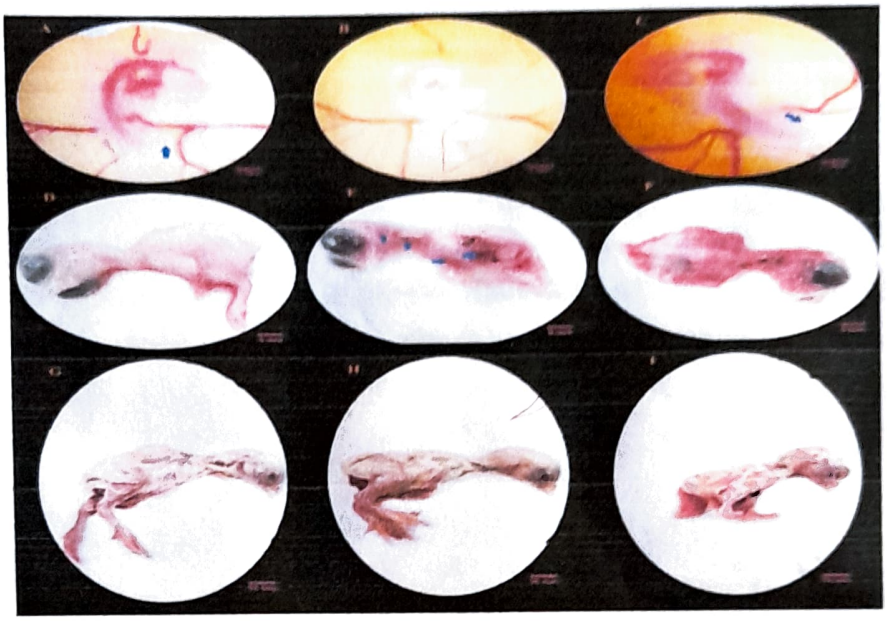
NANDA NATH SAIKIA COLLEGE



Project report on: Development of chick embryo(CXIII,Developmental biology)

Examined.
15/3/22

Roll no: 308200085

Reg. no: 5190598

Department of Zoology

ACKNOWLEDGEMENT

It is my privilege and honour to convey my heartfelt gratitude and thanks to everyone who have contributed in their best possible way for the successful completion of this project work.

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The study has been undertaken and completed under the inspiring guidance and constant valuable supervision of Dr. ManashiBortamuly, .HOD of zoology. The investigator expresses heartful thanks and deepest gratitude for her continuous super vision guidance, and constant encouragement during the entire course of study and preparation of this project which means much more than words can convey.

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Last but not the least, I am grateful to my parents for the financial and mental support during the project . Thank God for keeping me in a good health.

...Basanta Chutia.....

Bsc6th Semester

Dept. Of Zoology

CERTIFICATE

This is to certify that Ms/Mr .....Basanta Chutia.....a 6th Semester student of zoology honours with roll no ..B0820008.....registration no.S1905698.....has performed a field study tour to Fish and fishery Department of Assam Agricultural University to study about different aspects of fishery under my supervision . The purpose of the field study is to do a project work for the fulfilment of B.Sc final semester curriculum of DSE course VII (course code ZD607P) under Dibrugarh University .

Manashi
14/07/22

DR.MANASHIBORTAMULY

H.O.D OF ZOOLOGY DEPARTMENT.

CONTENT

Aim and objective

1. To study different development stages of chick embryo during incubation period.
2. To study different extra embryonic membranes of chick..
3. To study the time taken for various embryonic developmental stages.

Introduction

The development of a fertilized egg (zygote) into a functional, multicellular organism is a dynamic process that is tightly orchestrated in both time and space, and requires multiple interactions between developing cells and tissues. Many of the events during embryogenesis are controlled by gradients of different proteins or other factors formed within the developing embryo. The presence or absence of one of these factors at the wrong place or at the wrong time can have dramatic effects on the developing organs. In general, the embryonic development of multicellular organisms can be subdivided into a number of different stages: fertilization, cleavage, gastrulation, and organogenesis. The chicken egg starts as an egg yolk inside a hen. A yolk produced by the hen's ovary in a process called ovulation. The yolk continues down the oviduct and is covered with a membrane called vitelline membrane. The eggshell is deposited around the egg in the lower part of the oviduct of the hen, just before it is laid. The shell is made of calcium carbonate . The fertilized blastodisc grows and becomes the embryo. As the embryo grows, its primary food source is the yolk. Waste products collect in a sack called the allantois. The exchange of oxygen and carbon dioxide gas occurs through the eggshell; the chorion lines the inside surface of the egg and is connected to the blood vessels of the embryo . The embryo has three primary layers that undergo many interactions in order to evolve into organ, bone, muscle, skin or neural tissue. The outside layer is the ectoderm, the middle layer is the mesoderm and inner layer is the endoderm . Embryonic development begins with the fertilization of an egg by a single sperm to form a diploid zygote. The events in fertilization include- activation of the sperm, fusion of the sperm and egg membranes, activation of the egg membrane to block entry of additional sperm, fusion of the nuclei of the sperm and egg to create the diploid nucleus of the zygote . After fertilization the first cell divisions take place, the fertilized egg divides to form two cells then divide to form four cells then eight cell . Cleavage cause the formation of uniform cells that form a morula which continues to divide forming a blastula then gastrula . Organogenesis begins with the inductive interaction between ectoderm and underlying chorda mesoderm. Each of the three primary tissues formed during gastrulation then proceeds to undergo growth, differentiation, and morphogenesis. The aim of this study is to studying the changes in the stages of the development of chicken embryo.

