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A CASE OF ABNORMAL DEVELOPMENT IN *GALLUS DOMESTICUS* WITH NOTES ON SIMILAR CASES IN OTHER SPECIES

F. L. FITZPATRICK

The production of "developmental monstrosities" in the species *Gallus domesticus* has been observed in a number of cases. It is safe to say that few of these "monstrosities" have been subjected to more than a passing investigation or have been recorded in the literature. Perhaps the recording of more complete data on this subject would show that such occurrences are not uncommon. Whether such investigation or the discovery of the cause of such abnormal development would have any part in solving some of the problems of heritage and development is an open question.

During the current year the Coe College Museum came into the possession of a "freak" specimen of *Gallus domesticus*. The study of the anatomy of this specimen has revealed several interesting features which are detailed in the following paragraphs. The specimen in question was obtained in Johnson County, Iowa in the summer of 1925. It was stated that the bird lived for four days after hatching and that its death was probably due as much to excessive handling as to anything else. This last statement is seriously questioned by the writer in view of the facts disclosed by the dissection. In fact it seems remarkable that the bird survived as long as it did.

When first examined the specimen attracted attention because of the presence of four wings and four legs. Both wings and legs were normal in structure except that they were small in size. The head, neck and trunk appeared to be normal externally except in one particular. This had to do with the distribution of the feather areas; examination of these areas showed that they were double both on the trunk and on the neck. In other words the arrangement of the feather areas indicated that there were two backs and two necks placed with their ventral sides together. As will be seen, this prediction was realized in the dissection that followed. The feather areas of the head were normal, and examination of this region showed that all of its structures were similarly normal at least in major details.

The integument was removed as the next step in dissection. Then it became apparent that there were two complete backs and two complete necks in so far as skeletal parts were concerned. A central mass containing the internal organs lay between the two backs. The backs were easily separated from the central mass and from each other by severing some of the muscle bands that held the opposing pectoral regions together. The central mass contained a *single* set of organs, greatly reduced in size and modified in structure. These organs occupied only the anterior half of the central mass, the posterior portion being composed of a yellowish substance resembling hardened fat, with a small mass of cartilage at its posterior end. Since all other skeletal parts were accounted for it seems possible that this cartilage represented material that would normally have been used in the formation of a sternum or possibly two sterna.

A summary of the structure of the various internal systems follows. Certain details are necessarily omitted because of the obvious impracticability of accurate study with only one specimen at hand.

Digestive system: The mouth cavity was normal in so far as this system was concerned. A single oesophagus passed downward between the two necks. There was no crop enlargement. Both proventriculus and gizzard were present, the latter abnormal in shape but recognizable because of its thick muscular walls. The intestine left the gizzard in a normal position close to the point of union between that structure and the proventriculus. A pancreas was present, lying in the loop of the duodenum, its normal position. A two lobed liver was also present though the lobes were compressed until they no longer conformed to the natural shape. Pancreatic and hepatic ducts were atrophied. The intestine was greatly modified in the region posterior to the duodenum. There was no differentiation into an ileum and a rectum, simply a straight tube about four inches in length which led to the right back region and emptied into a cloaca. No cloaca was present in connection with the left back.

Circulatory system: The circulatory system was better developed than any of the other internal systems yet there were some unusual alterations. The heart was enclosed in a pericardial cavity and was apparently normal, even in size. The right auricle and right ventricle were proximal to the left back in position.

Reduced right and left precaval veins and a postcaval vein discharged into the right auricle. The course of the postcaval was

greatly modified to conform to the displacement of the internal organs. The right jugular vein was well developed but there was no jugular vein on the left side. Both right and left brachial veins were present, the former coming from the right back region, the latter from the left back. Unfortunately it was not possible to trace their origins.

Two pulmonary arteries led to one lung which lay in the central mass but was in contact with the left back. There were apparently two pulmonary veins in connection with this lung but they were much reduced in size. Another much smaller lung was found lying adjacent to the opposite back but it was not connected with the main circulatory channels.

The aorta curved to the right despite the unusual position of the heart. Right and left innominate arteries were represented; the right led to the right back, the left to the left back. Their branches could not be followed except in the case of the right common carotid. No left common carotid was present.

Respiratory system: Two tracheae were connected to the posterior end of the mouth cavity. The one on the left side proved to be rudimentary and ended blindly about half an inch posterior to the head. The right trachea continued downward and gave rise to two bronchii at the level of the heart. At the branching of the trachea a syrinx was found in its normal position. The right bronchus was atrophied but the left connected with the functional lung previously mentioned. Note the singular separation of the two lungs, one being in connection with each back. Also that only the left lung had tracheary and circulatory connections.

Nervous system: The nervous system presented an interesting modification in that there were two separate and apparently complete spinal cords, one passing to the right neck and back region, the other to the corresponding region on the opposite side. Both cords were connected with the brain at the posterior end of the medulla. Anterior to the medulla the brain seemed to be normal in structure.

Urogenital system: Two testes and two kidneys were developed in connection with each back. Those on the right side were provided with vas deferens and ureters. The vas deferens and ureters were not developed in the left back region, this being in keeping with the absence of a cloaca here.

Summary: It will be noted that most of the internal systems "favored" the right back. Only the respiratory system was better developed on the left side. This seemed to be due to the fact

that the circulatory system had established better connection with the lung on this side.

It would seem that such an individual must have developed from a single zygote, otherwise the common head and the common set of visceral organs would be hard to account for. The partial division of an embryo during development and the formation of two neural canals and two sets of metameric somites in connection with a single head opens up an interesting field for speculation.

Similar cases in other species: Some other cases of a similar nature have come to the attention of the writer quite recently. So far, they have been subjected to only a superficial examination but some of them are certainly parallel cases. The list includes the following:

- (1) A sheep with two bodies and two sets of appendages, but with a single head.
- (2) A pig with two heads and a single body.
- (3) Two pigs with a single head and a single set of front limbs, but with a double set of hind limbs.

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