



Effect of Locally Consumed Alcoholic Beverages ('Burukutu', 'Pito' and 'Goskolo') on Body Weight and Anatomy of Testicular Tissues

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ABSTRACT

The effects of locally consumed alcoholic beverages ('burukutu', 'pito' and 'goskolo') on body weight, sperm count and testicular tissues were evaluated in rats. Animals in the test groups were administered the local beverages daily, while the control group was administered normal saline daily for 14 days. The study revealed that there was a decrease in body weight in the groups treated with the local beverages compared with control group that was treated with normal saline. Similarly, the sperm counts in the treated groups were significantly ($P < 0.05$) reduced. Histological study showed that the seminiferous tubules and the integrity of the sperm cells were significantly affected in the treated groups compared to the control group. These data suggest that the three locally consumed alcoholic beverages may grossly decrease spermatogenesis, thus, influencing an alteration in the reproductive system.

Keywords: Local alcoholic beverages, spermatogen, testis, rats

INTRODUCTION

Historically, alcoholic beverages have served as sources of food and have been widely used as socialising drink and for their medicinal, antiseptic, and analgesic properties. In ancient times people always drank when holding memorial ceremonies, while offering sacrifices to the gods or their ancestors, pledging resolution before going into battle, celebrating victory, before feuding and official executions, for taking an oath of allegiance, while attending the ceremonies of birth, marriage, reunions, departures, death, and festival banquets. The consumption of alcoholic beverages is as old as man's history, and is currently a major social and health problem in most societies world-wide. Alcohols are hydroxyl derivative with straight or branched chain aliphatic hydrocarbons [1]. Alcohol is, generally, used to make ethanol, but in scientific terms, it is the name of a group of compounds with hydroxyl-group of which ethanol is one. Alcoholic beverages contain different alcoholic content and this depends on the type and method of

preparation. Polson and Tattersal [2], demonstrated that alcoholic beverages have ethanol contents of about 2-70%.

In Plateau State, Nigeria and some of its neighbouring States, the consumption of locally produced alcohol far exceeds that of any other drug. The three major alcoholic beverages consumed are locally called 'burukutu', 'pito' and 'goskolo'. 'Burukutu' in Hausa (also called 'mos' or 'gem' in ethnic slangs in Plateau State) and 'pito' are produced from cereals: millet and guinea corn, while 'goskolo' is locally and privately prepared from an undisclosed concoction, and all of them are of unknown alcoholic content. Of all the beverages, 'goskolo' is believed to be of very high alcoholic content. Indeed, the consumers say 'goskolo' is 'short cut' to intoxication.

Chronic alcohol ingestion will result in toxic effects that affect all tissues and cells, though, sensitivity of



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these organ systems differ. The liver is the most insulted of all the organs. Katzung [3], demonstrated that alcohol appears to be able to interpolate into biological membranes, expanding them and increasing their fluidity (i.e affect their semi-permeable membrane status). This can alter their action potentials, interfere with their active transport mechanisms and affect neurotransmitter release. Alcohol is a direct testicular toxin [4]. It causes atrophy of seminiferous tubules, loss of sperm cells and an increase in abnormal sperms [5]. Lipsett [6], also demonstrated that alcohol is a strong leydig cell toxin, thus, this can have an adverse effect on the synthesis and secretion of testosterone. Ylikahriet *al.* [7], and Mendelsonet *al.* [8], have shown evidence that this effect on the testosterone is a direct correlation with infertility properties in males. Alcohol toxicity is known to produce a significant deterioration on sperm concentration, output and motility [9,10]. Brzek [10], showed that alcohol increases the frequency of damaged spermatozoa.

The aim of this study was to evaluate the effect of the three commonly consumed alcoholic beverages: 'burukutu', 'pito' and 'guskolo' on some metabolic indices and testicular structure and function in rats.

MATERIALS AND METHODS

Animals

Male albino rats (SpaqueDawley strain) of about 14 weeks (150-200 g) were purchased from the Animal House of the University of Jos, Jos, Nigeria. The animals were fed with compressed grower mash and allowed water *ad libitum*. They were kept in the laboratory for 24 hours to adapt to the environment before commencement of the experiment.

Alcoholic beverages

Freshly prepared *guskolo*, *burukutu*, *pito* were purchased daily from the same source (to eliminate the errors of fermentation) from the local producers/sellers at Congo Russia, a settlement in Jos metropolis, Plateau State, Nigeria.

Administration

Five (5) animals were used per group. The beverages were administered orally with the aid of a cannula. The animals were administered 10 ml per 1000 g body weight (1 kg) daily for 14 days. The control group was administered equi-volume per 1000 g body weight normal saline.

Body weight and sperm count

The animals were weighed daily. On the 15th day of the study, they were sacrificed. Each animal was placed in a dessicator, which has formalin in a cotton wool. The animals got suffocated on inhalation of the formalin in the dessicator. They were removed from the dessicator and dissected. The testes and epididymis were removed and fixed with 100% formaline buffer overnight. The epididymis was carefully dissected from the testes after which seminal fluid was extracted and sperm count done with the aid of a light microscope. The testes were processed through the techniques of dehydration in graded ethanol, clearing in xylene and embedding in paraffin wax and sectioned. The sections were stained by haematoxylin and eosin and then examined for spermatids under the light microscope.

RESULTS AND DISCUSSION

The animals treated with 'guskolo' and 'burukutu' showed a gradual but non significant increase in body weight if compared to the control group. While the group administered 'pito' showed a significant decrease ($P<0.05$) in body weight 7 days after treatment, till the end of the experiment (Figure 1).

