

Actions of Red Palm Oil and Cow Fat Oil Blend on The Liver Function of Treated Wistar Rats

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Abstract:

The present study was conducted to determine the effect of the consumption of fresh red palm and cow fat blend oil on the liver function of treated wistar rats. A total of 60 rats weighing 150-250g were randomly divided into 4 groups of 15 rats each. Group A served as normal control and were fed with pelleted growers feed. Group B were fed with pelleted feed mixed with 2ml/kg b.wt of cow fat oil. Group C were fed with pelleted growers feed mixed with 2ml/kg b. wt of cow fat oil while Group D were fed with pelleted growers feed mixed with 2ml/kg of a blend of red palm oil and cow fat oil. Animals were sacrificed after 28 days by euthanasia. Three (3mls) of blood were collected by cardiac puncture into plain bottles for the estimation of liver function parameters involving the Alkaline Phosphate (ALP), Alanine Transaminase (ALT), Aspartate Transaminase (AST), Total Bilirubin (TB) and Conjugated Bilirubin (CB) by standard methods. Results were reported as mean + standard deviation from the mean with $P < 0.05$ considered significant. There was a significant increase in the ALP ($P=0.003$), ALT ($P=0.015$), AST ($P=0.007$), TB ($P=0.022$), CB ($P=0.010$) for the rats treated with cow fat oil compared to those treated with red palm oil, blend of cow fat and red palm oil and normal rats. These findings suggest that a blend of cow fat and red palm oil may pose a health risk to the liver of treated rats.

Keywords: blend oil, cow fat oil, red palm oil, liver function

Introduction

Dietary oils are lipids (fats) made from plants, animals or synthetic compounds used in almost all types of human diet preparations including frying, baking and extrusion [1]. They are important source of lipids which cannot be synthesized by the body and a major constituent of biomembranes and building block for several hormones. There is a convincing evidence that the nutrient composition



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of dietary oils such as the fatty acid composition (the proportion of saturated to unsaturated fats; and monounsaturated to polyunsaturated fats) and natural antioxidants such as tocopherols, tocotrienols and carotene could alter the physiology of treated animals as well as human [2-4]. The liver is the centre for the metabolisms of dietary supplements before distribution through the blood stream to the rest of the body. The central role of the liver in body metabolism exposes it to increased vulnerability to xenobiotics [5]. Blending is a simple process of combining two or more dietary oils to alter the physiochemical and nutritional properties [6]. Emerging evidence highlights that blend oil could be more beneficial to health than the individual use of the oils [7]. The present study was therefore designed to determine the effect of the consumption of fresh vegetable oil (red palm) and animal oil (cow fat) blend oil on the liver function parameters of treated wistar rats.

Materials And Methods

Red palm and cow fat oils: The red palm oil and cow fat oil were purchased from a local market (Nkwo Ogbe) at Ihiala, Ihiala Local Government Area, Anambra State, Nigeria.

Wistar Rats: Male wistar rats (*rattus nervigicus*) weighing between 150-250g were procured from Chris Animal Farms and Research Laboratories, Awka, Anambra State, Nigeria. They were maintained under standard conditions of light (12/24 hours) and temperatures (25-29°C) in an aluminium wire guaze cage and fed with standard growers pellet feed (Pfizer, Nigeria, Ltd) and allowed free access to water for a two weeks of acclimatization prior to the experimental protocol .

Ethical Considerations: Ethical clearance was obtained from the Animal Research Ethical Committee of Chukwuemeka Odumegwu Ojukwu University, Uli, Anambra State, Nigeria.

Sample Size: The sample size was calculated using the maximum sample size relation according to one way analysis of variance.

Maximum sample size (n) = Maximum DF/ k + 1

where

DF = the between-subject error

k = the number of groups

n = the maximum number of rats per group

The maximum sample size (n) per group as obtained from the relation was 16.

Experimental Design: A total of 60 rats weighing 150 – 250g were randomly divided into 4 groups of 15 rats each. Group A served as normal control and were fed with pelleted growers feed. Group B were fed with pelleted growers feed mixed with 2ml/kg b.wt of red palm oil by oral gavage. Group C were fed with pelleted growers feed mixed with 2ml/kg b.wt of cow fat oil while Group D were fed with pelleted growers feed mixed with 2ml/kg b.wt of a mixture of red palm oil and cow fat oil (ratio 1:1) by oral

gavage. Animals were sacrificed by euthanasia using chloroform after 28 days. Three millilitres (3mls) of blood were collected by cardiac puncture into plain bottles, centrifuged and separated for the estimation of liver function parameters involving the Alkaline phosphatase (ALP), Alanine Transaminase (ALT), Aspartate Transaminase (AST), Total bilirubin (TB) and conjugated bilirubin (CB) by standard methods.

Estimation of Alkaline phosphatase: The method of Wilkinson and Vodden was used in determining serum alkaline phosphatase level [8]. Alkaline phosphatase acts upon hpenolphthalein monophosphate in 2-methylpropan-1-ol buffer at pH of 10.15. The addition of an alkaline reagent stops enzyme activity and simultaneously develops a blue chromogen. The absorbance of the sample was read against the reagent blank at 590nm using a DRE 3000 HACH spectrophotometer.

Estimation of Aspartate Transaminase: The Reitman and Frankel method was used to determine the serum aspartate transaminase level [8]. Alanine Transaminase catalyses the transfer of the amino group between L-alanine and α -ketoglutarate to form pyruvate and glutamate. The pyruvate formed reacts with 2,4-dinitrophenylhydrazine in sodium hydroxide to give a complex with a reddish-brown colour. The absorbance of the sample was read against the reagent bank at 546nm using a DRE 3000 HACH spectrophotometer.

