

Haematological and hormonal implications of feeding varying levels of zinc gluconate to male rabbits

¹Ogbu, O. C. and ²Herbert, U.

¹Dept. of Agricultural Technology, Federal Polytechnic Oke, Anambra State, Nigeria.



² Dept. of Animal Breeding and Physiology,

Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria.

*Corresponding author:ogbuonyineac@gmail.com

Abstract

This paper examines the impact of zinc gluconate fed to male rabbits at different levels on their blood haematology and hormone (interstitial cell stimulating hormone (ICSH) and follicle stimulating hormone (FSH)). Thirty-two (32) male rabbits of about two (2) months old weighing averagely $1.050\text{kg} \pm 0.032$ were assigned to four treatment groups. The results were subjected to analysis of variance while means were separated with Duncan Multiple Range Test. There were significant ($p < 0.05$) difference on the packed cell volume (PCV), haemoglobin level, white blood cell and neutrophils parameters measured. These differences did not take a definite pattern that could be attributed to effect of zinc on the rabbits like tumour or poor physiological status. The level of hormone also differed significantly ($p < 0.05$) in the follicle stimulating hormone (FSH) level. The FSH hormonal level increased as the level of zinc gluconate increase T2 (4.0×10^{-3}) T3 (3.9×10^{-3}) T4 (3.9×10^{-3}). It could be concluded that using zinc as high as 100ppm and 150ppm has no detrimental effect on the blood haematology and general hormonal physiology of male rabbits.

Keywords: Zinc, male, rabbits, hormone and haematology

Introduction

Zinc, as a trace mineral plays an essential role in the body as either activator or inhibitor to some enzymes' activities (Reddy *et al.*, 2007). It is a critical element in animal health that even a small deficiency is characterized by growth retardation, loss of appetite and impaired immune function (Maret and Sandstead, 2006). Zinc gluconate is a nutritional supplement supplied Zinc to the body. Its absorption is usually influenced by the chemical compound found in them. To prevent toxicity and access availability of the Zinc form administered, it becomes imperative to check its effect on blood haematology as well as hormones of male rabbits.

Blood functions basically in carrying nutrients, oxygen and waste excretory products to and from various cells and organs of the body. These blood functions

are made possible by the individual or collective actions of its constituents (Awoniyu *et al.*, 2000). Blood examination is a way of assessing the health status of animals (Mahammad *et al.*, 2000). The haematological constituents of a blood are usually affected by the quality and toxicity of food items taken by the animal (Onukwe, 2000). Beside these haematological roles, the hormones which are chemical messengers are secreted from ductless glands, emptied directly into the circulation and transported by the blood (Reimer 2003). The FSH is a gonadotropin, a glycoprotein polypeptide hormone that regulates the development, growth, pubertal maturation and reproductive processes of the body. The interstitial cell stimulating hormone (ICSH) stimulates the ledig cell production of testosterone. According to Osinowo (2016) these two hormones acts synergistically in the process

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of spermatogenesis, follicular development, ovulation, sexual behaviour, and implantation, maintenance of pregnancies as well as parturition and lactation. In an attempt to improve the productivity of male rabbits using zinc supplements, the implication on blood and two principal reproductive hormones (ICSH and FSH) were examined.

Materials and methods

Experimental site

The experiment was conducted at the livestock unit of the teaching and research form of Michael Okpara University of Agriculture, Umudike Umuahia, Abia State, Nigeria. Umudike is on an attitude of 120m above sea level with a mean annual rainfall of 2404mm and average temperature of 22°C-36°C depending on the season.

Experimental animal

A total of 32 Dutch belted growing male rabbits of an average age of two (2) months and weighing between 0.9kg and 1.2kg, sourced from a reputable form in Umuahia were used for the experiment.

The rabbits were randomly assigned into four (4) treatment groups. Eight (8) rabbits in a group represented one treatment with two (2) male rabbits per replicate and four replicates per treatment. The rabbits were housed in individual cages measuring 60x60x45cm. The experiment lasted eighty four (84) days. The rabbits were fed four experimental diets and water *ad libitum*. Treatment 2 (T₂) had no Zinc and served as control. Treatment 2 (T₂) had 50ppm of Zinc per kg of feed, while treatment 3 (T₃) had 100ppm of Zinc per kg of feed. Treatment 4 (T₄) comprised of 150ppm of Zinc kg of feed. Zinc (Mason Vitamin Inc., Miami Lakes USA) was bought in a pharmaceutical store in Umuahia town served as dietary supplement.

