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EFFECT OF THERMOXIDISED GROUNDNUT OIL ON AMINOTRANSFERASE ACTIVITY OF HEART TISSUE IN WISTAR RATS

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ABSTRACT

The effect of thermoxidised groundnut oil on the aminotransferase activity of the heart health of Wistar rats was investigated. Eighteen female albino rats were randomly divided into three groups of six rats each .Group 1 was fed 15% fresh groundnut oil supplemented rat pellet, group 2 received 15% thermoxidised groundnut oil supplemented rat pellet, while group 3 received the normal pellet only. The feeding experiment lasted for a period of twenty one days after which the animals were sacrificed and tissue homogenates analyzed for tissue enzymes using standard methods. The results indicated a significant increase ($P<0.05$) concentrations of alanine aminotransferase (ALT) in animals treated with the oils with respect to the control. The AST showed similar pattern in group 2 treated when compared to the control. The amongst group variation was not significant. We therefore conclude that thermoxidised groundnut oil impact adversely on heart tissues as indicated in raised enzyme levels.

KEYWORDS: Wistar rats, groundnut oil, thermoxidation and aminotransferase

INTRODUCTION

The most commonly used industrial frying oils are based on partial hydrogenation, which has the benefit of high oxidative stability. Most foods are subjected to processing before being consumed with the goal of enhancing palatability as well as facilitating quick digestion (Sanders 1993).Prominent amongst these processing methods is hydrogenation process especially in he production of margarines and shortenings (Egbung et al.,2012 and Odutuga et al.,1997). Ologan (2002) reported persistent use of reprocessed thermoxidised oils that are predisposed to auto oxidative deterioration in most middle income countries of the world due to its low cost. Different food processing techniques have been found to have adverse effects on consumers. Groundnut oil is extracted from groundnut(*Arachis hypogea*),a member of the plant family, leguminosae, with a vine like growth form containing pinnate compound leaves of 5 to 7 leaflets(Blackmon and Reynolds,1986).Almost every part of the plant is useful, the kernels are used for candy production when roasted, it is also consumed as a delicacy especially when used in preparing soups in some African communities such as Bekwarra in Cross River State ,Nigeria (Isleib and Wyne,1992,Omagu 2013).The oil can be used as shortening agents or a base for confectionery and for peanut butter as well as for deep frying such as French fries and chicken (Shankarappa *et al*.,1996).

Odutaga and Ajayi 1998 reported a reduction in the concentration of ALP and the loss of enzyme in conditions of deficiency of Zinc and essential fatty acids. There was significant increase ($p<0.05$) in levels of haemoglobin in rats fed thermoxidised groundnut oil (Ani *et al*., 2015).Despite these reported literature information on groundnut oil, there is paucity of information on the biological effects of groundnut oil on the heart tissue hence the present study was designed to evaluate the effect of thermoxidised groundnut oil on the aminotransferase activity in the heart tissue of Wistar rats.

MATERIALS AND METHODS

Eighteen female albino Wistar rats weighing between 90 – 140 grammes were obtained from the Animal House of the Department of Biochemistry, University of Calabar, Calabar, Nigeria, were used for this study. Ethical approval was obtained from the College of Medical Sciences Animal Ethics Committee of the same University. The animals were randomly divided into three groups of six rats each. The animals were maintained under standard conditions as recommended by the National Research Council (1985).

Formulation of diet

Fresh groundnut (3 litres) was purchased from Ika-Ika Oqua market in Calabar Municipality, Cross

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River State, Nigeria. Preparation of thermally oxidized groundnut oil was carried out according to the methods described by Owu *et al*., (1998) and Egbung *et al*., (2012).Fifteen percent (15g) of fresh groundnut oil was supplemented with 85 percent (15g) of rat chow. The animals received feed and water ad libitum within the twenty one days experimental period. The experimental design is presented in table 1 below.

Table 1: Experimental animal design

Group	No of Animals	Feed formulation ratio
1. Unoxidised chow	6	15g oil + 85 g chow
2. Thermoxidised	6	15g oil + 85g chow
3. Normal control	6	100% chow

Preparation of heart tissue homogenate

At the end of the 21 days experimental period, feed was withdrawn12 hours prior to the time of sacrifice while the animals were allowed free access to water. The animals were after euthanation using chloroform vapours, dissected and heart tissues surgically removed .One gramme of the heart tissue was homogenized in 10 ml of phosphate buffer using mortar and pestle. The homogenate was centrifuged at 4000g for 10 to 15 minutes using a table top centrifuge (Model SM80-2, Surgifield Medical, England) and the supernatant collected for the enzyme analysis.

RESULTS

Results of serum enzyme activities of Alkaline aminotransferase and Aspartate aminotransferase in rats fed thermoxidised groundnut oil is presented in table 2 below.

Table 2: Effect of fresh and thermoxidised groundnut oil on the aminotransferase in Wistar rats

Group	Number of Animals	ALT(Iu/l)	AST(Iu/l)
1. Unoxidised	6	41.10 ± 4.03	62 24 ± 4.85
2. Thermoxidised	6	39.27 ± 5.85	120.70 ± 13.42*
3. Normal control	6	38.19 ± 6.61	65.15 ± 5.81

Mean ± SEM, n = 6, * $p < 0.05$ vs control

Following the completion of the treatment period, the Aspartate aminotransferase indicated 62 24 ± 4.85 IU/L in group 1, group2 showed an increase level of 120.70 ± 13.42 IU/L while group 3 indicated 65.15 ± 5.81 IU/L. The concentration of Alanine aminotransferase in group 1 showed 41.10 ± 4.03 IU/L, group 2 showed 39.27 ± 5.85 IU/L while group 3 revealed 38.19 ± 6.61 IU/L.

DISCUSSION

The increased activity of Aspartate aminotransferase (AST) is an indication that there was probable damage to the heart tissue due to compromised membrane integrity, resulting in leakage of the enzyme into the blood stream. The AST is usually a clinical diagnostic tool for liver impairment and a very useful toxicological tool for assessment studies. The free radicals generated in the thermoxidised groundnut oil that was fed to the Wistar rats may have elicited this sequence of reaction leading to membrane peroxidation. This is corroborated by the reports of Osim *et al*.,1994, Jenkinson *et al*.,1979 Edem, 2002, Egbung *et al*., 2009 and Felzenszwalb *et al*., 2014.Compounds formed due to oxidative stressing of culinary oils are highly reactive and on absorption in the body can induce cellular /organ damage subsequently resulting in probable development of cardiovascular diseases. Aldehydes formed during heating of groundnut oil could generate free radicals and initiate a chain reaction leading to cell membrane damage/cell death (Keller and Mathson,1998). However, There was no significant difference ($p>0.05$) in activity of AST in group 1 treated with unoxidised groundnut oil.

We therefore conclude that consumption of thermoxidised groundnut oil exerts probable adverse effect on the heart tissue as revealed by the marker enzyme (AST) only in this study.

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