EFFECT OF RAW BEEF AND CHICKEN MEAT ON SERUM BIOCHEMICAL AND HAEMATOLOGICAL PARAMETERS OF WISTAR ALBINO RATS

[1]Mohammed, A., [2]S.K Inusa., [2]M.I Gidado and [2]Salihu, A.A
[1]Department of Animal Science, Faculty of Agriculture, Federal University, Gashua
[2]Department of Animal Science, Faculty of Agriculture, Bayero University, Kano
Corresponding Author's Email: ahmedmalah19@gmail.com

ABSTRACT
The study evaluated the effect of raw beef and chicken meat consumption on biochemical and haematological parameters of Wistar Albino rats. The experiment consisted of seven (7) treatments each containing 6 Wistar albino rats and..... replicates. T1 was the control, T2 was fed 15% beef, T3 30% beef, T4 45% beef, T5 15% chicken meat, T6 30% chicken meat and T7 45% chicken meat. A total of 42 Wistar albino rats were used in 2×3 factorial arrangement of a completely randomized design (2 meat types and 3 inclusion levels of beef and chicken meat). The results reveal no significant differences ($p<0.05$) in the experimental animals with respect to serum protein. Haematological parameters (red blood cell, white blood cell, mean corpuscular volume, mean corpuscular haemoglobin and lympocyte) were significantly ($p<0.05$) affected by the consumption of the two meat types by Wistar Albino rats. Electrolyte parameters (potassium, urea and creatinine) were also significantly ($p<0.05$) affected. It was concluded that meat types have no effect on biochemical and haematological parameters in Wistar Albino rats. Based on the results, beef and chicken meat can be consume to meet the protein requirement and further research should be conducted by comprising red meat with another meat.
Keywords: Raw beef, chicken, Wistar Albino Rat, Haematology, serum

INTRODUCTION
Constituents of red meat that have been proposed to be responsible for these associations include the fat content, fatty acid composition and the possible formation of carcinogenic compounds, such as heterocyclic amines (HCAs) as a result of cooking meat at high temperatures (Bingham, Hughes, & Cross, 2002). Although there are many studies documenting these associations, results are not always consistent and there are several methodological issues which could limit the findings. Therefore this research aimed at evaluating the effect of raw beef and chicken meat consumption on biochemical and haematological parameters of Wistar albino rat.

MATERIALS AND METHODS
The study was conducted at the animal science laboratory, Faculty of Agriculture, Bayero University, Kano

Forty two (42) Wister albino rats were randomly assigned to seven (7) treatments with 6 animals per treatment. T1 is the control, T2 was fed with 15% Beef, T3 with 30% Beef T4 with 45% Beef, T5 15% Chicken meat, T6 30% Chicken meat, T7 45% Chicken meat. Single factor arrangement of Completely Randomized Design CRD (2 meat types and 3 inclusion rates of red and white meat). Minced raw beef and chicken meat, grower mash (chicken grower mash) and groundnut cake (powder) were mixed and fed to the experimental animal, other experimental materials Include: Ethyl Alcohol, which was used to kill micro-organism at point where blood was taken. EDTA and non-EDTA sample bottle were used to put blood samples, EDTA means the bottle that contain ethylene diether tetra acetic acid is used to prevent coagulation. Syringe, was also used to draw blood sample. Cotton wool was used for cleaning the animal after blood collection. Dettol was used as disinfectant. Detergent was used for general cleaning and washing. Hand gloves were used for protection and prevention of infection. Colour was used as tagging material.

The experiment lasted for 8 weeks, and one week acclimatization period. The blood was collected following collection site cleaning with 70% alcohol, the rat is restrained and blood was collected using a 21-23 gauge needle from the lateral tail vein. Blood flow is stopped by applying pressure. Haematology is the study of the cells and proteins found in blood. The blood collected in EDTA bottle was used to determine haematology at the end of the experiment at AKTH Kano, the following vitals were determined; they are White Blood Cells (WBC), Red Blood Cells (RBC), Haemoglobin (HGB), Haemotocrit (HCT), Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH), Mean

Corpuscular Haemoglobin Concentration (MCHC), Lymphocyte (LYM), Red Cell Distribution width (RDW). Blood chemistry tests are group of tests that measure many chemical substances in the blood that are released from body tissues or are produced during the breakdown (metabolism) of certain substances Examples are Electrolyte, Urea and Creatinine, kidney function tests etc. At the end of the experiment blood sample was taken from 3 experimental animals in each treatment for blood chemistry in AKTH (Aminu Kano Teaching Hospital) Kano non EDTA sample bottle was used to put the blood used for chemistry analysis. The data generated was subjected to analysis of variance (ANOVA) using SAS and the means (the calculated means of each treatment) were separated using Tukey post hoc test