Data collection

Blood samples were drawn through the ears of four male rabbits from each treatment to determine the haematological, interstitial cell stimulating hormone (ICSH) and follicle stimulating hormone. This was done with syringe and needle collection was done between 0200 and 0800 local time. The samples for hormonal assay were analysed using TECO (2006) diagnostic commercial test kits. The haematological samples in anticoagulant bottles were analysed using Trall and Weiser (2000) for haemoglobin and white blood cell count was determined by Schalm *et al.* (1975) method.

Statistical analysis

The collected data was subjected to analysis of variance (ANOVA) Steel and Torrie (1980). The means were separated using Duncan's New Multiple Range Test (Duncan, 1995).

Results and discussion

The mean haematological values of male rabbits fed control and experimental diets containing Zinc Gluconate at various levels were shown in Table 1. There were significant differences (P<0.05) in the packed cell volume (PCV), with Zinc supplemented diets (T 3, T 2, T 4) having values (22.2, 14.5, 16.5) higher than T1 (4.4) in the non-supplemented group (T1). The haemoglobin level was highest in T 3 and other Zinc supplemented diets (T 2 and T 4) than T1. Consequently, the level of white blood cell and its component neutrophils was significantly (P<0.05) higher in T2, T4, and T3 when compared to T1. The PCV is used as an index for the body's physiological status (Esonu *et al.*, 2001) and was observed to be significantly (P<0.05) higher in the Zinc supplemented diets. The white blood cell level for zinc supplemented diets corroborated the findings of Rosenthal (2003) and Ozkan *et*

al. (2012) 4 -10 x 10³/μl and 5.90 - 18.30x10⁹/l respectively for rabbits. This implies that the male rabbits on zinc gluconate are less likely to be affected by infectious disease because of their high immunity level when compared with T1.

The levels of haemoglobin were affected by Zinc in take which is an indication of sufficiency of oxygen to the body tissue resulting in an enhanced metabolism which may have increased the overall physiology of the rabbits.

Table 1: Mean haematological parameters of male rabbit fed different levels of Zinc gluconate supplemented diets

Parameters	T ₁ (0ppm)	T ₂ (50ppm)	T ₃ (100ppm)	T ₄ (150ppm)	SEM
Packed cell volume (%)	4.4b	14.5 ^a	22.2 ^a	16.5 ^a	4.0
Haemoglobin (g)	1.5 ^b	4.8 ^a	7.4 ^a	5.5 ^a	1.2
White blood cell (x10 ³)	3.6 ^b	7.8 ^a	4.3 ^{ab}	7.5 ^a	1.2
Lymphocytes (%)	27.5	38.2	32.4	37.1	6.0
Neutrophils (%)	13.5 ^b	30.0 ^a	25.0 ^a	27.4 ^a	3.06

^{abc} means with different superscripts on the same row are significantly (P<0.05) different.

The mean values of hormonal profile measured in the male rabbits fed different levels of Zinc Gluconate supplemented diets are shown in table 2. It was evident that the FSH level of the Zinc fed male rabbits increased significantly (P<0.05) and was the highest in T₄ (3.9x10⁻³) and T₃ (3.9x10⁻³ as against T₂ (4.0x10⁻³) and T₁ (4.3x10⁻³). However, there were no significant (P<0.05) increase in the level of ICSH measured in the study. Zinc plays

important role in enzyme and hormone synthesis which is noticed in Zinc supplemented diet in the study. Since FSH improves the secretion of testosterone level in the blood which is the primary male reproductive hormone FSH and ICSH works in synergism to improve reproductive potential of male rabbits. This study therefore confirms the earlier report of EL-Sisy *et al.* (2008) that Zinc deficiency caused reduction in testosterone secretion in male goats.

Table 2: Mean value of hormonal profile measured in the male rabbits fed different levels of Zinc gluconate as diet supplement

Parameters	T ₁ (0ppm)	T ₂ (50ppm)	T ₃ (100ppm)	T ₄ (150ppm)	SEM
FSH(iu/ml)	4.3x10 ^{-3b}	4.0x10 ^{-3b}	3.9x10 ^{-3a}	3.9x10 ^{-3a}	0.05
ICSH(iu/ml)	0.69x10 ³	0.65x10 ⁻³	0.6x10 ⁻³	0.6x10 ⁻³	0.02

^{abc} means with different superscript are significantly (P<0.05) different

Conclusion

Using Zinc as high as 100and 150ppm will definitely increase the secretion of the principal sex hormone FSH and ICSH in male rabbits. Consequently improve reproduction among male rabbits, without any harm on the body as was evident in the haematological assessment.

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