ON THE

STRUCTURE AND THE HATCHING OF THE EGG OF THE COMMON FOWL.

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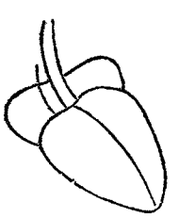
It has been already stated that the blood of the fœtal chick, which circulates in the membranes, runs towards the narrow end of the egg, and returns from the broad end to the chick. This peculiar course never varies, whether the chick be a male or a female, and in whatever position it may be placed. This circumstance indicates that the course of these vessels proceeds, not from any provision inherent in the primordium, but in the egg itself. What, then, is the cause of this particular arrangement of these vessels? We know that the egg is composed of parts peculiarly arranged and held together by a particular kind and amount of force, and that so long as this kind and amount of force exist, the egg continues in a state of integrity. We likewise know that the folliculus aeris is almost invariably situated at the broad end of the egg, and that this cavity progressively enlarges as the egg increases in age. We further know that the fœtal chick progressively approaches the folliculus aeris, that the glaire or albumen is progressively drawn towards, and taken from, the narrow end of the egg, and is the pristine and most important food of the fœtus. These circumstances indicate that the narrow end of the egg inherits a power which does not exist in its broad end, and that this power has an attractive influence; and hence that there exists in the egg either a polarity, or something of a polar nature, and that this polar influence is the probable cause of the peculiar arrangement of the bloodvessels, which ramify in the membranes of the primordium.

On the fifth day of hatching, the various structures of the chick already noticed are more fully developed. The rudiments of the toes are now recognised. At this period, the heart retains its actions for a longer period, when cold water is applied to the outer surface of the egg-shell, than on the preceding day, and these actions, when rendered quiescent by cold, can be reproduced by heat with greater facility.

At this period of hatching, the folliculus aeris is much enlarged, the yelk has a muddy appearance, and the colour of whey; the albumen lies under the yelk, and is so thick and tenacious as to appear like a firm jelly. The chick is fixed to the yelk and respiratory membrane by bloodvessels, and the respiratory membrane slides over the inner surface of the chorion, and hence enables the chick to lie uppermost in every position of the egg. The surface of the membrana vitelli, which lies uppermost, is not so vascular or so thick as its other parts, but the inner surface has throughout a beautiful reticulated appearance.

At this period of hatching, the auricles of the heart of the chick are not serrated at their margins, and the heart has the shape represented in figure 19.

Fig. 19.



On the sixth day of hatching, the chick is, with the exception of the abdominal opening, fully developed, and moves the several parts of its body, and the coccyx in particular, very frequently. The body lies nearer the folliculus aeris, and the albumen or glaire of the egg has a less muddy appearance.

At this period of life, reiterated experiments prove that when the actions of the heart cease to exist by cold, they can be reproduced by heat at 104° Fahrenheit, and that these reproduced actions are not so readily evolved, nor so long in duration, as on the preceding inquiries.

On the seventh day of hatching, the chick is much larger than on the preceding day. The walls of the thorax are now so thick and opaque, as to prevent the actions of the heart from being readily seen. The eyes are now completely formed.

The chick lies nearer the broad end of the egg, and is progressively approaching the folliculus aeris.

On the eighth day of hatching, the chick is about one inch in length, from the head to the tail, and lies under the folliculus aeris. It has still an opening into the abdomen.

The bloodvessel which passes from the chick towards the broad, and runs in the respiratory membrane towards the narrow end of the egg, contains blood of a bright scarlet colour; and the other bloodvessel, which runs from the chick in a contrary direction, contains blood of a dark vermillion hue, and pulsates. These circumstances are better recognised at this than at any former period of life.

The albumen of the egg is again perfectly transparent, and is much diminished in quantity. It is now placed at the narrow end of the egg, a very small portion of it being in contact with the chick.

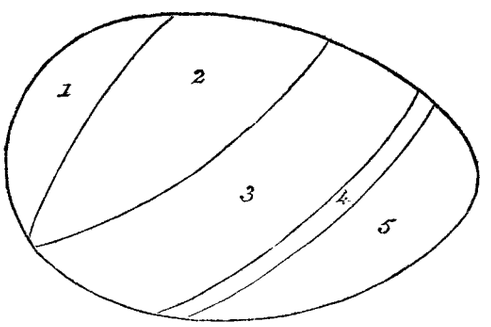
On the ninth day of hatching, the chick is more perfect in its several structures; a white limey spot is now seen at the point of its beak.

