

ANATOMICAL OBSERVATION ON SOME ANOMALIS
IN CHICKEN
(With 12 Fig.)

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**ملاحظات تشريحيه على التشوهات الخلقية
في الدجاج**

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أثناء القيام ببعض الدراسات على التطور لأجنة فصائل مختلفه من الطيور وعند فتح بيضة لجنين كتكوت فيومى عمره ١٩ يوم من التفريخ لوحظ ان البيضة تحتوى على حالة توأم غير كامل حيث أن بعض أجزاء جسمه الخارجيه مزدوجة التكوين (الأجنحه والأرجل).
تم فحص الجنين ودراسة أحشائه الداخليه وأجزاء جسمه المشتركه حيث وجد أن بعض الأعضاء مزدوجة التكوين إما فى حاله كامله مثل الرقبه والأجنحه والأرجل والجهاز البولى التناسلى أو أجزاء منها مثل حالة الجهاز العصبى والجهاز الهضمى التنفسى.
ويمكن أن تعزى مثل هذه الحاله قليلة الحدوث الى بيضه تحتوى على بويضتين ناضجتين وتم الاخصاب طبيعى ولكن لسبب ما مثل الأخطاء فى ميكانيكية التفريخ (حراره - رطوبه - ضغط وخلافه) أو عوامل وإنقسامات غير طبيعیه أدى إلى إتحاد غير طبيعى للأجنه نتج عنها تضاعف لبعض أجزاء الجسم .
عرضت مجموعه من أمهات البيض لقطع هاى لاين لدرجات حراره وإضاءة مرتفعه ومحسوبه لفترات محدوده فأظهرت بعض التشوهات نتيجة لتغير فى التراكيب الوراثيه ومنها زيادة عدد الأصابع أو شكل غير طبيعى لبعض أجزاء الهيكل العظمى للأطراف أو زيادة نسبة التوائم نتيجة لإرتفاع نسبة البيضة ذو الصفارتين .

SUMMARY

During the course of research in embryology on different species of birds; A case of monster chick embryo (Fayomy breed) of 19 days age of incubation was observed. The monster appeared as incomplete twins as some parts of the body are duplicated (limbs, wings, neck, urogenital system). This case may be derived from double ova ovulated at one time or any unknown mechanical factors. Other cases of monsters were recorded in eggs obtained from hens exposed to high temperature and light for certain time. These cases were represented by two normally well developed newly hatched chickens connected together through the yolk stalk, other monster was represented by unhatched chick. It had an abnormal tibio-tarsal and tarso-metatarsal bones with super number of digits in each limbs.

INTRODUCTION

Malformations are found to be widely distributed in general life between the different species. Various forms of monsters were recorded in newly born and hatched vertebrates. VON BAER (1827) observed several monsters of incubated chick embryos at 28-30 hours and 36 hours. Two were living; one of these had two heads at an angle of about 60° to each other, while the other was divided to about the middle of the body with the duplicated parts at an angle of about 110° to each other. DONITZ (1866) studied a double chick monster in which the heads were united and the caudal ends were directed in opposite direction. However AHLFELD (1874) observed three monsters. A chick embryo of about 36 hours incubation was clefted caudally with the parts at an angle of about 120° , a chick embryo of about 90 hours of incubation with two separate bodies and heads close and tails were widely separated. HENERY ERDMANN RADASCH (1912) described a chick embryo with two bodies and an apparently fused head, one body exhibited 19 and the other 17 somites. There was but a single heart. The head seemingly double showed fusion in the frontal region as the neural canals was single up to the midbrain region. Apparently there was but a single fore-brain vesicle. The second case included an egg incubated for 60-72 hours and contained two embryos which were almost completely separated; united only in the thoracic region. The third condition 72 hours of incubation exhibited a double caudal

