



# Study of the anomalies in unhatched chicken eggs

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Citation: Maya, S., Anitha, P., Aravindakshan, T.,V., Sunanda, C., Indu, V.,R., Sreeranjini, A.,R., Sunilkumar, N.,S. and Sumena K.,B. 2020., Study of the anomalies in unhatched chicken eggs. *J. Vet. Anim. Sci.* **51**(1): 70-74.

Received : 17.08.2019

Accepted : 08.09.2019

Published : 01-01-2020

## Abstract

*Studies were conducted on 2972 failed to hatch chicken eggs with embryonic deaths to detect the various abnormalities occurring during their development. The study included descriptive examination and comparison of unhatched eggs of chicken. Objective of the experiment was to study the occurrence of abnormalities of embryos at various stages of incubation in chicks by gross examination. Of the total eggs collected, a major contribution towards lesser hatchability was accounted by infertile eggs, followed by mortality during early period, late stage and then mid-stage mortality. A significant positive correlation existed between weight, length and width of eggs. Anomalies encountered in the present study were categorized as developmental failure, developmental arrest, developmental excess including twinning and atypical differentiation with skeletal abnormalities.*

**Keywords:** *Anomalies, chicken, eggs, unhatched*

Avian embryonic mortality is an economically important problem of poultry industry and a major concern of farmers. Problems of egg quality, hatching technology and embryonic development of the domestic birds are economically most important. The knowledge on avian reproduction and pathology involved in the development of the birds are the key factors that underlie successful hatchery operation. Developmental anomalies can result from random accidents of ontogeny, single mutations, inbreeding, nutritional constraints, climatic factors or the action of teratogens. The magnitude of the effects of deviations from recommended incubation conditions like temperature, humidity, turning frequency, ventilation and egg orientation contribute to the embryonic abnormalities. Even though there are studies on hatchabilities of chicken eggs, specific analysis of the relationship between hatchability with the anatomical possibilities and nature of embryonic anomalies are less. This study was aimed to investigate the morphological basis for

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the possible anomalies during various stages of pre-hatch period of development in chicken by gross examination.

### Materials and Methods

The experiment included descriptive examinations and comparisons of unhatched chicken eggs. Studies were conducted on 2972 failed to hatch chicken eggs with embryonic deaths to detect the various abnormalities occurring during their development. The eggs were collected from AICRP on Poultry for eggs, Mannuthy, Revolving Fund Hatchery, Dept. of Poultry Science, College of Veterinary and Animal sciences, Mannuthy and Hatchery of Poultry Farm, CVAS, Mannuthy. After recording the gross observations like weight, length and width of the unhatched eggs, the embryos inside were taken out along with the other contents. Morphological details of the embryo and foetal membranes were noted. Embryos were examined and measured for basic dimensions of body and organs, state of embryonic membranes, morphological malformations,

malpositioning, downiness, degree of yolk sac absorption as well as appearance of the skin and internal organs. Gross observations of germinal discs or embryos, hatchability of total eggs, hatchability of fertile eggs, fertility, early embryonic mortality (dead embryos during 0-6 days of incubation), mid period embryonic mortality (dead embryos during 7-18 days of incubation) and late period embryonic mortality (dead-in-shell embryos during 19-21 days of incubation) were noted. The data were analysed statistically (Snedecor and Cochran, 1994).

### Results and Discussion

The details about the occurrence of embryonic deaths in unhatched eggs used for the present study are presented in table 1.

The different hatcheries of the University farm showed good hatchability percentage due to the well maintained conditions except for the experimental groups which exhibited a lower hatchability percentage. Of the 2,50,258 total eggs set, 7.2 per cent eggs were infertile.