On the tenth day of hatching, the chick lies close under the folliculus aeris, at the broad end of the egg, and moves its head, wings, legs, in fact, its whole body, with facility; and from these motions the liquor amnii has an undulating motion similar to the ebbing and flowing of the tide, and to respiration. The cutis anserinus of the chick is now completely developed.

The albumen of the egg is now much less in quantity, has a pure amber colour, is more glutinous than in a new laid egg, and is placed at the narrow end of the egg. It seems to adhere to the membrana vitelli, and where it is adherent, the membrane has a lighter colour, and appears less vascular than at any other part; and between these parts, a dark-coloured and vascular portion of membrana vitelli, like a belt, is seen. The yelk of the egg does not, as yet, seem to have decreased in magnitude, and become less in quantity.

Figure 20 represents the relative positions of the parts now noticed.

Fig. 20.



1, Folliculus aeris. 2, Chick. 3, Yelk. 4, Belt. 5, Albumen.

On the eleventh day of hatching, the chick is about two inches in length, and has a ridge formed by the roots of feathers, extending from the crown of the head, along the spine to the coccyx. The chick now opens and shuts its beak very frequently.

Reiterated experiments prove that the actions of the heart are as much influenced by heat and cold as at any former period of life. At this period of life, I accidentally noticed that the body moved as if the animal breathed. This respiratory action is perhaps the motion recognised at the twenty-seventh hour of hatching. It is similar to the motion noticed in the gills of fish, and in the nymphæ of the dragon-fly.

On the twelfth day of hatching, the skin of the chick is covered with the roots of feathers, and surrounded with liquor amnii, which is clear and colourless. The yelk of the egg is not apparently the least diminished in magnitude, but is very soft to the touch, and is somewhat of a fluid consistence.

On the thirteenth day of hatching, the chick is thickly covered with feathers. The albumen of the egg is now about the size of two kidney-beans, and is quite transparent. The yelk, when its membrane has a whiter colour than its other parts, has a wheyish colour.

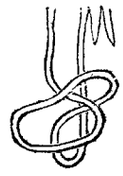
Several white, flaky substances, of an earthy or limey nature, are now seen lying in the folds of the membranes. These white substances increase progressively in size and number, and become more consistent as the chick advances in age. But more of this hereafter.

On the fourteenth day of hatching, the chick lies embedded, as it were, in the yelk, which has not, as yet, diminished much in magnitude. The albumen, on the contrary, is small in quantity. The amniotic fluid is likewise much diminished in quantity, and, when mixed with cold water, it makes the water muddy. The blastoderma is now the largest membrane

in the egg, and has the shape of a double nightcap, with the contents of the egg lying into its duplicature. Its external portion constitutes the respiratory membrane.

A convolution of intestine, about two inches long, now hangs out of the abdomen of the chick, and has two short diverticula lying before it, as represented in figure 21. This intestine has the artery of the respiratory membrane passing behind, and the vein before it.*

Fig. 21.



On the fifteenth day of hatching, the albumen of the egg is about the size of a cherry, and lies, as already stated, at the narrow end of the egg.

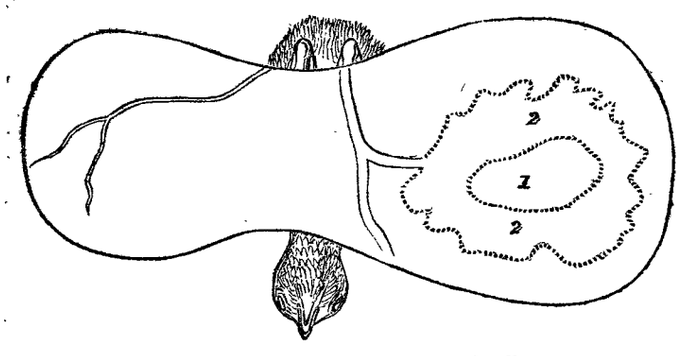
When we, at this period of hatching, put an egg into cold water, and stop the actions of the heart of the chick, and afterwards restore these actions by the gradual application of warm water, we notice that the membrana vitelli corrugates into folds in the cold, and dilates and becomes smooth in the warm water. This circumstance was noticed in the description of the anatomy of the egg.

At this period of hatching, the abdominal opening of the chick exhibits the same appearance as described on the preceding day. The two diverticula already noticed are now each about one-eighth of an inch in length.

On the sixteenth day of hatching, the chick extends from one end to the other of the egg, and is completely covered with feathers. It lies across the yelk, as represented in figure 22. The yelk still retains its original size, but is apparently in a semi-fluid state.