extremity. The fourth condition was represented by a hatched bird but was of about one third below the normal size ;It exhibited one head, one pair of wings and four legs. From the level of the lower sacral region the bird appeared double formed. At this region the area of bifurcation was triangular in shape (about 6mm each way), this area appeared as an opening in the vertebral canal. The fifth specimen was represented by a three legged rooster dressed apparently from market. The third leg placed near the tail region and was attached to the bony pelvis that is an off-shoot of the main skeleton just at junction of sacrum with coccygeus, The claws were six in number and large. The monster presented two cloacal orifices. The six condition was represented by two headed chicken of 21 days of incubation showed two beaks, four eye balls and two frontal bones apparently just adjacent eye balls occupied a common orbital fossa. The beaks made an angle of about 40° with each other. Other condition was represented by a failure of development of the upper part of the beak. The upper division ended by a mass resembling the trochlear end of the humerus. The authors also observed a monster duck at full term possessed an extra pair of lower extremities. The head also was malformed; the eye balls were absent; the cerebral hemispheres were exposed and the upper bill was absent. HOFFMANN (1952) described a specimen of anadidymna in a chick embryo as omphalocephalia. In this condition the heart forms the cephalic extremity of the embryo followed by the neck while the head was found near the yolk sac caudal to the heart.

RESULTS

During the course of research in embryology on different species of birds; A case of monster chick embryo (Fayomy breed) of 19 days age of incubation was observed.

The incubated eggs was obtained from the poultry farm of faculty of agriculture Assiut university. The hens were fed on normal poultry ration. The capacity of the incubator reaches about 16800 eggs, the temperature and the humidity measured 101 F, 87% respectively till the eighteenth day of incubation, in the hatcher incubator (last three days of incubation period), the temperature measured 99 F, the humidity reaches 90%.

By opening the egg the double monsters were enveloped by one amniotic sac. The external feature of the specimen was represented by :an incomplete fusion of the two bodies of twins which share together in a single head, neck, two trunks appeared fused completely from the ventral aspect till the

level of the navel where it formed a single trunk roofed by two vertebral columns . A single navel for the two birds was found. The navel appeared as a fossa containing the residue of the yolk which was not absorbed Fig (1). There are two normal pairs of wings and limbs Fig (2) .Each pair of them was attached to its normal position FIG (2&3) Each bird had a separate vent. After carrying outthorough dissection, the following features were observed:

IN THE HEAD REGION:

The single head possessed one beak, two eyes and two nostrils of normal structure and position. The cranial cavity comprised a normally developed cerebrum with two normal hemispheres. Each of them measured about 12 mm in length and 10 mm in width Fig (4) The cerebellum Fig (5) was represented by a normally developed left one of about 9 mm length and 7 mm width and an abnormal right cerebellum measured about 6mm in length and 4.5 mm in width. The two cerebelli were incompletely fused with each other .The monster presented also two incompletely separated asymetrical medulla oblongata. The left one was well developed corresponding to the well developed cerebellum, reached about 4mm in length and 3mm in width. The ill developed right medulla oblongata lost its normal morphological structure and appeared as a part of the spinal cord with a somewhat wide transverse diameter.

IN THE NECK REGION :

By removal of the skin it was noticed that the specimen possessed two fused necks .Each neck contained a normal number of cervical vertebrae. Each cervical vertebral canal contained cervical spinal cord with normal number of cervical spinal nerves Fig (4 & 5) .The neck contained a single oesophagus and a single crop which is normally located just cranial to the thoracic inlet.

IN THE TRUNK REGION

Two body walls were observed by dissection of the examined specimen, However they were fused completely ventrally and formed a single common body cavity for the two monsters Fig (6). Each of them had a special separate back containing normal vertebral column and a normally developed spinal cord. The latter possessed a normal number of thoracic ,lumbo-sacral and caudal spinal nerves and has a rhomboid fossa containing glycogen body.

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In the thoracic part: each bird had a divided sternum and the keel was absent. the two halves of the sterni were fused together side by side. The pectoral muscles were relatively weaker. The cavity of the thoracic part of the common trunk contained four lungs. Each pair was located in its normal position in the corresponding bird. However a single well developed heart was present Fig (8). The latter measured about 13 mm in length and 18 mm in its circumference at the level of the base.

The abdominal part of the trunk had a single stomach measured about 16 mm in length. The glandular part could be easily distinguished from the muscular part at the isthmus. The length of the glandular part was about 9 mm. The circumference of the muscular part about 36 mm.

The distance between the isthmus and the origin of the duodenum was about 6mm. Also a single spleen and liver were observed. The right lobe of the liver reached about 22 mm in length while the left one measured about 20 mm. It contained a well developed gall bladder of 6 mm in length Fig (6 & 7).

There were two intestinal tracts; each had two caeci of about 19 mm in length. Also there were two separate recti, each opened in a completely separate cloaca of 15 mm length. The common body cavity had a normally well developed renal system for each bird Fig (7) related to the renal fossa.