RESULT AND DISCUSSION

The result of the effect of feeding raw beef and chicken meat on blood electrolytes of Wistar albino rat is shown in Table 1. It was observed that Wistar albino rats fed raw beef and chicken meat at different levels of inclusion had significant ($p<0.05$) effect on potassium (K), urea (UR), and creatinine (CRT). Wistar albino rats fed diet containing 45% beef had significantly ($p<0.05$) higher value of potassium while the control treatment group recorded the lowest value, the level of potassium increase with higher intake of beef and chicken meat. It was observed that wistar albino rats in the control treatment group had significantly ($P<0.05$) higher value of urea while those fed with 30% chicken meat recorded the lowest value. Wistar albino rats fed diet containing 30% beef had significantly ($p<0.05$) higher value of creatinine while rats fed 30% chicken meat recorded the lowest value. It was observed that sodium, chlorine and bicarbonate showed no significant ($p>0.05$) difference between the treatment groups. The effect of feeding raw beef and chicken meat on serum protein content of Wistar albino rat it was observed that the consumption of varying amounts of raw beef and chicken meat did not significantly revealed differences in the level of total protein (TP), albumin (ALB) and globulin (GLB) among the treatments. The control treatment group recorded significantly ($p<0.05$) the lowest value for all the parameters. Wistar albino rats fed diet containing 45% chicken meat had significantly ($p<0.05$) highest value of TP and GLB. It was observed that Wistar albino rats fed diet containing 15% beef had significantly ($p<0.05$) highest value of ALB. The result of the haematological properties of Wistar albino rats fed diet containing varying levels of beef and chicken meat it was observed that white blood cell (WBC), red blood cell (RBC), mean corpuscular volume (MCV), mean corpuscular heamoglobin (MCH) and lymphocyte (LYM) were significantly affected by dietary treatments. Wistar albino rats fed diet containing 30 and 45% chicken meat had significantly ($P< 0.05$) higher value of WBC while those that consumed 45% beef recorded the lowest value. It was observed that rats that consume 30 and 45% chicken meat had significantly ($P<0.05$) lowest levels of RBC while those fed 15% beef recorded significantly ($P<0.05$) highest values. The control experimental animals recorded significantly ($P<0.05$) highest value of MCV and MCH while those fed diets containing 30 and 45% beef of MCV recorded the lowest values also Wistar albino rats fed 45% beef of MCH had the lowest value. It was observed that wistar albino rats fed 30% chicken meat had significantly ($p<0.05$) highest value of LYM while those consume 45% beef had the lowest value. The value of sodium (107.67-132.00 mmol/L) is close to the value of 90-110 mmol/L reported by Rosenthal (2013) as normal sodium range. Shehani *et al*. (2018) reported 21.5-28.1 mmol/L which does not agree with 17.3-20.6 mmol/L in our result, it may be due to high temperature, because this experiment was conducted in march and Wistar albino rats have no gall bladder making them easily responded to heat. potassium (4.57-7.17 mmol/L) value is very close to (4.3-5.8 mmol/L) reported by Rosenthal (2013). The value of protein is in agreement with 60-83 g/L reported by Landry and Baziri (2016).

Red blood cells (RBC) values (2.95-9.29 × 10^6/ µL) are very close to 2.9-6.8 × 10^6/µL reported by Shehani *et al*. (2018). Hemoglobin (HGB) and hematocrit (HCT) (8.70-11.00 g/L and 26.47-34.33 %) are in agreement with 8.6-16.5 g/L and 10-48 % respectively as reported by Shehani *et al*. (2018).

Table 1: Effect of Feeding Raw Beef and Chicken meat (%) on Blood Electrolyte of Wistar Albino Rats

	Meat type/level of inclusion							
	Beef				Chicken meat			
Parameters	0	15	30	45	15	30	45	SEM

Na mmol/L	125.00	116.67	107.67	125.67	123.33	132.00	128.00	2.61
K mmol/L	4.57^{g}	5.17^{f}	6.93^{b}	7.17^{a}	6.27^{e}	6.43^{d}	6.57^{c}	0.21
HCO_3 mmol/L	20.67	18.67	19.00	17.33	21.33	21.00	17.67	0.48
Cl mmol/L	96.00	88.00	88.00	94.33	93.00	97.33	95.33	1.40
Urea mmol/L	2.40^{a}	1.73^{d}	1.90^{c}	1.70^{e}	1.90^{c}	1.60^{f}	2.10^{b}	0.06
Creat µmol/L	43.00^{b}	33.67^{d}	43.67^{a}	33.67^{d}	38.33^{c}	28.33^{f}	28.67^{e}	1.20

P= (P<0.05), SEM= Standard Error of Mean, Creat = Creatinine, HCO_3= Bicarbonate

Table 2: Effect of Consuming Different Amount (%) of Raw Beef and Chicken meat by Wistar Albino (g/dL) Rats on Serum Protein Constituent

Meat type/level of inclusion								
	Beef				Chicken meat			
Parameters	0	15	30	45	15	30	45	SEM
TP	67.67	73.33	79.67	74.33	71.67	74.33	88.66	2.70
ALB	42.00	45.67	44.00	42.67	42.00	41.67	42.33	0.66
GLB	25.67	27.67	35.67	31.67	29.67	32.67	46.33	2.89

TP=Total Protien, ALB=Albumin and GLB=Globulin, P= (P<0.05), SEM= Standard Error of Mean.

