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## Quality Assessment of Layer Day-Old Chicks Supplied to Maiduguri, North-Eastern Nigeria

Y.A. Geidam, H.A. Kumshe, M.Y. Bukar-Kolo, I.A. Gulani and Z.N. Margimari  
Department of Veterinary Medicine, University of Maiduguri,  
P.M.B. 1069, Maiduguri, Nigeria

**Abstract:** Chick quality assessment was carried out on layer day-old chicks supplied to Maiduguri. A total of 30 layer day-old chicks, comprising of 10 chicks each from three major suppliers were used for this study. Physical, microbiological and serological qualities were assessed. Although the chicks from source C had a higher mean body weight ( $33.1 \pm 0.4$  g), there was no significant difference ( $p > 0.05$ ) in the mean body weight among chicks from all sources. Similarly, no significant difference ( $p > 0.05$ ) was found in the agility between the three sources. However, chicks from source C showed significantly ( $p < 0.05$ ) higher mean chick length ( $18.2 \pm 0.21$  cm) than chicks from other sources. Ten percent mortality was recorded in chicks from source A, while no mortality was recorded in chicks from sources B and C. Hundred percent of the chicks from sources A and C had their navel completely closed while 90% navel closure was observed from source B. None of the three sources had chicks with any form of physical deformity. Seven different bacterial organisms were isolated from the cloacal and navel swabs of chicks from the different sources with *Escherichia coli* being the most prevalent bacteria isolated from all sources. Serological quality showed better protection against Newcastle disease than against IBD among chicks from all sources. The study revealed mixed qualities among chicks from the different sources. Minimum standards are suggested to be set for physical, microbiological and serological qualities and a regulatory body should also be established to ensure strict adherence to the minimum standards of chicks supplied to farmers in Nigeria.

**Key words:** Quality assessment, layer, day-old chicks, Maiduguri, Nigeria

### INTRODUCTION

The quality of day-old chick has a big effect on the starting of growing period and consequently on the final performance. It has become necessary that day-old chicks should be given proper assessment to determine chick vitality and help reduce financial losses faced by poultry farmers due to purchase of poor quality day-old chicks. Most poultry farmers can identify good quality chicks, but when people are asked to define chick quality, different descriptions would be received (Fairchild, 2005). Currently, determination of chick quality is mainly based on observations such as whether the navel is completely sealed and presence or absence of deformities. While these are good start, there are chicks that can be dry, have completely sealed navels, with no deformities but will still perform poorly (Fairchild, 2005). Until recently, day-old chicks quality had received little attention, as there has been no universally established method for its measurement (Tona *et al.*, 2005). Day-old chicks are the end product of the hatchery industry but they form important starting material for the poultry farmers because they need chicks with good feed conversion efficiency and low mortality. For economic reason, the major objective of a hatchery is to obtain a high hatchability (large numbers of marketable chicks) while the farmers need chicks of high growth performance (Tona *et al.*, 2005).

**Corresponding Author:** Dr. Y.A. Geidam, Department of Veterinary Medicine, University of Maiduguri, P.M.B. 1069, Maiduguri, Nigeria Tel: +234 8023 550 333

Parameters that can now be used in assessing the performance potentials of chicks using quantitative and qualitative measurements have been reviewed (Tona *et al.*, 2005; Geidam *et al.*, 2006). A one-day-old chick of good quality must be clean, dry and free from dirt and contamination, with clear and bright eyes, free from deformities, with a completely sealed and clean navel. No yolk sac or dried membrane should protrude from navel area. The body should be firm to the touch and there should be no sign of respiratory distress. The chick should be alert and interested in its environment, responding to sounds. The legs should have the normal conformation, with no swelling and no hock or skin lesions; the beak should be formed and the toes firm and straight (Funk and Irwin, 1955; Raghavan, 1999). However, Cervantes (1993) proposed a numerical standard for chick quality where he defined chick quality on the basis of three specifications viz., physical, microbiological and serological specifications to derive a numerical score for chick quality grading. Though this system was proposed only for broiler chicks, it has been applied very well for both pullet and broiler chicks (Koteeswaran *et al.*, 2004; Geidam *et al.*, 2007).