= OTHER CASES OF MONSTERS WERE RECORDED IN EGGS OBTAINED FROM HENS EXPOSED TO HIGH TEMPERATURE OF ABOUT 34 °C FOR EIGHT HOURS DAILY FOR FOUR MONTHS. THE ANOMALIES WERE REPRESENTED BY:

- * Two normally well developed newly hatched chicks connected together through the yolk stalk Fig (9 & 10). By dissection the anatomical structure of internal viscera of the two birds were normally in its morphological features and topographical position.
- * The second case was represented by unhatched (dead) chick embryo of 21 days incubation. It had an abnormal tibiotarsal and tarso-metatarsal bones and each limb has six digits FIG (11). Medially on the right limb; above the distal articular surface and laterally on the left one at the middle of the tibi-tarsal bones projected a bony tuber carrying a normally developed digit with three phalanges and ended by a claw. However the first digit was represented by two structures each had two phalanges.

DISCUSSION

Many authors discussed the causes of monsters in different vertebrates: VON BAER (1827) in chicken, BISCHOFF (1898) in lower vertebrates and GEOFFROY ST. HILLOIRE (1822) in shark declared that all malformations arose from mechanical disturbances. These statement was agreed with the result of KAESTNER (1895 , 1897 and 1906) who carried on some interesting experiments with hens eggs to determine the effect of cold and interruption of incubation by cooling which resulted to the development of malformation. WARYNSKI (1812) stated that if the pressure of the embryonic area against the shell be sufficient great disturbances will be formed and the area lead to malformation. KAESTNER (1895) obtained the same results by momentary strong pressure upon the exposed embryonic area with the hand of scalped. LOMBARDINI (1897) mentioned that the chaking and rotation of the incubated eggs; the conduction of electric and electromagnetic current and the interruption of the incubation temperature (very low and very high) are considered as stress factors for inducing malformation. Also the present investigation indicates that the exposure of the hens to high temperature for long time acts as stress factor which produces monsters. TIEDMANN (1843) in chick embryos and bony fishes considered that the causes of malformation to be a deviating or a declearing activity of the vegetative force or power. MECKEL (1812 & 1816) considered also all malformations of its variety under the term of arrested development. He believed that the individual part of the whole body seldom be duplicated more than once, in case of two incomplete bodies fused at a point what he termed " procreative variety ". These two independent developed embryos fused later. He stated that The fusion is oftenest lateral and less often cephalad or caudad. VALENTINE (1851) stated that one of the monsters was always weaker than the other and the weaker was attached to the ventral belly wall of the stronger. PROCHASKA (1814) believed that in the early stage of development of monster the embryonic area of one was forced into that of the other resulting in fusion. ALLEN THOMPSON (1844) studied monsters in goose and chick embryos. He found two cicatriculae in one yolk. He believed the deception is possible. Many authors suspect that most of these mentioned embryos die shortly after incubation.

The double fused monsters (fauomy breed) of the present investigation could be derived from double ova ovulated at one time This can explain that the two monsters had one navel connected with one yolk stalk and the two birds covered by the same amniotic membrane. It can also be attributed to any

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unknown factors where the cells of the germinal disc are programmed to produce special parts of the body undergo abnormal division; these cells doubled and sequentially its corresponding organs (limbs, wings, some parts of the viscera) become also double. The present study indicated that the exposure of the hens to high temperature and light lead to formation of anomalies. In case of high line breed: the twins originated from one egg with double yolk each has germ disc (dizygomatic twins) but they fused together through yolk stalk due to any stress factor. The second case with super number of digits may be attributed to disturbance in the normal genetic structure, caused by the effect of high temperature and light