Table 3: Effect of Consuming Raw Beef and Chicken meat (%) on Haematological Parameters of Wistar Albino Rats

Meat type/level of inclusion								
	Beef				Chicken meat			
Parameters	0	15	30	45	15	30	45	SEM
WBC 10^3/UL	12.37^{b}	11.50^{c}	11.97^{c}	9.57^{d}	11.87^{c}	14.13^{a}	14.00^{a}	0.35
RBC 10^6/UL	2.95^{g}	9.29^{a}	8.73^{b}	8.27^{d}	8.65^{c}	3.32^{f}	3.97^{e}	0.61
HGB g/dL	9.43	11.00	10.56	9.47	10.43	8.77	8.70	0.25
PCV %	29.53	34.33	32.17	30.13	33.70	26.47	27.23	0.91
MCVfl (um^3)	111.93^{a}	40.07^{d}	40.50^{d}	39.33^{e}	39.43^{e}	99.90^{c}	100.13^{b}	7.17
MCH 10^3/UL	31.97^{a}	11.63^{e}	12.00^{d}	11.23^{e}	11.70^{e}	28.00^{b}	25.80^{c}	10.03
MCHC g/dL	29.00	29.40	26.73	28.17	29.63	27.40	26.40	1.16
LYM 10^3/UL	46.07^{b}	44.33^{d}	41.00^{e}	39.53^{g}	40.00^{f}	47.52^{a}	45.43^{c}	0.80
RDW %	20.47	19.70	19.50	19.10	20.03	20.70	20.33	0.22

WBC=White Blood Cells, RBC=Red Blood Cells, HGB=Haemoglobin, PCV=Packed Cell Volume MCV=Mean Corpuscular Volume, MCH=Mean Corpuscular Haemoglobin, MCHC=Mean Corpuscular Haemoglobin Concentration, LYM= Lymphocyte, RDW=Red Cell Distribution width, P= (P<0.05), SEM= Standard Error of Mean.

CONCLUSION

It can be concluded that both beef and chicken meat did not affect biochemical and haematological parameters in Wistar Albino rats. Based on the result both red and white meat can be consume based on the protein requirement or even more. It is recommended that further research should be conducted by comparing meat with fish.

REFERENCES

Amanda, W. (2009). Introduction, Health consequences of consuming white meat**,** vegetarian and vegan foundation top suit, 8 york court wilder street, Bristol. Pp (6).

Bingham, S. A., Hughes, R., and Cross, A. J. (2002).The effect of white versus red meat on endogenous N-nitrosation in the human colon and further evidence of a dose response. *Journal of Nutrition,* 132 (11), 3522-3525.

Charles, P. D. (2018). Liver Blood Tests (Normal, Low, and High Ranges & Results*). Medicine Net*.
Cross, A. J., Leitzmann, M. F., Gail, M. H., Hollenbeck, A. R., Schatzkin, A., and Sinha, R. (2007). A prospective study of red and processed meat intake in relation to cancer risk. Plos Medicine, 4(12). 149–155
Dean, H.K., and hilditch, T.P. (1933). The body fats of the pig. III. The influence of body temperature on the composition of depot fats. *Journal of Biochemistry* 27:1950-1956.
Huizen, J. (2018). What do abnormal ALP levels mean. Medical News today.
Landry, D.W., Bazari, H. (2016). Approach to the patient with renal disease. *Goldman-Cecil Medicine*. 25th ed. Philadelphia, PA: Elsevier Saunders; chap 114.
Marie, L.A., Giknis, K., Charles, B., and Clifford, M., (2008). *Clinical Laboratory Parameters for Crl:Wl(Han) Rats.*
Rosenthal, K. (2013). Rodents include mice, rats, hamsters, and gerbils. Rodent Reference Ranges.
Shehani L.D., Mangala, G., Vera, B., Melanie, D.S., Manjula, L.B.D., Sijani, S.B., Asanga, H.U., and Prasad, B.W. (2018). Reference values for selected hematological, biochemistry and physiological parameters of Sprague – Dawly rats at the Animal House. *Animal Models and experimental Medicine*. 1(4): 250-254.
William, P.G. (2007). Nutritional composition or red meat. Nutrition & Dietetics. *International Food Research Journal*. 18(1) 113-119.