This study examined the quality of layer day-old chicks supplied to Maiduguri, North eastern Nigeria.

## MATERIALS AND METHODS

### Study Area

Maiduguri is the capital and the largest urban center of Borno State. The State lies between latitude 11°32' north and 11°40' north and latitude 13°20' East and 13°25' East and located between the Sudan savannah and sahel savannah vegetation zones, characterized by short rainy season of 3-4 months (June-September) followed by a prolonged dry season of more than 8 months duration (Ibrahim *et al.*, 2006).

### Experimental Birds and Procedure

The study involved 30 layer day-old chicks, 10 chicks each from the three main suppliers of day-old chicks in Maiduguri (Tanya Agrovets Services, El-Ibrahim Enterprises and Vetagric Ltd.), all of whom are accredited agents to identified different major hatcheries in Nigeria. Random sampling was used in selecting 10 boxes and selecting a chick from each box of a batch supplied. The chicks collected from the different agents were separately grouped and randomly designated as source A, B and C.

The quality of the day-old chicks from the sources A, B and C were assessed using 3 different quantitative and qualitative parameters; physical assessment, microbiological and serological qualities. These procedures were performed as described by Tona *et al.* (2005) and Geidam *et al.* (2006).

### Physical Quality

The chicks were assessed for physical qualities based on the following parameters; chick weight, chick length, 7 day mortality, navel closure, physical deformity and time taken for chick to stand on its feet when placed on its back (agility). The body weight of the chicks in grams (g) was measured on day one using a sensitive beam balance (Mettler®, CH-8606). Chick length was taken by measuring the length of stretched chick from the tip of the beak to the middle toe using a measuring tape and recorded in centimeters (cm). Physical deformities like deformed legs, under developed feathers, weak legs, soundness of eyes and overall appearance was examined for all the chicks and recorded for all the sources. The navel of each chick from all sources was examined for closure. Time taken for chick to stand on its feet when placed on its back as a measure for agility or vitality was recorded in seconds for each chick from all sources. On the seventh day the number of chicks that died (7th day mortality profile) from each source was recorded.

### Microbiological Assessment

Microbiological assessment was done by the examination of cloacal and navel swabs for presence of pathogenic bacteria. On day 3, samples of cloaca and navel swabs were collected from each chick for bacteria isolation on selective differential media. MacConkey agar was used to check for presence coli form bacteria and blood agar for enteric bacteria. Gram staining was done to identify the Gram positive and Gram negative bacteria from the bacteria isolated on different culture media. The slides were viewed under Microscope using x 100 magnification or oil immersion. The organisms were sub-cultured using different media for confirmation of the organisms earlier identified. All media used were prepared according to manufacturers instructions.

### Serological Quality

Presence of antibodies against Newcastle disease and infectious bursal disease, the two most important endemic viral diseases in Nigeria, was used in the assessment of serological quality. On day 7, blood samples were collected from each chick through the wing vein using tuberculin syringe and needle into sterile containers and allowed to clot at room temperature. Sera were then harvested by centrifuging the tubes at 1,500 rpm for 10 min. The samples were stored in sterile bottles at 20°C until tested. Haemagglutination test and haemagglutination inhibition test were used to detect for antibodies against Newcastle disease virus as described by Allan and Gough (1974). While agar gel precipitation test was used to identify the presence of antibodies against infectious bursal disease virus following standard procedure as described by Cullen and Wyeth (1975).

### Statistical Analysis

The data obtained were analyzed using t-test (Anonymous, 1998).

## RESULTS

Although the chicks from source C had a higher mean body weight followed by source A then B, the mean body weight of the chicks from all sources did not differ significantly ( $p>0.05$ ). However, chicks from source C showed significantly ( $p<0.05$ ) higher mean chick length than chicks from sources A and B (Table 1). While no significant difference ( $p>0.05$ ) was found in the measurement of time taken for chicks to stand on their feet when placed on their backs (agility) between the three sources. Ten percent mortality was recorded in chicks from source A in the first seven days while no mortality was recorded in chicks from sources B and C. Hundred percent of the chicks from sources A and C had their navel completely closed while 90% navel closure was observed from source B. None of the three sources had chicks with any form of physical deformity.