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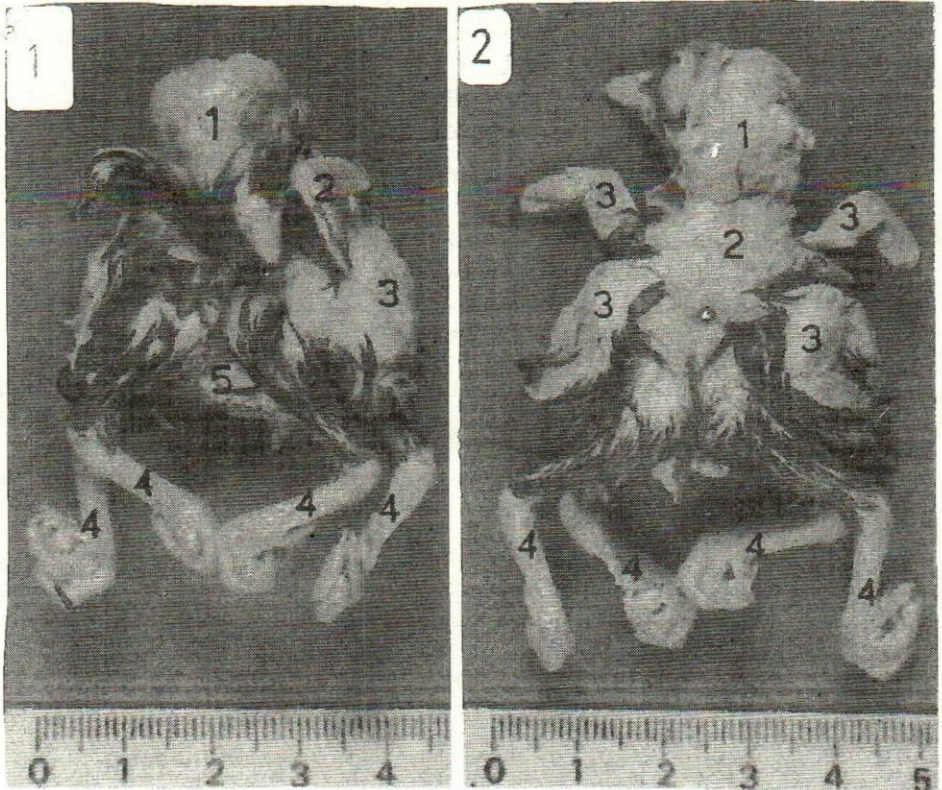
LEGENDES

FIG. 1: Chick embryo (19 days) , Ventral view, X-1.3 photograph showing

1-head 2-wings 3-back 4-legs 5-navel

FIG. 2: Chick embryo (19 days) ,Dorsal view, X-1.3 photograph showing:

1-head 2-back 3-wings 4-legs



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FIG. 3: Chick embryo (19 days), Dorsolateral view, X-1.3
Photograph showing :

1-head 2-neck 3-thorax 4-wings 5-back 6-legs.

FIG. 4: Central nervous system in chick embryo (19 days), X-1.7
Photograph showing:

1-cerebral hemisphere 2-optic lobe 3-cerebellum

4-spinal cord 5-cervical enlargement 6-lumbosacral
enlargement

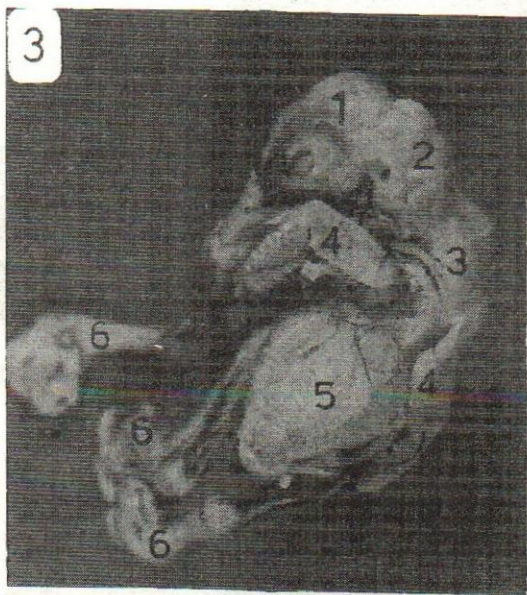
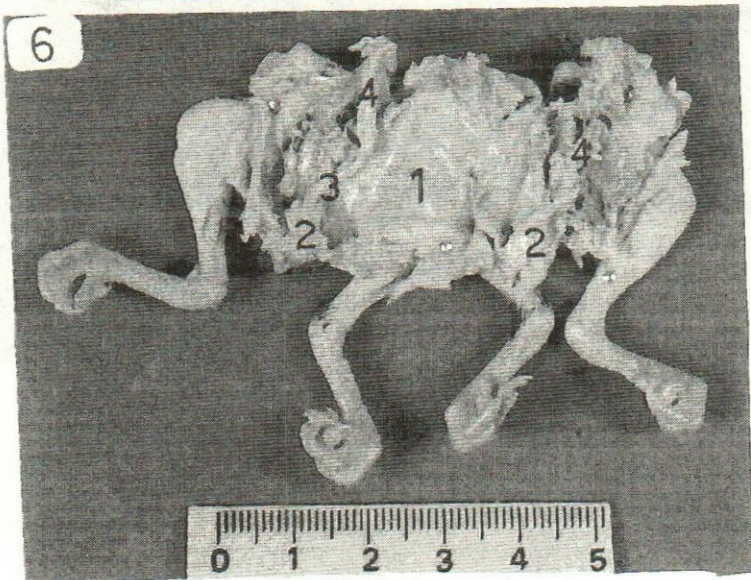
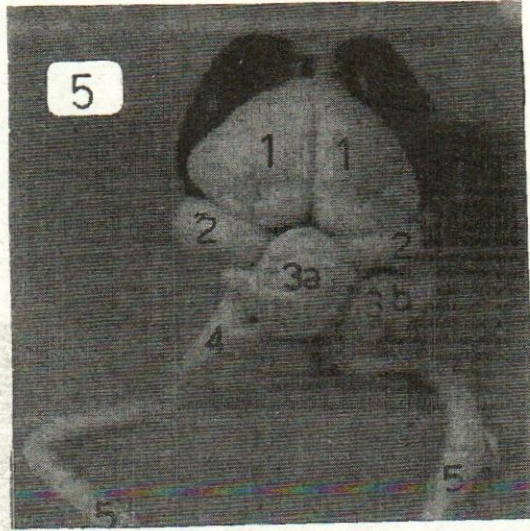


