ASSESSMENT OF CHANGES IN PHYSIOLOGICAL PARAMETERS AND IMMUNE MARKER LEVELS IN ANIMALS PRESENTED FOR SLAUGHTER AT IKPA NSUKKA SLAUGHTER ABATTOIR

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ABSTRACT

The objectives of the study were to determine the changes in physiological parameters such as heart rate, pulse rate, respiratory rate and rectal temperature) and to assess the changes in immune marker levels like total leucocyte count, differential leucocyte count and neutrophil/lymphocyte ratio) of animals presented for slaughter at Ikpa slaughter slab. Physiological parameters of the cattle were determined using conventional methods. Blood was collected from 40 cattle at two stages: 1) pre-slaughter and 2) during slaughter. A significant increase in the physiological parameters at slaughter compared to the pre-slaughter in the both sex groups of the bovine species was noted. A slight increase in the neutrophil/lymphocyte ratio in the different sex groups at pre-slaughter and slaughter were observed. However, the increase was not statistically significant. It can be concluded from this study that changes in vital parameters (heart rate, pulse rate and respiratory rate) are more indicative of acute stress which is associated with slaughter processes in Ikpa abattoir

Keywords: stress, haematology, cattle, slaughter, physiological parameters.

INTRODUCTION

Stress is defined as the biological response elicited when an animal perceives a threat to its homeostasis (Moberg, 2000). Stress can also be defined as adverse effect in the environment or management system which forces changes in the animal's physiology or behavior to avoid physiological malfunctioning and assist the animal in coping with its environment (Ferguson and Warner, 2008). Stress leads to fight or flight response, so an animal can experience faster pumping lungs, increase heart rate, higher blood pressures and endorphins flooding the body. Also appetite, libido and immune system is shut down in order that energy is diverted to muscle to prepare for flight (Ranabir and Reetu, 2011). Animals can be stressed by either psychological factors (hunger, thirst, separation from group, mixing with unfamiliar group or novelty), physical factors (such as restraint, handling, fatigue or injury) and environmental factors (temperature and noise) (Etim and William, 2013). The main stressors in an animal's life are danger, illness, pain, accident, synthetic chemicals, inappropriate diet, weaning, confinement, isolation, overcrowding, change in routine, change in environment and over-stimulation (Etim and William, 2013).

Biological response to a stressor is used as an indicator of stress (Kumar *et al.*, 2012). Vocalisation, restlessness, fight, pain, refusal to move, increase in heart, blood pressure variability and increase in respiratory rate as behavioural indicator for stress (Broom, 2003). Endocrine Indicators used in determining acute stress level include corticotrophin-releasing hormone, catecholamine (epinephrine and norepinephrine), cortisol, adrenocorticotropic hormone, oxytocin, vasopressin, prolactin, glucagon, serotonin, opiates and gonadotrophins (Sapolsky, 2000).

Immune indicators that can be used in determining stress include increase in neutrophil/lymphocyte ratio and blood monocyte count (Sapolsky, 2000). Biochemical markers used in determining the level of acute stress in animals include urea level, glucose level, packed cell volume (PCV), total protein albumin,

creatinine kinase level (CK), aspartate transaminase (AST), lactate level, alkaline phosphatase (ALP) and blood potassium level (Calamari *et al*., 2003; Lay and Wilson, 2004; Abeni *et al*., 2007).

The objectives of the study were to evaluate the changes in physiological parameters (heart rate, pulse rate, respiratory rate and rectal temperature) and to assess the changes in immune marker levels (total leucocyte count, differential leucocyte count and neutrophil/lymphocyte ratio) of animals presented for slaughter at Ikpa slaughter slab.

MATERIALS AND METHODS

The rectal temperature was measured using a clinical thermometer (Naylor *et al*., 2010).

The heart rate was measured using a stethoscope (David and Dumitrascu, 2017).

The pulse rate of the animals was determined by placing the thumb on superficial arteries and the pulsating effect of the vessel was counted as beat in a minute (Tibballs and Russell, 2009). The respiratory rate of each animal was determined by calculating the number of movements of the flank in a minute (Legates *et al*., 1991).

Blood sample was collected from the jugular vein using sample bottle containing ethylene diamine tetraacetic acid (EDTA) from the animals 48 hrs before slaughter and during slaughter at the abattoir. Total white blood cell count was obtained using the haemocytometer counting method and while thin blood smear made on clean grease-free glass slides for differential leukocyte count were stained following the Leishman technique and enumerated by the meander counting method (Thrall and Weiser, 2002).