In the microbiological assessment a total of seven different bacterial organisms (*Escherichia coli*, *Staphylococci* sp., *Streptococci* sp., *Diplococci* sp., *Corynebacterium* sp., *Proteus* sp. and

Table 1: Physical quality of layer day-old chicks supplied to Maiduguri, Northeastern Nigeria

Parameters	Sources		
	A	B	C
Chick body weight (g)	29.00±1.20	25.90±0.80	33.10±0.40
Chick length (cm)	17.07±0.17	16.70±0.16	18.20±0.21
Chick vitality (sec)	0.61±0.06	0.73±0.04	0.71±0.08
Seven days mortality profile (%)	10	0	0
Physical deformity (%)	0	0	0
Navel closure (%)	100	90	100

Table 2: Bacteriological quality of layer day-old chicks supplied to Maiduguri, Northeastern Nigeria

Bacterial isolates	Sources					
	A		B		C	
	Cloaca	Navel	Cloaca	Navel	Cloaca	Navel
<i>Escherichia coli</i>	+	+	+	+	+	+
<i>Staphylococci</i> sp.	-	+	-	+	-	+
<i>Streptococci</i> sp.	-	-	+	-	+	+
<i>Diplococci</i> sp.	-	+	-	-	-	-
<i>Corynebacterium</i> sp.	-	-	+	+	-	-
<i>Proteus</i> sp.	-	-	+	-	+	-
<i>Klebseilla</i> sp.	-	-	-	+	-	-

+: Indicates presence; -: Indicates absence

Table 3: Serological quality of layer day-old chicks supplied to Maiduguri, Northeastern Nigeria

Disease	Chicks positive for antibodies (%)		
	Sources		
	A	B	C
Infectious bursal disease	0	40	20
Newcastle disease	66.6	90	80

*Klebseilla* sp.) were isolated from the cloacal and navel swabs of chicks from the different sources. *E. coli* was the most common bacteria encountered from both navel and cloaca of all the chicks from all sources (Table 2).

Highest number of chicks (90%) tested positive for antibodies against Newcastle disease virus from source B, while 80% of the chicks from source C and 66.6% of chicks from source A. Similarly, highest percentage of chicks (40%) tested positive for antibodies against IBD virus from source B and 20% from source C, while none of the chicks tested positive from source A (Table 3).

## DISCUSSION

This study on layer day-old chick quality assessment carried out in Maiduguri, was done using both quantitative and qualitative chick quality assessment parameters. Tona *et al.* (2005) suggested that though there are still some unknown factors that can be involved in chick quality definition, quantitative (weight or length) and qualitative assessment of day-old chick quality are relevant and related to performance. In this study no significant difference ( $p > 0.05$ ) was observed in the body weight of the day-old chicks from the different sources. Though body weight is an easy and highly objective measurement, the value is relative. Day-old chick weight is highly correlated with egg weight but does not give good indication for chick development (Meijerhof, 2005). This is because chick weight contains the real chick weight so the amount of egg that is transformed into the chick tissue and remaining yolk residue. Embryos use the fat in the yolk as fuel for their development and therefore the deviation between real chick weight (without remaining yolk sac) and yolk residue is an indicator for development. If a lot of yolk is left over, then less should be considered lower. However, this does not show in day-old chicks weight (Meijerhof, 2005).

The chicks from source C showed significantly ( $p < 0.05$ ) higher mean chick length values than the chicks from the other sources. Meijerhof (2005) have reported the importance of chick length as a more practical way to measure chick development. The length of the chick is a rather accurate and repeatable way of measuring development and that large samples of chicks can be checked in a relative short time frame. It has been reported to have a positive correlation with performance (Meijerhof, 2005).

