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THE DISSECTION OF AN ABNORMALLY DEVELOPED  
FOETAL PIG, WITH NOTES ON THE POSSIBLE  
ORIGINS OF SUCH "FREAKS"

F. L. FITZPATRICK

At the 1926 meeting of the Iowa Academy of Science the writer reported on the anatomy of an abnormally developed chick.<sup>1</sup> At the time a statement was made to the effect that such cases were probably not uncommon although they were infrequently recorded in the literature.

During the year just past a number of so-called "freaks" have been reported by the press or by scientific investigators. Dr. F. E. Chidester of West Virginia University reported upon the anatomy of such forms at the December, 1926, meeting of the American Association for the Advancement of Science. Science<sup>2</sup> reports that one of his examples, a chicken, had four wings as well as four legs, and four kidneys, but the gizzard, heart and respiratory apparatus remained single. At the University of Wisconsin two abnormally developed pigs are being examined as to their internal anatomy, according to the Daily Cardinal.<sup>3</sup> One of these pigs is reported to have one body and two heads. The other has one head and two bodies.

The last named specimen apparently resembles the one on whose anatomy this report is primarily based. The development of the specimen in question was checked by the death of the maternal parent about a week before birth would have taken place. The death of the adult was a purely commercial matter and had nothing to do with the questions involved here.

*External appearance:* The external appearance of this specimen indicated at once that many of its structures were double. There were four front limbs, four hind limbs, two complete sets of mammae, two tails, two anal openings, two urino-genital openings, four ears, three eyes and two snouts.

One of the snout or facial regions was well developed, having normal nostrils and nasal passages and a normal mouth opening except that the lower jaw was cleft. This side of the head which for want of a better name will be called side A, bore two eyes and two ears in their customary positions.

The other facial region, B, on the opposite side of the head, was poorly developed. The snout was elongated or trunklike in form and was possessed of a single nasal passage and a single nostril. The two ears on this side of the head were grown together. A single median eye was located just below the base of the snout.

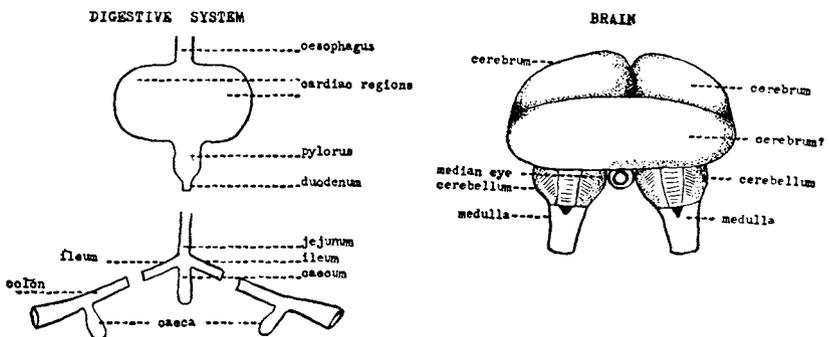
The hair of the foetus was well developed and its distribution conformed to the normal situation on each half of the double body, except where interrupted by the joining of the two halves along their ventral midlines.

A single umbilical cord seemed to represent the fusion of two cords, since it contained four arteries, two veins and two allantoic ducts. Upon further dissection it was found that there were two allantoic bladders, one in connection with each back region and each set of urino-genital organs; the latter being also present in duplicate. Two arteries, a vein and an allantoic duct connected with each bladder or the surrounding bloodvessels.

*Body cavities:* The arrangement of the body cavities was interesting and unusual. It must be remembered that the internal space really represented two coelomic cavities that had been combined. A single diaphragm stretched across the double cavity separating the thoracic and abdominal regions. The abdominal region was not subdivided. The thoracic region, however, was separated into two chambers by a median membrane or sheath that stretched from the diaphragm to the body wall. A heart and two lungs were situated in each of the thoracic cavities. For the sake of clarity in description these thoracic cavities will be referred to as cavities A and B.

*Digestive system:* As previously indicated, there was only one mouth cavity. This cavity was apparently normal in every respect. An oesophagus extended posteriorly to the stomach, which was grown fast to the ventral side of the diaphragm.

The stomach was much too large to be a single organ. It probably



represented the fusion of two stomachs. There were two well defined cardiac regions and a single pyloric region.