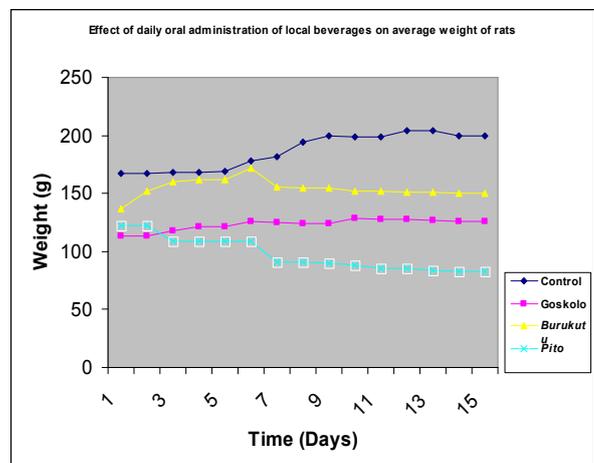


Table 1: Effect of oral administration of local beverages on sperm count in rats

Spermatocytes	Control	Guskolo	Burukutu	Pito
Dead	627±34.22	*112±49.12	*90±116.78	*77±14.40
Live	73±12.72	*22±11.31	*36±50.20	*18±2.83
Total	700±16.5	*134±15.2	*126±13.4	*95±6.5

Values are cells/mm³* $P<0.05$

The local alcoholic beverages administered for 14 days produced a significant ($P < 0.05$) decrease in spermatocytes. The group administered 'pito' showed a greater decrease followed by 'burukutu' and 'goskolo', in this order 95 ± 6.5 ; 126 ± 13.4 ; 134 ± 15.2 ; compared to the control group administered normal saline that gave 700 ± 16.5 cells/mm³

Histological section of the testes revealed that in the control group, the seminiferous tubules appear large and round within scanty interstitial connective tissue (Plate 1). Animals administered 'goskolo' showed highest lost of seminiferous tubules, with only a few sperm cells seen. The seminiferous tubules were replaced by mass of epithelial cells. The seminiferous tubules in the section are spindle shaped instead of their normal rounded nature (as seen in the control). This might be as a result of dehydration caused by the administered 'goskolo' (Plate 2). The section further revealed that there was a decrease in primary spermatocytes and active meiotic secondary spermatocytes. There was also a compromise of the basement membranes in the "goskolo" treated group compared to control (Plate 1).

The group that was administered 'burukutu' showed an intact membrane but there was, similarly, a decrease in spermatocytes. Marked decrease was also observed in the density of spermatids present in the lumen of the tubules, the seminiferous tubules in this section are round with prominent interstitial connective tissue around the tubules (Plate 2). The animals administered 'pito' showed elongated nuclei that give rise to no cell division in the primary spermatocytes. The secondary spermatocytes show cell division which give rise to massive production of spermatids immature sperm cells (Plate 3).



Plate 1: Histological section of the testis of control animals.



Plate 2: Histological section of animals administered 'goskolo'

Plate 3: Histological section of animals administered 'burukutu'

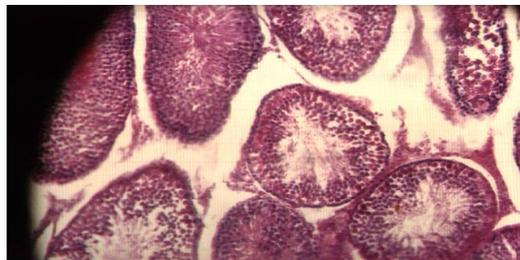
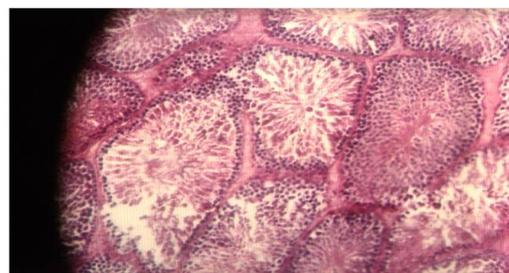


Plate 4: Histological section of animals administered 'pito'



'pito'

Male sperms are vulnerable to environment and some occupational risk factors. Sperm count is correlated with fertility and epidermal sperm in man is very sensitive to a wide variety of environmental insults. Spermatogenesis (formation of sperm which takes place in the seminiferous tubules) is a very important index in reproductive function in males.

Alcohol metabolism involves the formation of acetate via acetaldehyde, which is further converted to acetyl CoA. Acetaldehyde is a highly reactive molecule and can form adducts with proteins, nucleic acids and other molecules, thus, resulting in toxicities [11]. According to Noth and Walter [12], ethanol disrupts the hypothalamic-pituitary-gonadal axis, adversely affects the secretory function of Sertoli cells, and produces oxidative stress within the testes. The result of this is testicular atrophy and male infertility. These authors also demonstrated that alcohol induced hepatotoxicity can result in hyperestrogenisation and a reduced rate of production of testosterone and/or metabolic inactivation of testosterone.

The result of this study, revealed that the locally consumed alcoholic beverages reduced sperm

count and produced testicular atrophy. However, the effect on testicular tissue depends on the type of alcoholic beverage. 'Burukutu' and 'gokolo' produced marked seminiferous tubule atrophy and 'pito' produced little if compared to the other two. The result of this study showed that the locally consumed alcoholic beverages produced damages in male reproductive system which could lead to infertility in males.

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