**Table 1.** Classification of occurrence of embryonic deaths

Sl. No	Unhatched eggs	Frequency	Percent
1.	Infertile	1690	56.9
2.	Early Mortality (0-7)	613	20.6
3.	Mid Mortality (8-14)	119	4.0
4.	Late Mortality (15-21)	438	14.7
5.	Putrified	112	3.8
	<b>Total</b>	<b>2972</b>	<b>100.0</b>

**Table 2.** Mean weight, length and width of eggs in the study

Descriptive Statistics			
	N	Mean	
	Statistic	Statistic	Std. Error
Egg weight (g)	293	46.265	0.413
Length of egg (cm)	293	5.321	0.026
Width of egg (cm)	290	4.230	0.026
Valid N (listwise)	290		

**Table 3.** Correlation between weight, length and width of eggs in the study

	Egg weight (g)	Length of egg (cm)	Width of egg (cm)
Egg weight (g)	1	0.374**	0.445**
Length of egg (cm)	0.374**	1	-0.476**
Width of egg (cm)	0.445**	-0.476**	1

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Fertility per cent was 92.48. Of the total eggs set, 79.57 per cent chicks hatched and 78.08 per cent were good chicks. Of the total 2972 unhatched eggs collected, a major contribution towards lesser hatchability accounted for infertile eggs, followed by mortality during early period, then by late stages and then mid-stage mortality.

It was in accordance with the reports by Whitehead *et al.* (1985) that greatest embryonic mortality (64 percent) occurred in broiler chicks during the first week of incubation, with a further 30 percent taking place during the third week. Lyons (2003) also had similar findings, which revealed that approximately 20 percent of chicken eggs normally did not hatch; the majority of this expected percentage of embryonic mortality occurred during the first and last weeks of incubation. Various factors like genetic, infectious, nutritional and managemental may be attributed to cause embryo mortality in chicken (Lalithakunjamma and Nair, 1990).

The mean egg parameters and their correlation are presented in tables 2 and 3. There was a significant positive correlation between weight, length and width of eggs. Kumar and Shingari (1969) noticed the relationship of size and shape of egg with hatchability in white leghorn birds. Tripathi *et al.* (1973) also opined that the fertility, hatchability and sex as affected by size of the egg.

**Anomalies:** On the day of hatch, some anomalous birds did hatch out later exhibiting anomalies. Of the 2,972 unhatched eggs studied, 164 chicks were anomalous (5.52%). Some were weaklings also. The anomalies observed were categorized as follows:

- a. **Developmental failure/ agenesis:** Absence of both eyes, *i.e.* bilateral anophthalmos, or unilateral anophthalmos *i.e.* absence of right or left eye (Fig. 1).
- b. **Developmental arrest/incomplete development:** Small eye (microphthalmia); imperfect fusion of ventral abdominal wall and improper internalisation of the vitellus resulting

in the prolapse of yolk sac (Fig. 2) and herniation of abdominal organs; prolapse of the rectum and prolapse of yolk sac through cloaca.

- c. **Developmental excess:** Bulged neck; enlarged neck; neck swollen at the back; and swollen abdomen.

**Twinning:** There was only one incidence of twinning observed in the whole period of study at 5<sup>th</sup> day of incubation with separate amniotic bags indicating the splitting at a very early stage.

- d. **Atypical differentiation with skeletal abnormalities:** Hatched out chicks also exhibited small legs; curled toe (Fig. 3); bilateral (Fig. 4) or unilateral extended legs; swollen and reddish hock joints; crossed beak (Fig. 5); short lower beak; absence of two eyes (bilateral anophthalmia) with crossed/ small beak (Fig. 5); and swollen left eye and left side of the head. One chick exhibited shorter digits on left leg. There were incidence of curved neck and also cranioschisis (incomplete fusion of frontal bones of cranium) with external bulging of brain (Fig. 6).

Earlier reports suggested that the absence of egg turning results in adhesion of the embryo to the inner shell membrane, and increased incidence of malpositions in chicken. The swollen head and back of neck (exudative diathesis with increased capillary permeability), were caused by nutritional deficiencies especially vitamin E or selenium (Wilson, 2003).