FIG. 5: Central nervous system in chick embryo (19 days), X-4
Photograph showing:
1-cerebral hemisphere 2-optic lobe 3a-cerebellum (normal)
3b-cerebellum (abnormal) 4-medulla oblongata 5-spinal cord

FIG. 6: body cavity in chick embryo (19 day) , X-1.1 Photograph
showing:
1-body cavity 2-cloaca 3-rectum 4-coecii.



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FIG. 7: Left body cavity of chick embryo (19 day), X-3 photograph showing:

1-cloaca 2-coecii 3-rectum 4-gonads 5-synsacrum

FIG. 8: Viscera of chick embryo (19 day), X-1.4 Photograph showing:

1-heart 2-stomach 3-liver a-oesophagus b-duodenum.

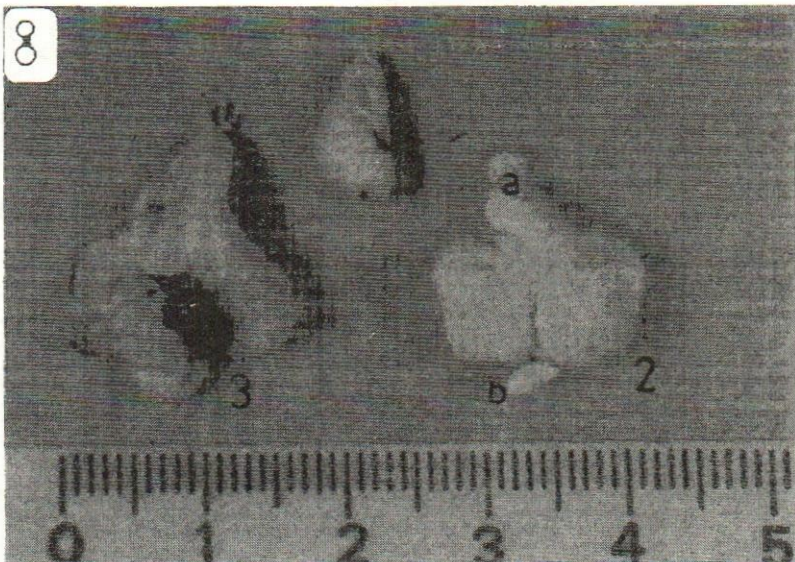
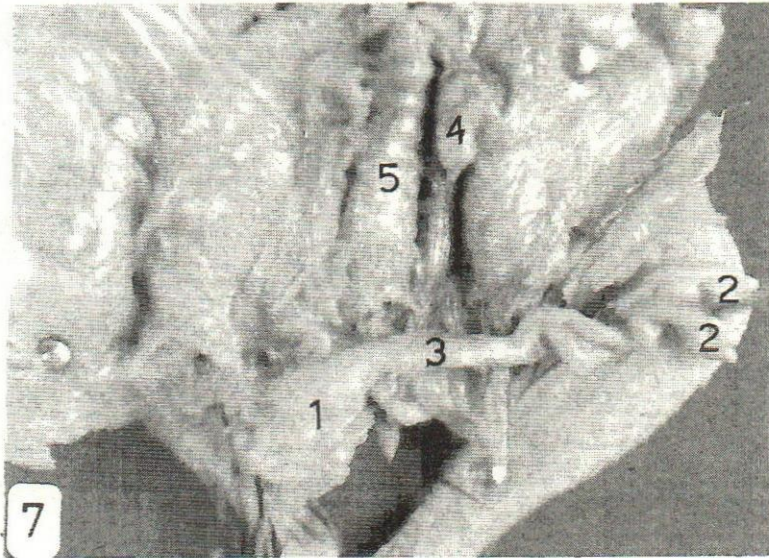
