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Physiological Responses of Nigerian Indigenous Mother Hens to Visual Separation from Chicks

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Abstract

Two sets of birds were used to investigate the physiological responses of Nigerian indigenous mother hens before and after separation from her chicks. From a flock of indigenous birds reared on the farm, broody hens were identified and separated into a brooding pen where they remained until the chicks were hatched. For the first set of birds, mother hens were subjected to visual (day 12 post-hatch) separation from their chicks for 10 minutes. For the second set, mother hens were subjected to visual separation for 20 minutes. Before and after each separation, the heart rate and blood glucose level of the hens were measured. Data collected were analyzed using paired sample T-test of SPSS statistical package. Separation of a mother hen for 10 minutes did not cause any significant changes heart rate and blood glucose level. However, visual separation of mother hens for 20 minutes resulted in 18% increase in the heart rate though this increase was not accompanied with a significant increase in blood glucose. Mother hens experience more stress after 20 minutes of visual separation from chicks.

Keywords: Motherhens, physiology, separation, stress, visual

Introduction

The low productivity of indigenous hens has been associated with the large percentage of time spent incubating eggs and post-hatch care for the chicks (Huque *et al.*, 1990). Although maternal care is not mandatory for the survival of precocial birds, however, several studies have established that the presence of the mother hen during rearing has a positive influence on the chicks (Shimmura *et al.*, 2010), such that chicks and pullets naturally brooded by the mother hen were less fearful than non-brooded counterparts (Rodenburg *et al.*, 2009; Shimmura *et al.*, 2010).

Separation of chicks from hens at 5 or 10 days old influenced the productivity of indigenous hens in terms of the shortened interval between the end of incubation and first lay, increased number of eggs laid per clutch and increased chick mortality (Amin *et al.*, 2009). Chicks separated from hens at 21 and 7 days were heavier than those left with their hens but those separated at 7 days had more mortality than those separated at 21 days or not separated at all (Huque *et al.* (1990). According to Edgar *et al.* (2011) using the 'mother hen-chick model' reported that mother hens previously subjected to distress condition (air puff) exhibited both physiological and behavioural changes when witnessing their chicks subjected to a similar condition.

Whilst separation of chicks has previously been reported to increased productivity of the hens, information is lacking on the physiological effect separation has on the hen.

Materials and Methods

The research was conducted at a Poultry unit at Camp, Abeokuta, Ogun State, Nigeria. The experimental site lies at latitude 7°25'N and longitude 3°25'E. The area is characterized by an annual rainfall of about 1037mm. The average temperature and relative humidity are 34°C and 82%, respectively.

From an established flock of indigenous chickens on the farm, broody hens were identified when they begin to sit on the eggs for a longer period (Romanov *et al.*, 2002), and transferred with their eggs to a brooding pen (wire mesh cage with wooden frame having 100cm×100cm dimension) and provided with feed and water *ad libitum*. After hatching, brooding pen was cleaned and the mother hen and her chicks were provided with water from standard bell drinkers and chick starter feed in tray feeders *ad libitum*. The mother hen and her chicks were left undisturbed for 7 days. Then, on day 12 post hatch, hens were subjected to 10 minutes visual separation from chicks in a test arena (100cm × 100cm) made of wire mesh with wooden frames. The test arena was divided into two equal sections, one for the mother hen and the other for her chicks with a solid wood partition inserted between the two sections allowing auditory and olfactory but no visual contact between the mother hen and her chicks. Before and after the separation, the heart rate (measured with a stethoscope) and blood glucose (ACCU-CHEK active glucose meter) of the mother hens were recorded. Another set of 12 hens,

which displayed broodiness were separated and monitored until hatching. The hens were subjected to the same protocol mentioned above but for a period of 20 minutes.

Data collected on the physiological parameters of the mother hen before and after each separation trial were subjected to paired sample T-test of SPSS statistical package.

Results and Discussion

There were no significant differences in the heart rate and blood glucose levels of the hens before and after a 10 minutes visual separation from chicks. However, the heart rate of mother hen increased after 20 minutes of visual separation from chicks but the blood glucose level remained stable (Table 1)

Table 1: Heart rate and blood glucose levels of mother hens before and after subjection to the two separation methods for 10 minutes

Duration of separation	Heart rate (beats/minute)	Blood glucose (g/dL)
10 minutes (n=8)		
Before	176.29±6.13	182.57±10.83
After	185.43±4.74	179.14±7.13
20 minutes (n=12)		
Before	177.94±4.69 ^b	228.00±9.82
After	209.13±10.47 ^a	229.92±9.77

^{ab} Means with different superscript along the column for each duration of separation differ significantly at $p < 0.05$. Values are Means $\pm$ SEM

Mother hens found the visual separation for 20 minutes more stressful than those separated for 10 minutes. Visual separation of a mother hen for 20 minutes caused an 18% rise in the heart rate of the hens although this was not associated with a significant increase in blood glucose level. Heart rate measurement has been proven to be a useful measure of stress because it is one of the sympathetic nervous system responses to stress (von Walter, 2010). Mother hens witnessing her chicks undergo distress for 10 minutes showed physiological responses such as an increase in heart rate and a decline in eye temperature (Edgar *et al.*, 2011).

There are inconsistencies in the literature regarding stress and increase in glucose level in chickens. Broiler chickens whose corticosterone levels were manipulated (to simulate chronic stress) by feeding mealworms injected with corticosterone had similar glucose level with the control birds (Iyasere *et al.*, 2017). Exposure of Red jungle fowl and broiler chickens to 6h heat stress (36°C) didn't elevate the blood glucose level (Zulkifli *et al.*, 1999). Other studies, however, have reported significant changes in blood glucose arising from stress.

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