The microbiological quality assessment indicates the presence of 7 different bacterial organisms (*Escherichia coli*, *Staphylococci* sp., *Streptococci* sp., *Diplococci* sp., *Proteus* sp., *Corynebacterium* sp. and *Klebsiella* sp.). The bacterial organisms were isolated from the cloaca and navel of chicks from different sources. Even though some of the organisms isolated are normal micro flora, the high number of organisms isolated from the chicks is an indication of poor hatchery hygiene. *Escherichia coli* were isolated from all sources (both from the cloaca and navel). Strains of *Escherichia coli* normally predominate at the intestinal tract and most of them are not pathogenic. Certain serotypes however can be associated with yolk sac infection (Omphalitis), which is frequently being accompanied with an infected or unabsorbed yolk sac (Gordon, 1977). *Staphylococci* sp. was present in navel chicks from all sources. *Staphylococcus aureus* is normally present on the skin and in nasal cavities, sinuses and nasopharynx of majority of poultry. Yolk sac infection can occur in Staphylococcal infection. Omphalitis or navel ill occurs more frequently on a hatch basis, but the number of chick involved is relatively low. This condition results from an imperfect healing of navel which in acute yolk sac infection is usually perfectly healed (Gordon, 1977). *Streptococci* may form parts of the normal intestinal and mucosal flora of most avian species; however, *Streptococci* infection in young chicks can be associated with Omphalitis (Jordan and Pattison, 1996). *Proteus* sp have been reported to cause yolk sac infection either on its own or more commonly together with *Escherichia coli* (Jordan and Pattison, 1996). Poor microbiological quality of chicks from a particular source will be compounded if the chicks have poor navel closure. This is because the bacterial organisms might gain entrance through the open navel which can lead to yolk sac infection even by organisms that are thought to be normal flora.

The result of the serological quality assessment indicates the absence of antibody against infectious bursal disease virus in chicks only from some of the sources. This is an indication that the parent stocks have not been vaccinated as to produce chicks with maternal antibodies against IBV virus. Antibody levels of chicks against Newcastle disease from all sources were generally good. This good antibody level in chicks against Newcastle disease indicates good vaccination coverage in various sources examined. The endemic nature of infectious bursal disease and Newcastle disease in this environment warrants ensuring protective antibody levels against the diseases for good quality day-old chicks.

Tona (2003) and Tona *et al.* (2005) established the correlations between several of the qualitative parameters that have been included in determining chick quality. Interestingly, most parameters are highly correlated with the conditions of the navel area, amount of retracted yolk and chick activity indicating that these parameters alone may be sufficient for sorting day-old chicks into quality groups. The study also showed that the incidence of day-old chicks with subnormal conditions in the navel area was the highest indicating that this may be a parameter of significant importance in the growth of the chicks. Also, other subnormal conditions that contributed highly to the number of chicks with subnormal conditions included the amount of retracted yolk, remaining membrane, activity, downs and appearance.

Under practical conditions, many birds have access to feed only 36-48 h after hatching of the batch and during this time, body weight decreases speedily (Noy and Sklan, 1999; Pinchasov and Noy, 1993). Several studies reported an inverse relationship between the duration of holding time (e.g., holding time at the hatchery and the transportation duration) after hatch and chick subsequent growth (Pinchasov and Noy, 1993; Hackl and Katela, 1997; Xin and Lee, 1997; Noy and Sklan, 1999; Dibner, 1999; Decuyper *et al.*, 2001). Maiduguri is located more than 600 km from the nearest hatchery and this translates into about 6 additional hours of transportation. This factor alone can negatively affect the growth of chicks supplied to Maiduguri.

It can thus be concluded that the day-old chicks supplied to Maiduguri have varying qualities. A source with good physical qualities will turn out to have poor serological and/or microbiological quality. Therefore, minimum standards for physical, microbiological and serological qualities of day-old

chicks should be set for hatcheries in Nigeria. A regulatory body should also be established to ensure strict adherence to the minimum standards of the quality of day-old chicks supplied to farmers. In addition to aforementioned, establishing a hatchery in the North eastern region will go a long way in reducing some of the problems being encountered.

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