RESULTS

Changes in values of heart rate, pulse rate, respiratory rate and rectal temperature at pre-slaughter and at slaughter in the different sex groups of Bovine were reported in the table 1.

Table 1: Mean table 1: Changes in Bovine vital parameters (pre and at slaughter).

PARAMETER	Group	48 hr pre-slaughter	Slaughter
Heart rate (bpm)	**Male**	80.00±7.48[a]	**112.50±2.87[b]**
	Female	51.33±1.76[a]	**64.00±2.31[a]**
Pulse rate (bpm)	**Male**	79.00±6.61[a]	**113.50±9.00[b]**
	Female	49.33±2.67[a]	**74.67±7.42[b]**
Respiratory rate (cpm)	**Male**	33.00±2.52[a]	**47.00±1.00[b]**
	Female	30.67±1.33[a]	**41.33±3.53[b]**
Rectal temp (°C)	**Male**	37.55±0.09[a]	**38.48±0.13[b]**
	Female	38.63±0.18[a]	**38.60±0.06[a]**

Different superscript [a, and b] in rows indicate a significant difference at $p<0.05$.

Changes in value of total leucocytes, neutrophils, lymphocytes, monocytes, eosinophils and neutrophil/lymphocyte ratio in the male and female groups of Bovine at 48 hr pre-slaughter and at slaughter were shown in the table 2.

Table 2: Mean changes in Total and Differential WBC at pre-slaughter and at slaughter (Bovine).

PARAMETER	Group	48 hr pre-slaughter	Slaughter
Total leucocyte (*10^3/µl)	**Male**	8.10±0.85[a]	**8.24±0.47[a]**
	Female	6.93±0.75[a]	**8.63±0.85[a]**
Neutrophils (*10^3/µl)	**Male**	3.67±0.56[a]	**4.05±0.31[a]**
	Female	3.24±0.30[a]	**4.16±0.35[a]**
Lymphocytes (*10^3/µl)	**Male**	3.73±0.20[a]	**3.80±0.11[a]**
	Female	3.51±0.63[a]	**4.14±0.59[a]**
Monocytes (*10^3/µl)	**Male**	0.55±0.11[a]	**0.33±0.13[a]**
	Female	0.18±0.10[a]	**0.28±0.05[a]**
Eosinophils (*10^3/µl)	**Male**	0.17±0.07[a]	**0.07±0.04[a]**
	Female	0.00±0.00[a]	**0.05±0.05[a]**
Neutrophil / Lymphocyte ratio	**Male**	0.97±0.10[a]	**1.07±0.08[a]**
	Female	0.97±0.16[a]	**1.02±1.31[a]**

Different superscript [a, and b] in rows indicate a significant difference at $p<0.05$.

DISCUSSION

The significant increase in the physiological parameters (heart rate, pulse rate, respiratory rate and rectal temperature) in the both sex groups of the bovine species at pre-slaughter and slaughter could be as a result of fear perceived by the animals during handling and restraint at slaughter. These changes also were observed by Apple *et al*. (2005) in a work done on the effect of handling and restraint on cattle. Catecholamine and cortisol are released during stressful conditions and they will lead to an increase in levels of vital parameters in other to maintain homeostasis (Sontag *et al*., 2010). The significant variation in the heart and pulse rates and rectal temperature between the male and female groups of the bovine specie could be as a result of sex differences in stress response. Bale and Epperson (2015) reported that sex differences in stress response can be found at all stages of life and these differences is related to the organizational and activational effects of gonadal hormones (testosterone and estrogen) and also to the various genes found on the sex chromosomes. In this study, the male group responded more to stressors associated with slaughter than the female group. This was also observed in the work done on pigs by Morta-Rojas *et al*. (2006) who showed that male animals are more susceptible to changes in vital signs associated with stress than the female because the male animals are more excited and aggressive.

The increase in neutrophil/lymphocyte ratio in the different sex groups at pre-slaughter and slaughter in this study could be as a result of increase in level of neutrophil and decrease in level of lymphocyte. Elevated levels of glucocorticoids have been reported to lead to an increase in the level of neutrophils and a decrease in level of lymphocytes resulting in variations in total leukocyte level (Davis *et al*., 2008).

CONCLUSION

It can be concluded from this study that changes in vital parameters (heart rate, pulse rate and respiratory rate) are more indicative of acute stress which is associated with slaughter processes in Ikpa abattoir. From this study there was no significant changes in total and differential leukocyte counts.

RECOMMENDATION

Animals should be given enough rest while they are kept in lairage before slaughter to avoid stress in these animals. Also proper handling of animals should be adopted by Butchers during slaughter to avoid stressing them which could affect the quality of meat.

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