At this period of hatching, the chorion is easily separated into five laminæ, and has a more opaque white than at any former period. The respiratory membrane is readily detached from the chorion, and the liquor amnii has a slight muddy appearance, (this appearance is perhaps accidental, for it is not invariably seen.) On the surface of the yelk, a small quantity of albumen is seen adhering to its surface, and around this albumen the surface of the yelk has a wheyish colour, as represented in the following figure, and nowhere else.

Fig. 22.



1, Albumen. 2, Whey-coloured yelk.

On the seventeenth day of hatching, the albumen of the egg is not one-third the size it exhibited on the preceding day; but the yelk does not appear diminished from its original magnitude. It is, however, very soft to the touch. Large flakes of whitish earthy or limey matter, at first recognised on the thirteenth day of hatching, are now seen lying under the respiratory membrane, and above the bloodvessels which pass from the umbilicus of the chick. These limey flakes have no communication with the intestines of the chick, and hence do not proceed, as Harvey states, from that canal. They seem to be produced from the liquor amnii.

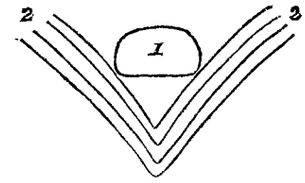
At this period of hatching, all the intestines are drawn into the cavity of the abdomen, and the umbilical opening is now about a quarter of an inch in diameter.

On placing the egg with its contents in cold water, a quantity of air is recognised under the respiratory membrane.

On the eighteenth day of hatching, all the albumen of the egg has disappeared, and the size of the yelk is now considerably diminished. Its whey-coloured portion is situated farthest distant from the abdominal opening of the chick, and the yelk itself is drawn close to that opening, and has its membrane corrugated, as represented in fig. 23. The bloodvessels of the respiratory and the other membranes enter the abdomen of the chick behind the yelk.

The white flakey matter is now very much increased in quantity, and the liquor amnii is proportionally diminished.

Fig. 23.



1, Umbilical opening.
2, Folds of the membrana vitelli.

On the nineteenth day of hatching, the egg-shell separates from the chorion with great facility, and the inner surface of the latter is soft and dry, like the cuticle of the human skin. The folliculus aeris is now very large, and the chick so much increased in size, as to occupy two-thirds of the cavity of the egg-shell. The yelk which fills up the other third of the cavity is now about half its original magnitude, and lies close to the umbilical opening of the chick, which it seems to fill up. The limey matter, already noticed, is now much increased in quantity, and lies chiefly at the narrow end of the egg. Very little liquor amnii is now seen, and no air can now be discovered under or between the membranes.

On dissecting a chick at this period of hatching we discover a thin and clear mucous fluid, extending from the mouth along the œsophagus to the crop, where it becomes thicker in consistence, and has a dirty cream-colour. This thick mucus passes from the crop to the stomach, where it becomes curdled, and assumes a whiter colour. At the pyloric orifice of the stomach this curded matter becomes more fluid, and in the duodenum is mixed with bile. It then has a yellow colour, and passes along the alimentary canal, and in its course becomes more fluid. It does not, however, extend as far as the rectum, for that viscus is entirely empty.

This dissection proved that the illustrious Harvey was in error respecting the limey flakes, already noticed, being the feculent matter of the chick.

On the twentieth day of hatching, the chick removes its head from between its legs, forces its beak into the folliculus aeris, and begins to breathe and chirp. The yelk of the egg has now disappeared, and is lodged within the abdomen of the chick, and gives to it a large appearance. The bloodvessels of the respiratory membrane are, however, still as large and numerous, and as replete with blood, as at any former period.

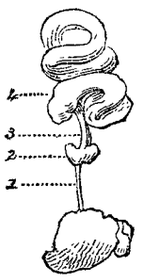
About the beginning of the twenty-first day of hatching, the chick bursts the egg-shell, and escapes from its fœtal habitation. Its umbilical opening being now closed up, and the trunks of the allantoid vessels obliterated, nothing remains in the shell but the membranes and the limey flakes.