Materials and methods

For the present project egg incubator of capacity 50 eggs with temperature control system which is present in our departmental laboratory . In case of fluctuation of electricity sometimes we collect eggs of required incubation period from village farm. Dissecting apparatus used were sharp and blunt forceps (sigma), dropper , needle etc. 10 percent saline solution was used. Experiment was done in Titabar(26.5881^0N ,94.1872^0E) Assam ,India. The experiment proceeded with the following methodology .

1. Fertilized eggs are incubated in incubator at $38^0 - 40^0$ temperature and humidity 70^0c.
2. To maintain require humidity a plate full of water was placed at the lower part of egg in incubator.
3. Date and time of inserting the eggs has been marked before place the eggs in the incubator.
4. The eggs have been taken out after 16 hours of incubation and dissected out to see the blastodisc. Another egg has been taken out of incubator after .24 hours of incubation dissected out and observed .
5. Like that the remaining eggs are taken out of incubator and dissected after 38 ,48 , 72 and 196 hours of incubation to observe various developmental stages.

The observations are given in the next page.

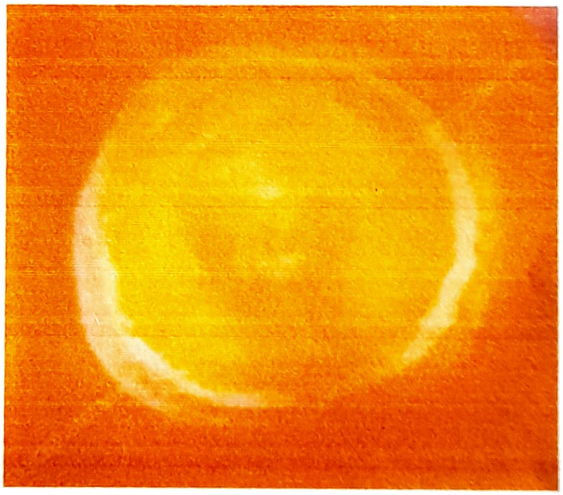
Observations

16 hours :

1) The chick embryo of 16 hours of incubation shows a prominent primitive streak.
2) The blastoderm is differentiated into central area pellucida and marginal area opaca.
3) The primitive streak contains a central furrow called primitive groove and thickened margins called primitive folds or ridges.
4) At the cephalic end of primitive streak, the cells accumulate in the form of a local thickening called primitive knot or Hensen's node.
5) The Hensen's node contains primitive pit which is continuous within the primitive gland.
6) The primitive streak is also referred to as the extraembryonic axial filament.
7) Caudal end of the streak is that which lies closes to the area opaca.
8) Area pellucida assumes elliptical shape.
9) Elongated primitive streak represents long axis of future embryonic body.

24 hours :

1) In 24 hours chick embryo's cephalic region undergoes rapid growth. It extends anteriorly overhanging the proamnion region.
2) The cephalic region which projects free from the blastoderm may now properly be termed as the head of the embryo.
3) The space formed between the head and the blastoderm is closed in subcephalic pocket.
4) In the mid-line the notoehord is seen .
5) The neural plate is much more clearly marked.
6) The neural fold appear as a pair of dark bands.
7) Four pairs of somites are seen in the mid-line.
8) Primitive streak gradually decrease in size .
9) At this stage the dark peripheral area opaca and central translucent and colourless area of pellucida are distinglyvisible .
10) The neural canal ,in the region of head fold , gives rise to forebrain .