Two complete livers were found, one of them on each side of the double abdominal cavity. Each liver was well developed although slightly compressed and somewhat unnatural in shape. But there was in each case a gall bladder, a complete set of bile ducts, an hepatic duct, cystic duct and a common bile duct. The common bile ducts from the two livers entered the single duodenum near its anterior end.

This duodenum and the jejunum intergraded so completely that it was impossible to determine where one ended and the other began. Their combined length was thirty-two inches.

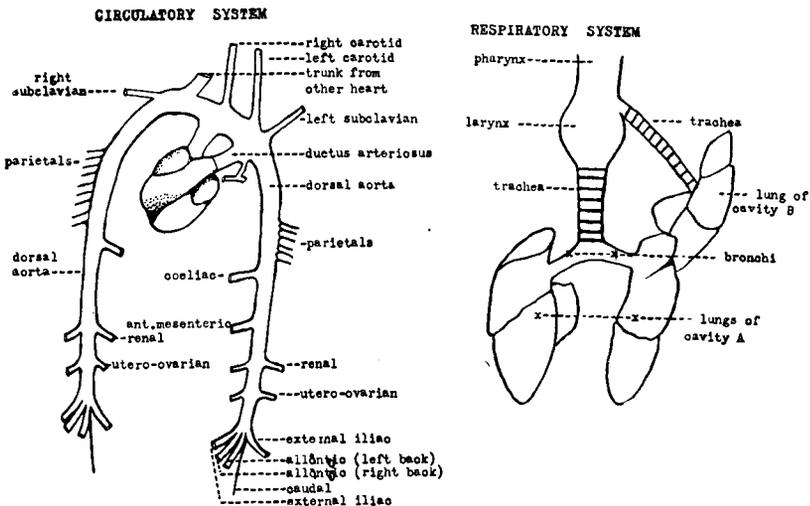
An irregularly shaped pancreas was found lying adjacent to the pyloric stomach. Its duct communicated with the duodenum.

At the end of the jejunum the intestine branched to form two ilea. A median caecum was located at the point of division.

Each ileum was about seven inches in length and was succeeded by a combined colon and rectum, the latter terminating at one of the anal openings. A caecum was located at the juncture of each ileum and colon.

The intestines were coiled together in a compact mass. The walls of the small intestine were highly vascularized, revealing the presence of approximately double the normal number of bloodvessels. As will be seen, the small intestine received the branches of two dorsal aortae.

*Circulatory system:* The heart in thoracic cavity A was examined



first. A remarkable divergence from the typical arrangement of the attached arteries was at once observed. There was a right aortic arch as well as a left arch. The left arch was the larger, receiving part of the blood from the left ventricle and all of the blood from the pulmonary trunk via the foetal ductus arteriosus. This left arch gave off two carotid arteries to the head region, a subclavian trunk to one limb of the left back, a coeliac artery, an anterior mesenteric artery, two renal arteries, two utero-ovarian arteries, two external iliac arteries to the hind limbs of the adjoining back, and two hypogastric arteries which continued into the umbilical cord as the allantoic or umbilical arteries. There were also some small parietal arteries.

The dorsal aorta on the opposite side, lying along what might be called the right back, received some blood from the heart to which it was attached in the capacity of a right aortic arch. But it also received the left aortic arch from the heart in thoracic cavity B. Its main branches were essentially similar to those of the other aorta except that the anterior mesenteric artery was absent.

The heart in cavity B was not normal in structure. Both auricles were on one side and discharged into the right ventricle. This did not interfere with the functioning of the left ventricle because the interventricular septum was not developed. A pulmonary trunk and a left aortic arch were brought together by the ductus arteriosus. The aortic arch gave off several branches including subclavians to the adjacent front limbs and carotids to the adjoining head and neck. Then the aorta penetrated the mid-thoracic septum and joined the right aorta on the other side as previously indicated.

The system of veins seemed to represent a simple compounding of the normal arrangement. Two postcaval veins ran forward from the posterior end of the abdominal cavity to the right auricles of the hearts. Renal veins carried the blood from the kidneys to the livers, a deviation from the normal condition in which the renal veins empty directly into the postcaval vein. There were large portal veins to return the blood from the intestinal region; one connected with each liver. One umbilical vein connected with each postcaval vein in the vicinity of the livers. Then there were two large hepatic sinuses, one emptying into each of the postcaval veins. The pulmonary veins were rudimentary. Each heart received the normal number of subclavian and jugular veins from the adjoining pectoral and head regions.

