition, using adult male Sprague-Dawley rats.

MATERIALS AND METHODS

Animals

Adult male Sprague-Dawley rats (± 3 months old) were used in the study. The rats, bred and housed at the Animal House, Faculty of Medical Sciences, University of Zimbabwe, were housed in cages under a 12-hour light / 12-hour dark regimen. The rat cages had