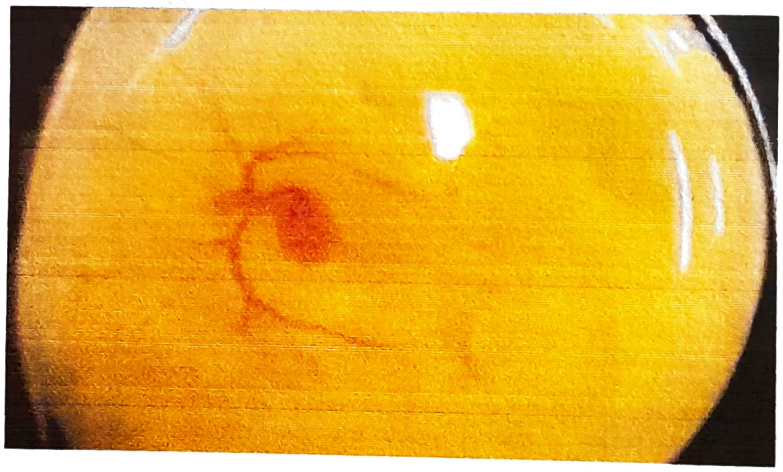


36 hours :

1) The brain is differentiate into forebrain , mid-brain and hindbrain .
2) The eptic vesicles are established as paired lateral outgrowth of the forebrain.
3) Thirteen pairs of somites are formed .
4) Premitive streak becomes shorter because of the lengthening of the neural tube.
5) Vitelline vein and vitelline artery have developed .
6) Pro amnion ,notochord,neuralgroove, neural fold ,area vasculusa,areapellucida,andHensen's node are also present.
7) Mid-region of the heart is considerably dialated andbend to the right.
8) Extra embryonic area has grown in size.
9) The cardiac vesicle has given rise to heart.
10) The area opaca has changed into area vascular.

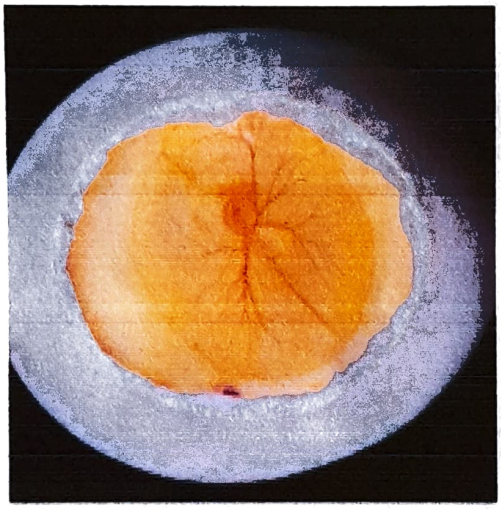
48 hours

1) At this stage the area opaca and area pellucida are not visible.
2) The extra embryonic area has grown in size.
3) Primitive steak has disappeared.
4) The mesoderm in front of Hensen's node, has given rise to 26-28 pairs of somites.
5) The brain has been differentiated into telencephalon, mesencephalon, metancephalon and mylencephalon.
6) The eye has been differentiated into optic cup and lens and optic vesicle has also developed sufficiently.
7) The head region has curved on right side due to craniest flexion.
8) The heart has been differentiated into ventricle and atrium. Sinus venosus and truncusarteriosus have also started developing.
9) Three pharyngeal gill-slits have also been differentiated.
10) Behind hensen's node a tail bud has also developed.



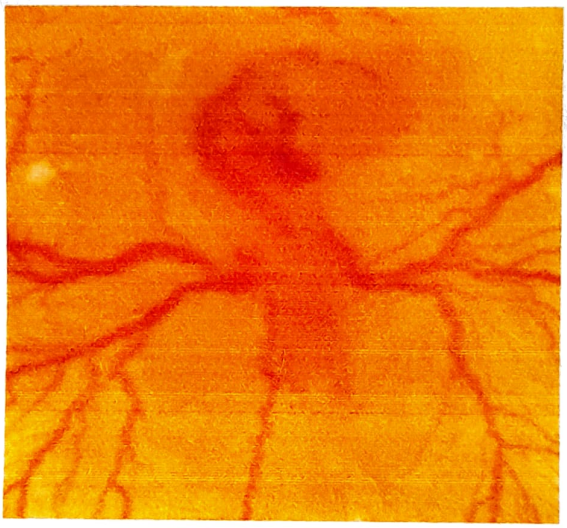
72 hours-

1) The chick embryo of 72 hours of incubation has been affected by torsion through entire length.
2) The torsion is complete well posterior to the level of heart but the caudal portion of the embryo is not turned on its side.
3) The visceral arches are thicker and more conspicuous then in the anterior embryo.
4) Both the anterior and posterior appendages buds have appeared in the embryo.
5) Telencephalon is also formed.
6) In the eyes, lens, sensory and pigment layers are developed.
7) The number of somites increase to 36 pairs.