Estimation of Bilirubin: Bilirubin was estimated using the Roche CobasCIII system [9]. Bilirubin in the presence of a solubilizing agent is coupled with a diazonium ion in a strongly acidic medium (pH₁₋₂). The intensity of the colour of the azobilirubin produced is proportional to the total bilirubin concentration which was measured photometrically.

Results

There was a non-significant increase ($p > 0.05$) in the Alkaline phosphatase, Alanine transaminase, Aspartate transaminase, Total bilirubin and conjugated bilirubin levels of the rats treated with red palm oil alone and a blend of red palm oil and cow fat oil compared to the normal rats but a significant increase ($p < 0.05$) in the rats treated with cow fat oil alone compared to the normal rats.

Table 1. Liver function parameters in wistar rats treated with red palm and cow fat blend oil

Group	A (control)	B(RPO)	C(CFO)	D(RPO + CFO)
ALP (Iu/L)	33.74±4.46	34.95±3.82	39.40±3.21	36.10±2.76
ALT (Iu/L)	24.57±0.95	23.89±0.34	36.02±0.93	27.12±0.24
AST (Iu/L)	28.35±0.48	27.90±0.51	34.66±1.05	31.60±1.33
TB (µmol/L)	5.51±1.60	5.80±1.94	19.12±2.22	16.23±1.55
CB(µmol/L)	3.40±1.24	3.73±1.88	10.04±3.51	8.73±2.29

ALP = Alkaline phosphatase, ALT = Alanine transaminase, AST = Aspartate transaminase, TB – Total bilirubin, CB = conjugated bilirubin, RPO = red palm oil, CFO = cow fat oil

Discussion

The red palm oil and cow fat oil are two commonly blended oil during food preparation in Nigeria. The significant increase in the liver function parameters of the rats treated with cow fat oil compared to those of the normal rats and the red palm oil suggests that the red palm oil may contain a better mixture of fatty acids and antioxidants beneficial to health compared to the cow fat oil. This is similar to the findings of some other studies who had reported a significant increase in the Alanine transaminase and aspartate transaminase levels in rats treated with animal oil enriched diets compared to vegetable oil enriched diets [10]. Similar decrease of the parameters in the rats treated with the blend of red palm oil and cow fat oil content of the mixture which may have augmented the fatty acid and antioxidants content. This finding agrees with the findings of other studies who had reported that a blend of oil is more beneficial to the liver function compared to the individual use of the two oils [11].

Conclusion

The consumption of cow fat oil and a blend of cow fat and red palm oil had a deleterious effect on the liver function of treated rats unlike the red palm oil. This study therefore recommends that the consumption of red palm oil may be beneficial to health than the blend of cow fat oil and red palm oil or cow fat oil alone which are common practice in Nigeria.

References

- [1] Folade AO, Oboh G, Okoh AI. Potential health implications of the consumption of thermally-oxidized cooking oils – a review. *Polish Journal of Food, Nutrition Sciences* 2017; 67(2):95-105.
- [2] Rauchova H, Vokurkova M, Pavelka S, Vanekova J, Tribulova N, Soukup T. Red palm oil supplementation does not increase blood glucose or serum lipids level in wistar rats with different thyroid status. *Physiology Research* 2018; 67:307-315.
- [3] Gugolek A, Kowalska D. Animal fats in rabbit feeding – a review. *Annals of Animal Science* 2020; 20(4): 1185-1215.
- [4] Olaniru BO, Ocholi MI, Etukudoh NS, Dawal AF, Iheanacho CU, Obeta MU, Ugwu BK, Ntuhun BD. Effect of Nsukka red palm oil hematological parameters of paracetamol treated albino wistar rats. *Food Sciences and Nutrition Technology* 2020; 5(2):000219.
- [5] Rita IKA, Jude JR, Olusegun OA. Biochemical changes in hematological and liver parameters in albino rats exposed to A20 dye adulterated palm oil. *International Journal of Biomedical and Clinical Sciences* 2021; 6(4): 137-141.
- [6] Dhyani A, Chopra R, Garg M. A review on blending of oils and their functional and nutritional benefits. *Chemical Science Review and Letters* 2018; 7(27): 840-847.
- [7] Bhatnagar AS, Kumar PP, Hemavathy J, Krisha AH. Fatty acid composition, oxidative stability and radical scavenging activity of vegetable oils blends with coconut oil. *Journal of the American Oil Chemists Society* 2009; 86(10):1769-1776.
- [8] Chukwudoruo CS, Ibe OK, Igwe NC, Itheme KO, Izunna C, Ujowundu FN, Mba BA. Serum total protein concentration and liver enzymes activities in albino rats model administered with ethanolic leaf extract of ficus capensis. *African Journal of Biotechnology* 2020; 20(4): 164-168.

- [9] Odiegwu CNC, Chianella I, Azubike NC, Odiegwu UO, Ogbuwelu SO. Liver function tests values in albino wistar rats administered with isolated Nigeria Achatina achatina snail lectin. *GSC Biological and Pharmaceutical Sciences* 2021; 15(02): 092-102.
- [10] Dalal MM, Edrees GM, Hassan HA, Abdel-Mogib M, El-Dein MA. Impacts of dietary lipids derived from abimal or vegetable sources on healthy rats. *Egyptian Journal of Basic and Applied Sciences* 2023; 10(1): 618-631.
- [11] Liu Z, Yuan J, Wen P, Guo X, Wen H, Guo Y, Li O. Effect of lard plus soya bean oil on blood pressure and other cardiometabolic risk factors in healthy subjects: a randomized controlled-feeding trial. *Food and Function* 2023;14: 7117-7129.