*Respiratory system:* The single mouth cavity was followed by a pharynx and a larynx. There were two tracheæ. One trachea was

attached to the posterior end of the larynx and after branching to form two bronchi communicated with the lungs in cavity A. These lungs had the usual form, although the apical and cardiac lobes of the left lung were fused and the intermediate lobe of the right lung was very much reduced in size.

The second trachea led from a point on the dorsal wall of the pharynx to thoracic cavity B where it connected with a single lung, the right. All of the lobes of this lung were well developed.

*Nervous system:* The brain differed from the normal structure in an interesting manner. The cerebrum consisted of three lobes instead of the customary two. There were also two cerebella, two medullæ and two spinal cords. The medullæ and spinal cords were attached to the lateral posterior sides of the brain and the spinal cords issued through two distinct foramina, widely separated from each other.

The spinal cords followed the spinal columns of the two backs. They were apparently normal in the manner of their branching.

A third median eye, or rather the eye of facial region B, was borne on a stalk which came from the optic chiasma on the ventral side of the brain. This eye was no doubt present because there was an extra cerebral hemisphere and consequently a third visual area in the brain.

*Urinary organs:* There were four kidneys, two to each back region. Each kidney was normal in structure and possessed the usual circulatory connections. There were four ureters, one from each kidney. The ureters of the right back led to the base of the bladder on that side and so communicated with the urethra and the exterior. The ureters of the left back were correspondingly related to the bladder and urethra on that side.

*Reproductive organs:* There were four ovaries, two to each back region. On each side the Fallopian tubes, uterus, vagina, urinogenital sinus and attendant structures were normally represented. It is interesting to note that both sets of reproductive organs represented the same sex.

*Glands of internal secretion:* A large thymus gland extended down from each neck region to cover the auricular ends of both hearts. These glands were normal in size and form.

A single spleen lay adjacent to the stomach. It was of the typical elongate straplike form.

A thyroid was located in the normal position in the neck adjoining thorax A. There was no thyroid in the neck adjoining thorax B.

There were four adrenal glands, one lying along the anterior inner border of each kidney.

*Skeleton*: The skull was modified at its posterior end, having two occipital regions and two foramina magna to accommodate the two spinal cords.

Posterior to the head region there were two separate and practically complete skeletons. The only observed modification was the absence of sterna, the ribs being loosely imbedded in the common body walls.

*Conclusions*: Such cases as this raise interesting questions as to the manner of their origins. Are they due to chromosomal changes or are they caused by certain unknown environmental factors? Are such abnormalities produced by a partial splitting of the embryo at an early stage of development? In the latter event would the splitting be the result of changes in the number, form, arrangement or quality of the chromosomes? Are such "freaks" predestined to die without leaving any similar descendants?

In this latter connection Walter <sup>4</sup> quotes Davenport (1909), as follows: "During the past four years I have handled and described over 10,000 poultry of known ancestry. Of striking new characters I have observed many, some incompatible with normal existence; others in no way unfitting the individual for continued life. In the egg unhatched I have obtained Siamese twins, pug jaws, and chicks with thigh bones absent. There have been reared chicks with toes grown together by a web, without toenails or with two toenails to a toe; with five, six, seven, or three toes; with one wing or both lacking; with two pairs of spurs; without oil gland or tail; with neck devoid of feathers; with cerebral hernia and a great crest; with feather shaft recurved, with barbs twisted and dichotomously branched or lacking altogether. Of comb alone I have a score of forms. All of these characters have been offered to me without the least effort or conscious selection on my part, and each appeared in the first generation as well-developed peculiarities, and in so far as their inheritance was witnessed, each refused to blend when mated with a dissimilar form."

Now some "freaks" obviously represent noninheritable variations for the simple reason that they do not survive for any length of time. Walter <sup>5</sup> seems to take the point of view that they are noninheritable in any event. If they are produced by abnormal embryonic environmental conditions this would be the natural conclusion. But if any of them result from definite chromosomal changes we might expect some of the not too greatly modified indi-

viduals to live to maturity and reproduce some of their strange characteristics in their offspring. Of course a good deal would depend upon the nature of the accepted definition of a "freak" if this point was raised in debate.

The specimen just reported on might possibly have lived to maturity if given proper care. It might even have produced offspring. At least, there was no observed anatomical condition that would necessitate an opposite conclusion.

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