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THE EFFECT OF POST-HATCH FASTING FOR VITELLIN VESICLE AND DIVERTICULUM PERSISTENCY IN BROILERS *(Gallus gallus)*

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Abstract: An experiment was performed to study the fasting influence (12h, 24h, 48h and 72h) started immediately after hatching, until receiving the first food in 100 commercial "Cobb" hybrid linage lineage chicks, in the vitellin vesicle and diverticulum persistency. The chicks were reared until 58 days old and were slaughtered at the treatments finishing. The vitellin vesicles and diverticulum were analyzed and compared to the noted data regarding the weight gain, food consumption and food conversion, in the four experimental groups. According to the obtained results, it was observed that the chicks which received the initial food and water until 24 hours after the hatching showed better weight and food conversion indexes when compared to the other groups. It suggests a higher economy for the poultry farm comparatively to introducing the food at the first day of age, besides of showing a satisfactory time between the hatching and the transportation until the poultry farms. For the group receiving the early food, only the diverticulum was observed and, in most of times, small ones. It was observed that fasting had no influence in the vitellin diverticulum persistency, because in 100% of the samples it was present; however, the vitellin vesicle was influenced.
Keywords: Anatomy, broilers, weight gain, vitellin pedicle, vitellin vesicle.

INTRODUCTION

Brazil produces 13,245 millions of tons of chicken meat, where 68% had been destinated to the internal market, with a *per capita* consumption of 42.84 kilograms in 2019 (ABPA, 2020).

The poultry production cost and the high market competitiveness make the companies more and more obligated to improve their efficiency and productivity results. The high-performance concept makes them to work with productive indicators to succeed (GALLO, 2015).

In the birds digestive system, especially for broilers, a post-hatching change happens mainly in the first 15 days, that may afterwards affects their performance. In this way, studying such adaptative stage is important to look for knowledges, aiming to improve these animals nutrition management (MAIORKA et al., 2000).

The birds small intestine is divided in duodenum, jejunum, and ileus, being the jejunum the largest portion (DYCE; SACK; WENSING, 2019). In this intestinal segment the vitellin diverticulum is found, remaining from the vitellin pedicle, that connected the vitellin vesicle to the chick during the embryogenesis and in the first days post-hatching (GUAHYBA, 2001). The vesicle content provides the nutrients to the chick and finishes around the seventh day (COX et al., 2011). The food beginning right in the first days of life stimulates the intestinal development (TAVERNARI; MENDES, 2009), both the weight (FERNANDES et al., 2017) and the villous (VIEIRA et al., 2006), as well as the body growth (UNI; FERKET, 2004), consequently improving the broilers performance (AMBROZINI, 2001).

After hatching, the chicks initial development is essential for the best broilers performance until the production cycle finishing. The high correlation between body weight at the pre-initial stage and the slaughter age is an indicator for the nutritional management influence in the first hours of life over the broiler chicks growth (JUNQUEIRA et al., 2001).

Facing the exposed, the objective of this work was to check the fasting influence in the vitellin diverticulum and vesicle persistency in the broilers weight gain.

MATERIAL AND METHODS

In order to perform this work, one day chicks were reared until 58 days old, in poultry farms located in the São João do Meriti city, in the Rio de Janeiro State. During the experiment, the chicks were fed with initial, growing, and fattening food, from the same manufacturer.

One hundred commercial "Cobb" hybrid linage lineage chicks were acquired, male and female, weighing 38 grams each, from a hatchery located in the Jundiaí-SP city. By arriving the poultry farm, the chicks were immediately separated in four lots with 25 animals each, identified as follows: Lot 1 (L1): fed with initial food and water, 12 hours after the hatching; Lot 2 (L2): fed with initial food and water, 24 hours after the hatching; Lot 3 (L3): fed with initial food and water, 48 hours after the hatching, and Lot 4 (L4): water, 48 hours after the hatching and fed with initial food at 72 hours.

Each lot was allocated in wood shaving bed, with water and food at will. At the first week 8 chicks died in the Lot 4 and none in the others, remaining without changes until the end. At this feeding stage, initial food was provided to the chicks until 21 days of age.

