

Original Research Article

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Sequential Morphological Development of Chick Embryos on Namakkal Variety of Chicken

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ABSTRACT

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The chick embryos of Namakkal chicken variety was collected sequentially from day 1 to day 20 and gross morphological developmental features were studied. On day one of development, head fold and neural fold were observed. From second to fifth day, gradual development of optic vesicle, limb, wing buds, circulation and body flexures were viewed. From day 6 to day 12, clear demarcation of toes, development of scales on the legs, feather germ development, formation of eyelid and its closure were observed. From 13th day to 20th day, growth of various developed body parts was noticed.

Introduction

In many ways, the history of chick embryology is the history of embryology itself because the great accessibility of the chick has always made it a favourite subject to study. All the great advances and discoveries in chick development have relevance for other vertebrates including mammals (Horder *et al.*, 1986). The chick embryos have long been used for the study of early embryonic development because the stages desired can be readily obtained. The developmental changes in the chick embryo are almost identical with other vertebrates whose embryos are difficult to obtain (Schoenwolf and Watterson, 1989). So, many outstanding experimental embryologists choose the chick embryo as a model to study the development.

Hence the present study was undertaken in chick embryos of Namakkal chicken to observe the gross developmental changes in a sequence.

Materials and Methods

In the present study, the Namakkal chicken parent birds which belong to same date of hatch were utilized. Three numbers of eggs were collected every day and set for incubation. At the end of the 20th day, all the eggs were opened and day wise embryos were collected from day 1 to day 20. The eggs were cracked into finger bowl which contained 0.9% warm saline solution without disturbing the yolk. With a fine forceps and scissors, the

blastoderm were separated from the yolk and allowed to float away in the saline solution. By using a microscopic slide, the embryos were picked up and transferred to a separate bowl containing fresh saline solution upto fifth day embryo stage.

The remaining stage of chick embryos were collected by using forceps and scissors and were transferred to warm saline solution. Afterwards, excess saline from the dish were pipetted out and they were replaced with fixative solution (Neutral buffered formalin and Bouin's fluid).

The embryos were allowed for overnight fixation and were used to study the different morphological development (Figs. 1 and 2) (Schoenwolf and Watterson, 1989).

Results and Discussion

Day 1

On 24 hours of incubation, the first indication of development of body plan, the head fold was noticed at the cranial end. It appeared like a crescent shaped structure.

The neural folds were visible which expanded posteriorly from the head fold. At this stage, pairs of somites on either side of notochord and primary optic vesicle were noticed (Bellairs and Osmond, 2005).

Day 2

The cranial flexure and trunk flexure were started to visible which were the indications of external appearance of chick. Somites and amniotic vesicle were clearly observed. (Pikalow *et al.*, 1994)

Day 3

On day 3, the cervical flexure formed an acute angle with the axis of the trunk. The trunk

flexure was entirely disappeared and the trunk was in a straight line with the base of the tail (Hamburger and Hamilton, 1951).

Distinct vitelline blood vessels on the yolk and to the embryo were clearly seen and also the heart pumping and circulation were distinctly noticed to the naked eye (De Haan, 1990)

Day 4

On day 4, both wing and limb bud were noticed as a bulge at the cranial and caudal regions respectively. At this stage, the head bends round in the neck region and it came to lie at right angles to the trunk (Flynn *et al.*, 1991). Faint eye pigmentation was noticed.

Day 5

On day 5, embryo showed distinct optic vesicles with eye pigmentation on the lateral aspects of cephalic region and also prosencephalic vesicle at the head region. In the wing demarcation of elbow and knee joints were observed. The digital plate in wing was distinct and first three toes were separated (Murray and Wilson, 1994).

Day 6

As mentioned by Hamilton (1965), distinct outgrowth of beak was visible and neck between collar and mandible had lengthened. The external auditory meatus was noticed.

Day 7

On seventh day, three major segments of leg and wing are clearly demarcated. The gap between beak and mandible had narrowed. Feather germs began to appear at brachial region and at the level of leg region. Scleral papilla was clearly visualised (Bellairs and Osmond, 2005).

Fig.1 Photograph showing the sequential developmental stages of chick Embryos from day 4 to day 12



Fig.2 Photograph showing the sequential developmental stages of chick Embryos from day 13 to day 19



Day 8

On eighth day, the embryo showed well distinct digits and toes and they were lengthened. The mandible and neck also lengthened. The egg tooth was clearly viewed. The feather germs became clearly visible and the scleral papilla formed almost a complete circle (Bellairs and Osmond, 2005).

Day 9

In the limbs, grooves appeared between first, second, third and fourth digits and which later forms the webs of digits. Distinct phalanges in toes were noticed. Eyelids began to overgrow the eyeball and eyelid circumference becomes ellipsoidal (Majumdar, 1988).

Day 10

In the tenth day of embryological development, distal segment of wings and legs became longer and primordia of claws were visible. The nostril was narrowed to a slit like opening and labial groove was clearly visible on the tip of the upper jaw (Bellairs and Osmond, 2005). As mentioned by Hamilton (1965), the flight feathers and nine rows of feather germs between upper eyelid and dorsal midline were not seen and comb primordia were also not noticed.

Day 11

On eleventh day, onset of cornification of claws was seen and pads on plantar surface of foot were visible. In the leg, scales were seen over the entire surface of leg. The opening

between the upper and lower eyelids was much reduced. The feather germs became conical and noticed over many areas of the body especially dorsal midline and caudal regions of body. Distinct development of flight feathers were noticed (Hamilton, 1965).

From eighth to twelfth day, the development of eyelids, feather germs, growth of legs, wing, beak and feathers were gradually increased. Afterwards, there was only growth of structures which were already formed was noticed up to 20th day. There was no new development of structures were seen after eighth day. Only growth of organs and structures which increased the weight of embryo was observed.

The study on sequential development of chick embryos in Namakkal variety of chicken concluded that the development of each and every parts of body were gradually started at 24 hours of incubation and most of the structures were fully developed at eighth to twelfth day of incubation. Afterwards, only increase in growth of structures was observed.

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