

Serum malondialdehyde concentration of weaned rabbits raised in two different management systems

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Abstract

Management system in rabbit production has been reported to affect their welfare and performance. In view of this, a study was conducted to evaluate the effects of two different management systems (cage-housed and pen-housed) on serum malondialdehyde (MDA) concentration of weaned rabbits in Northern Guinea Savannah zone of Nigeria. Twenty four healthy weaned crossbred rabbits in equal sexes, aged between 5-6 weeks with live weight of 612 ± 14.72 g (mean \pm SD) were used for the study. The rabbits were randomly divided into two groups (cage-housed and pen-housed) consisting of 12 rabbits per group. They were fed commercial diet (concentrate) supplemented with Tridax procumbens and given access to clean fresh water ad libitum. The experiment lasted for eight weeks. Results from the study showed a significant ($P < 0.05$) difference in the serum MDA concentration between the two groups. Pen-housed rabbits had lower MDA concentration (1.83 mmol/L) as against 2.78 mmol/L for the cage-housed rabbits. The higher MDA concentration levels for the caged-house rabbits indicate that they had greater free radicals-mediated cell damage and oxidative stress, which imply that they had the worst welfare conditions.

Keywords: Serum Malondialdehyde, Management systems, Rabbits

Introduction

Rabbit production has been on the increase in Nigeria in recent years, and represents a high potential for improving animal protein intake in the developing countries (Shehu and Mahmoud, 2013). Rabbits are mostly raised in cages for the purpose of stress-free feeding and other management practices. According to Van Der Horst *et al.* (1999) and Maertens and Van Oeckel (2001) housing systems affects body weight, some carcass parameters and sometimes the meat quality. Changes in the constituent compound of blood when compared to normal values could be used to interpret the metabolic stage of an animal as well as quality of feed (Babatunde *et al.*, 1992, Akinmutimi, 2004). Del Rio *et al.* (2005) described Malondialdehyde (MDA), a product of lipid peroxidation, as a good marker of free radicals-mediated damage

and oxidative stress. Lipid peroxidation yields a group of aldehyde products that are stable and can be measured in the blood (Kwiatkowska *et al.*, 1999). Shehu and Mahmoud (2013) in their study comparing the growth performance indices of caged-house and pen-housed rabbits, reported superior performance indices for the caged-house rabbits but recommended a follow-up study to compare the welfare conditions of rabbits in the two management systems. Therefore, the present study was undertaken to evaluate serum MDA concentrations in cage-housed and pen-housed rabbits.

Materials and methods

The experiment was conducted at the rabbitry unit of the Skills Acquisition and Development Centre of the National Agricultural Extension and Research

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Liaison Services (NAERLS), Ahmadu Bello University, Zaria (11° 12' N, 07° 33' E), located in the Northern Guinea Savannah zone of Nigeria. Twenty four weaned rabbits of heterogeneous breeds in equal sexes, aged between 5-6 weeks, with live weight of 612±14.72 g (mean ± SD) were procured from local rabbit producers in Zaria. The rabbits were randomly divided into two groups (cage-housed and pen-housed) consisting of 12 rabbits each. The cage-housed were kept housed in a well-ventilated rabbitry in three tier-wire cages. Each cage, measured 70 x 60 x 50 cm in length, width and height, respectively. The wire cages were fitted with earthen

drinkers and feeders, and aluminium tray for collection of faeces and urine. The second group was housed in pen according to housing standards for rabbits (0.4 sq meter/rabbits (Hoy, 2005). Wood shaving was used as the litter material and the depth of the litter was about 3 inch. The rabbits were pre-conditioned for two weeks, during which they were treated twice against parasitic infestation with Ivermectin (Laboratorios Calier, Barcelona, Spain) at the dose rate of 0.1mL per rabbit subcutaneously. Rabbits were fed commercial diet (Table 1) supplemented with *Tridax procumbens* and given access to clean fresh water *ad libitum*.