From the 22nd day, occurred the change from the initial food to the growth food for every lot, being provided until the 42 days of age.

At the 42 days of age, occurred the third and last diet change, substituting the growth food for the final food, being provided until the slaughtering, which occurred at the 58 days of age.

The broilers were weighed at the day before to the food change (21st and 42nd days). Due to the stress caused by the weighting procedure and to avoid consequent losses (weight and deaths), ten animals from each lot were differentiated for the weight control. They were weighted always at the same time (at the night) looking for a better thermal comfort and tranquility.

After slaughtering the 92 broilers, the intestines were collected to verify the vitellin vesicle and diverticulum presence and the fasting influence on these structures persistency. Once identified, they were measured in length and diameter using a pachymeter.

The food conversion was calculated in each stage, sharing the consumption by the lots average weigh. By comparing the food consumption, broilers average weight (g) and food conversion among the lots and the ages (days), the variance analysis (ANOVA) was performed with unfolding by the Tukey test for comparing the averages. The 1 and 5% significance values were adopted, by using the SPSS (18.0) statistical software.

RESULTS AND DISCUSSION

At the Table 1, the average weight gain/broiler results in the Lot 1 (L1 - fed 12 hours after the hatching) were presented, observing that at the initial stage, the consumption/broiler in grams was 1,200 and the average

Stage	Age (days)	Consumption/broiler (g)	Average/broiler (g)	Food Conversion
Initial	01 a 21	1200	797,4	1,50
Growth	22 a 42	2370	1,818.8	1,30
Slaughtering (Final)	43 a 58	800	2,223.1	0,36

Table 1 – The fasting influence in the average weight gain/broiler fed 12 hours after the hatching.

weight/broiler was 797.4 grams, while in the growth stage, the consumption/broiler was 2,370 grams and the average weight/broiler was 1,818.8 grams. At the final stage, the consumption/broiler was 800 grams and the achieved average weight/broiler was 2,223.1 grams at the slaughtering moment, with the L1 food conversion of 1.5, 1.3, and 0.36, at the all the three stages, respectively.

At the Table 2, the average weight/broiler results in the Lot 2 (L2 – fed 24 hours after the hatching) are presented. It was found that there was change only in the consumption/broiler at the initial stage, with 1,143 grams, which was attributed to the food have occurred 24 hours after the hatching. The Lot 2 was slaughtered with average weight/broiler of 2,209.2 grams and the food conversion of 1.43, 1.32, and 0.36 at the three stages, respectively.

At the Table 3, the body weight gain/broiler fasting results were presented for the Lot 3 (L3 - fed 48 hours after the hatching), being 724.1 grams the initial stage weight and 1,086 grams the consumption/broiler. At the growth stage, the consumption was 2,370 grams and the average weight gain/broiler was 1,682.5 grams. At the final stage, it was 2,014.1 grams and the food conversion were 1.51, 1.65, and 0.43 at the three stages, respectively.

At the Table 4, comparing with the previous tables, the results showed that prolonged fasting of 72 hours (Lot 4) harmed the broilers development, leading to a marked weight loss. The broilers were slaughtered with the average weight of 1,873.3 grams/broiler, considerably lower that the further groups average. Higher food conversion values were also identified on these lots, with values of 1.51, 1.65, and 0.43, at the initial, growth, and final stages, respectively.

In broilers, the vitellin vesicle content absorption finishes around the seventh day

Stage	Age (days)	Consumption/broiler (g)	Average weight/broiler (g)	Food Conversion
Initial	02 a 21	1143	797,4	1,43
Growth	22 a 42	2370	1,794.1	1,32
Slaughtering (Final)	43 a 58	800	2,209.2	0,36

Table 2 – The fasting influence in the average weight gain/broiler fed 24 hours after the hatching .

Stage	Age (days)	Consumption/broiler (g)	Average weight/broiler (g)	Food Conversion
Initial	03 a 21	1086	724,1	1,51
Growth	22 a 42	2370	1,682.5	1,65
Slaughtering (Final)	43 a 58	800	2,014.1	0,43

Table 3 – The fasting influence on the average weight gain/broiler fed 48 hours after the hatching.