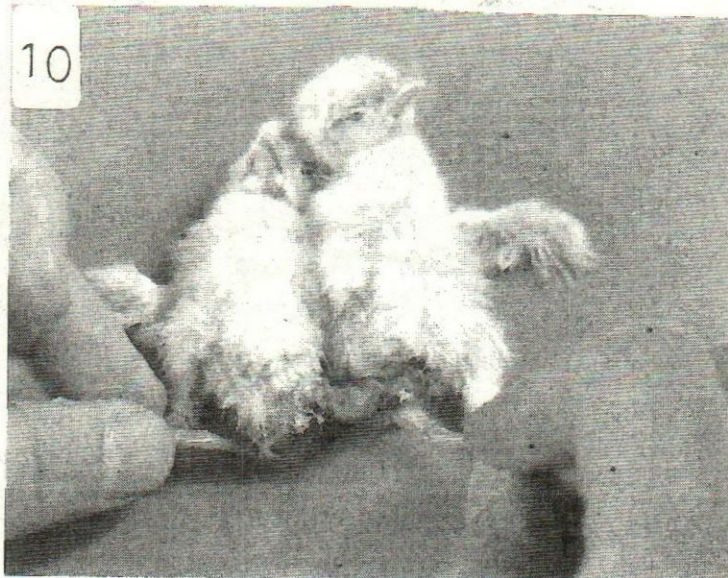
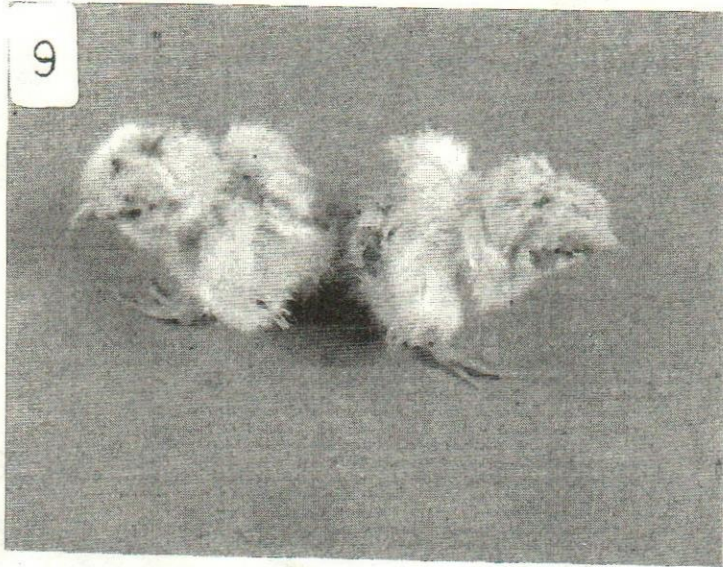


FIG. 9: Newly hatched chick, Dorsolateral view, X- Photograph showing the twins connected together..

FIG. 10: Newly hatched chicken, Ventral view, X- Photograph showing the yolk stalk connected the two birds together



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FIG. 11: Chick embryo (21 days), Ventral view, X-0.6. Photograph showing super number of digits (arrow).

FIG.12.: Photograph showing skeleton of the pelvic limbs of chick embryo(21day) ,X-,Dorsal view.(A)right (B) left.

- 1-tibiotarsal 2-tarsometatarsal 11\ 111\IV.
- 3-metatarsal 1 4-7.1st\2ed\3ed\4th digits
- 8-9.ubnormal gigits.