Table 1: Composition of commercial diet fed to rabbits

Ingredients	%
Maize	25
Soybean meal	5
Maize offal	15
Brewer's dried grain	25
Blood meal	2
Groundnut cake	12
Rice offal	12
Bone meal	3
Salt	0.25
Premix ^a	0.25
Lysine	0.25
Methionine	0.25
Total	100

^aProvided per kilogram of diet: vitamin A; 10 000 IU (retinyl acetate); cholecalciferol, 3000 IU; vitamin E, 8.0 IU (DL -α-tocopheryl acetate); K, 2.0 mg; thiamine, 2.0 mg; pyridoxine, 1.2 mg; cyanocobalamin, 0.12 mg; niacin, 1.0 mg; pantothenic acid, 7.0 mg; folic acid, 0.6 mg; choline chloride, 500 mg; Fe, 60 mg; Mn, 100 mg; Cu, 8.0 mg; Zn, 50 mg; Co, 0.45 mg; I, 2.0 mg; Se, 0.1 mg.

At the end of the feeding period, six rabbits from each treatment (two from each replicate) were starved overnight of feed for 12 h before blood samples were collected. Blood sample (3 mL) was collected aseptically from each rabbit from the marginal vein of the ear using a sterilised disposable syringe and needle between 06:30 and 07:30 a.m. The blood sample was transferred into a centrifuge tube, allowed to clot and then incubated for 30 min,

thereafter centrifuged at 2000 g for 10 min in a microcentrifuge to obtain serum. The serum samples obtained were used to determine MDA concentration. Serum MDA concentration was determined by the thiobarbituric acid (TBA) assay: Briefly, a sample of 0.50 mL of serum was added to 3 mL of 1% phosphoric acid, 1 mL of 0.060% TBA, and 0.15 mL of 0.20% butylated hydroxytoluene in 95% methanol. The samples were heated in a boiling water bath

for 45 min, cooled and 4 mL of 1-butanol was added. The butanol phase was separated by centrifugation at 3000 g for 10 min and the absorbance measured using a UV spectrophotometer (Jenway, 6405 model, Japan) at 535 nm. The concentration of MDA was calculated and expressed as mmol/L according to the procedure of Dandekar *et al.* (2002).

Statistical analysis

The data obtained were subjected to t-test in a completely randomized design using SAS 9.1 software package (SAS Institute, 2002), with the type of management system as the main source of variation. The means were compared using Duncan's New Multiple Range Test (Duncan, 1955). Values of $P < 0.05$ were considered significant.

Results and discussion

The MDA concentrations of the rabbits

raised under the two management systems are presented in Figure 1. Results from the study showed a significant ($P < 0.05$) difference in the serum MDA concentration between the two groups. Pen-housed rabbits had lower MDA concentration (1.83 mmol/L) as against 2.78 mmol/L for the cage-housed rabbits. MDA is one of the most common lipid peroxidation products that are combined predictive of oxidative stress (Griffiths *et al.*, 2002). Therefore, the higher MDA concentration values recorded for the cage-housed rabbits indicate that they had greater free radicals-mediated cell damage and oxidative stress than the pen-housed rabbits. The significantly higher MDA concentration in the cage-housed rabbits could be attributed to the psycho-emotional stress induced by the immobilization in cages.

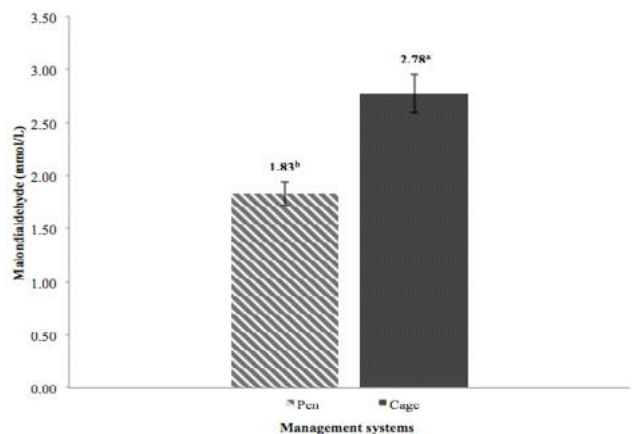


Figure 1: Malondialdehyde concentration of rabbits raised under different management system. Means with error bars having different superscripts letters are significantly different ($P < 0.05$)

Conclusion

The caged-house rabbits had greater free radicals-mediated cell damage and oxidative stress, which imply that they had the worst welfare conditions. Rabbits raised in cages could be administered antioxidants feed additives to help ameliorate the adverse oxidative stress associated with

psycho-emotional stress induced by immobilization in cages.

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