Stage	Age (days)	Consumption/broiler (g)	Average weight/broiler (g)	Food Conversion
Initial	04 a 21	1029	681,8	1,51
Growth	22 a 42	2370	1,432.2	1,65
Slaughtering (Final)	43 a 58	800	1,873.3	0,43

Table 4 – The fasting influence on the average weight gain/broiler fed 72 hours after the hatching.

of age (COX et al., 2011), at this stage, the intestine is going to be colonized by aerobic and anaerobic microorganisms. Bile salts and phospholipids from the vitellin vesicle modulate the intestinal flora and influence the mucosa integrity. In this way, it is recommended to house or to food the chicks as early as possible, because the food stimulates their intestinal mucosa development (OLIVEIRA et al., 2008; TAVERNARI; MENDES, 2009), improving the food efficiency and the broilers weight at the slaughtering (UNI; FERKET, 2004).

Significative statistical differences were not observed ($p>0.05$) by the ANOVA when the lots were compared among them. However, statistical differences were found withing all the lots when the ages were compared among them regarding the consumption, average weight, and food conversion ($p<0.01$). Although significative statistical differences were not observed among the lots, it was possible to observe higher slaughter weight in L1 and L2, and lower Food Conversion values in the Lot 2 at the initial stage, suggesting that the feeding with the initial food and water until 24 hours after the hatching generated better results. Besides that, it was evidenced in the Lot 1 the vitellin vesicle persistency connected to the vitellin diverticulum in 100% of the examined animals and, in the L2 the diverticulum incidence of 100%, with six animals presenting the vitellin vesicle persistency. This result may suggest a food save for poultry farms, which would represent a higher average profit by saving food in the two days after hatching.

The Food Conversion is an important index to measure the feeding management efficiency in a poultry farm, due to ponder the consumption by the weight gain. Similar results were observed by Girotto; Santos (2012), that evaluated the Cobb linage lineage broilers zootechnical performance.

Regarding the vitellin diverticulum incidence result, it was observed that in the Lots 3 and 4, only the vitellin diverticulum incidence was observed, totaling 100% in both lots. The diverticulum is a remaining from the connection between the vitellin vesicle and the small intestine during the life beginning and makes part of the secondary lymphoid tissue (RUTZ et al., 2015). Its presence was verified in all the examined broilers, exactly the same result found by Ferreira et al. (2012). Regarding the vitellin vesicle persistency, it was observed that the Lot 1 presented higher incidence; the Lot 2 presented low incidence; the Lots 3 and 4 did not present persistent vitellin vesicle, what could explain the results in this study. It was verified that the Lots with a most extended fasting were those in which the vitellin vesicle presence did not occur. Such results were according to those found by Silva; Nakano (1998) and Dyce; Sack; Wensing (2019).

Regarding the vitellin diverticulum form and dimensions, the findings in this study coincide with Scharra; Brito; Figueiredo (1976) and Vianna et al. (2020), because a high incidence of hunched structures was observed, sometimes confused with the intestine, sometimes perfectly independent from it. The length has varied from 0.4 to 1.5 and its width from 0.2 to 0.7. Ferreira et al. (2012), mention an average length of 1.20 cm, and Scharra; Brito; Figueiredo (1976) mention a variation from 0.5 to 1.0 centimeter and the width between 0.2 and 0.3 centimeters.

CONCLUSION

According to the obtained results, it was observed that the chicks that received the initial food and water until 24 hours after hatching showed better weight and food conversion indexes when compared to the other lots. Such results suggest a higher saving for the poultry farm comparatively to the food

introduction in the first day of life, besides of showing a satisfactory time between the hatching and the transportation until the poultry farms.

In the groups that received the early food, it was observed the vitellin vesicle persistency and, in the groups with late fed only the diverticulum was observed and, in most of times, in small dimensions.

It was verified that the fasting had no influence in the vitellin diverticulum persistency, because in 100% of the samples its presence was observed, however, the vitellin vesicle persistence was influenced.

CONFLICT OF INTEREST

The authors rule out any conflict of interest.

ETHICS COMMITTEE

The paper was approved by the Ethics Committee on the Use of Animals at the University, CEUA / protocol 7117240820 (ID 000991) /2020.

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