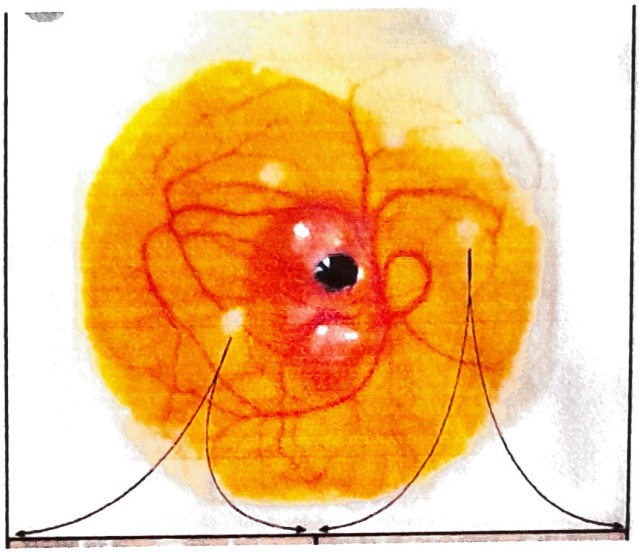
96 hours

1) The entire body has been turned through 90° and embryo lies with the left side on the yolk.
2) At the end of 96 hours the body folds have under cut the embryo so that it remains attached to the yolk only by a slender stalk.
3) Optic cups show the more developed lens.
4) Visceral arches have become very much thickened.
5) The numbers of somites are increased to 41 pairs.
6) Allantois has also appeared.
7) Omphalomesenteric artery and omphalomesentericvein are also appeared.
8) Endo-lymphatic duct arises from the auditory vesicles.



196 hours

1) Coronary arteries have formed.
2) The vessel walls of the coronary artery start to develop.
3) In this stage, the semilunar valves are completely formed and in the orientation of an adult heart.
4) At this stage the pulmonary valve lies ventral and leftward of the aortic valve.
5) Cardiac neural crest cells are also located throughout the anterior and posterior plexus.



CONCLUSION

It is not possible to observe each and every stage of the developing embryo in laboratory during working the project we face some problems like weak electric suplly because of the experiment is depends on electric supply. The observation may not be accurate due to its fluctuation and some restriction in our college.

But it was a we very nice experience. It has a very immense value for practical use . During summer, development of embroyo is weaker than winter. The temperature the of incubation was 38-40°C and humidity -70 percent

Result and discussion

From the present study on development of chick embryo it was observed that various developmental stages are found during progression of incubation period. A proper incubation require 38^0-48^oc of temperature and 70-76 percenthumidity.during oogenesis only the egg is formed without the albumin and cell part. After fertilisation a fertilised egg is prepared for further embryonic development during incubation period. From present experiment it was found 19-21 days of incubation is required for complete embryonic development.

The blastodisc has been observed during 16 hours of incubation. Primitive streak is just appeared on 16 hours of incubation. After 24 hours incubation formation of somites have started.36 hours incubation shows the formation of yolk sac which help for the nutrition of growing embryo. 36 hours incubation also shows the differentiation of fore brain,mid brain and hind brain. Heart biting is started with the appearance of vitelline vein and artery.48 hours incubation shows cranial flextion and torsion. Heart shows division of ventricular arterial and sinus region with clear yolk sac. 21 pairs of somitesis a characteristic features of 48 hours incubation. In the present study 72 hour incubation affect by complete torsion throughout its entire length to the level of heart but the caudal portion is not turned. Cranial and cervical flacture shows right angle bend. Enterior and posterior appendages bud have appeared in the embryo. In the eye pigjm entedlayers are developed. During 96 hours development we observed that appendages bud increase rapidly. Number of somites become 41 pairs. The entire body of the embryo turned turned through 90^0 and the embryo lies with its left side on the yolk. The body fold have under cut the embryo so that it remain attached to yolk by a slender stalk. In during 196 hours of development all the extra embryonic membrane appeared clearly. Allantois become prominent with nitrogenous waste product within it. Limb buds growing more vigorously and become prominent to identify the four and hind limb.

References

1. Practical Zoology vertebrate by S.S. Lal.

2. Advanced practical zoology by P.S. Barma and P. C. Srivastava.

3.Internate sourses(Google,Youtube etc).

Examined.
15/3/22