Hatch failure in chicken had also resulted from infected eggs (with abnormal color and odor), malpositioned embryos (other than head under right wing and in the large end of the egg), excessively wet or dry embryos (indicating incorrect incubator humidity and extended or improper egg storage, or poor shell quality) and genetically abnormal embryos (Ernst *et al.*, 2004).

As per the reports of Birkhead *et*



**Fig. 1.** Anophthalmos chick



**Fig. 2.** Chick with prolapse of vitellus



**Fig. 3.** Chick with curled toe



**Fig. 4.** Chick with bilateral Extension of legs



**Fig. 5.** Anophthalmos with Crossed beak



**Fig. 6.** Cranioschisis with external brain

*al.* (2008) hatching failure resulted from two main causes, viz. ova failed to be fertilized, or fertilized eggs failed to hatch in addition to embryonic mortalities occurring at any stage of development due to a variety of reasons. Sharaf *et al.* (2010) also accounted deformities and abnormalities as reasons of poor hatchability percentages in Egyptian chicken embryos.

### Conclusion

Anomalies encountered in the present study were categorized as developmental failure, developmental arrest, developmental excess including twinning and atypical differentiation

with skeletal abnormalities. As per the earlier reports hatching failure may occur not only due to genetic reasons, but also may be attributed to absence of egg turning, nutritional deficiencies especially vitamin E or selenium, infected eggs, incorrect incubator humidity, extended or improper egg storage, poor shell quality, infertility, embryonic mortalities or abnormalities in chicken embryos. Since hatchery conditions were satisfactory in the University farms, the etiology of the deformities in the present study may be attributed to spontaneous and genetic aberrations, which needs a continuous further research on the topic.

### Acknowledgement

The financial assistance extended by Kerala State Council for Science, Technology and Environment and the administrative help rendered by the Kerala Veterinary and Animal Sciences University in conducting the research are gratefully acknowledged.

### References

- Birkhead, T.R., Hall, J. Schut, E. and Hemmings, N. 2008. Unhatched eggs: methods for discriminating between infertility and early embryo mortality. *J. Compilation* 150 (3): 508- 517.
- Ernst, R. A., Bradley, F. A., Delany, M. E., Abbott, U. K. and Craig, R. M. 2004. *Egg candling and breakout analysis*. University of California, p.6.
- Kumar, J. and Shingari, B.K. 1969. Relationship of size and shape of egg with hatchability in white leghorn birds. *Ind. Vet. J.*, 46: 873-876.
- Lalithakunjamma, C.R. and Nair, M.K. 1990. Pathomorphological investigations on embryo mortality in chicken. *J. Vet. Anim. Sci.* 21(1): 59-63.
- Lyons, J.J. 2003. *Small Flock Series: Incubation of Poultry*. University of Missouri Extension, p. 85.
- Sharaf, M. M., Taha, A. E. and El-Sayed Ahmed. N. A. 2010. Deformities and abnormalities of egyptian chicken embryos as reasons of poor hatchability percentages. *Egypt. Poult. Sci.* 30 (1): 317-337.
- Snedecor, G. W. and Cochran, W. G. 1994. *Statistical Methods*. Eighth edition. The Iowa State University Press, U.S.A., p.313.
- Tripathi, C.S., Srivastava, V.S. and Kushwaha, N.S. 1973. Studies on fertility, hatchability and sex as affected by size of the egg. *Ind. Vet. J.*, 50: 343-348.
- Whitehead, C. C., Maxwell, M. H., Anne Pearson, R. and Herron, K. M. 1985. Influence of egg storage on hatchability, embryonic development and vitamin status in hatching broiler chicks. *Br. Poult. Sci.* 26 (2): 221 – 228.
- Wilson, H. R. 2003. *Hatchability problem analysis*. University of Florida, p. 337 ■