On dissecting a chick at this period, we find the yelk of the egg lying in the cavity of the abdomen, having the stomach and the greater portion of the intestines lying before it, the liver a little above its anterior part, a fold of intestine with the two diverticula already noticed above, and extending behind it. The yelk is about the size of a large Windsor bean, is enclosed in its capsule, which is very vascular, and is fixed by three bloodvessels, and to the umbilicus, in the following manner:—One bloodvessel runs from its inferior and posterior part to the posterior part of the spine, and joins the aorta. Another bloodvessel runs to the surface of the intestines, then through the mesentery to the inferior surface of the liver, and terminates in the vena cava. The other bloodvessel, which is the largest of the three, runs from the posterior and inferior part of the yelk, over the posterior surface of the stomach, then between the lobes of the liver, and terminates in the vena cava. Between the two bloodvessels which terminate in the vena cava, the gall-bladder is situated. The attachment to the umbilicus is by ligament formed from the obliterated bloodvessels.

The yelk in the abdomen, on the second day of life, is about the size of a small Windsor bean. On the third day it is about the size of a large field-bean; on the fourth day, it is about the size of a small field-bean; on the fifth day, it is about the size of a green pea, and has a lobulated shape; on the sixth day, it is about the size and shape of the following figure—

* Dr. Harvey says, "about this time the chick has a huge belly, as if it laboured of a hernia."

Fig. 24.



4, Intestines.
3, Tube or ligament to the intestines.
2, Yelk.
1, Umbilical ligament.

the umbilical ligament being about half an inch in length. On the seventh day, the yelk is still smaller in size, and has something of the same shape; its umbilical ligament is now about a quarter of an inch in length. On the eighth day, the yelk has nearly disappeared, and its bloodvessels become ligamentous; for these vessels undergo similar changes to the yelk.

Beyond the eighth day of life I did not carry my inquiries; but from what is stated in the *Philosophical Transactions* for 1822, p. 377, it seems that the yelk does not disappear entirely before the sixteenth day of life.

About the third day of life, we notice a tube, or something like a tube, extending from the yelk to the intestines, about half an inch in length. This tube probably exists at a much earlier period of life; but its textures are so delicate, that I was unable to discover them before this period. The tube is very conspicuous on the seventh day of life, and seems to give passage of the yelk to the intestines.

The stomach of the chick is very large on the first and second days of life. On the first day it contains a curdy substance, enclosed in a thin, delicate membrane. On the second day this substance is completely digested, and replaced with grains and small stones.

On the second day of life I drowned a chick, and five hours after death I exposed the heart, and on pricking its surface with the point of the scalpel, I noticed that the ventricles had a slight, and the auricles a strong, contracting and dilating power still existing in them. I likewise noticed that the pulmonic auricle and pulmonic ventricle had a greater amount of moving power in them than the cavic auricle and aortic ventricle. Fourteen hours after death I repeated these experiments, and noticed that the ventricles had lost all their moving power, and that the auricles still retained that power, but in a very slight degree,—another proof that each cavity or viscus of the heart has an action of its own.

At this period of life I drowned several chicks, and soon afterwards endeavoured to restore them to life by warm air, and by water heated to 104° Fahr., but was unable to succeed in my object.

During this investigation, I tried the following experiments:—

I placed a number of fecundated eggs under a clucking hen, when the moon was at her full, and noticed that these eggs were hatched about twelve hours sooner than eggs set under a hen at any other period of the moon's age.

I placed a number of unfecundated eggs under several clucking hens, and after allowing them to remain under the hens, some thirty, some thirty-five, and some thirty-eight days, I examined them, and noticed that no change had taken place in any of them, except a loss of weight. I then employed these eggs in making custards and puddings, and discovered that they were as fresh and sweet as new-laid eggs.

Unfecundated eggs are less liable to become addled than fecundated eggs.

Being unable to procure any double-yelked eggs, I can make no remarks upon them.

An egg loses about one-sixth of its weight during incubation.

I took several eggs which had been under clucking hens, five, six, ten, thirteen, and twenty successive days, and weighed each of them when warm. I then exposed them to the air for several hours, and when cold, weighed them again. I then placed them for one minute into boiling water, and weighed each of them when hot, and after they had become cold I again weighed each of them, and found that the weight of each egg never varied, dead or alive, hot or cold.

From what has now been stated, the following conclusions may be entertained:—

That a certain amount of heat causes the vital entity to unfold all the organs and textures of the body, and afterwards to perform their respective functions.

That this amount of heat coincides with, and, in fact, constitutes, the temperature of the blood of the producing and produced animals, and is the energizing agent in their economy.

That the several organs and textures of the body are progressively unfolded, of which some are unfolded prior to the existence or development of any action in the *punctum saliens* or heart, and others subsequent to that development.

That the several structures—solids and fluids—of the body owe their production and existence, not to the influence of any particular structure or function, but to the energized condition of the plastic principle inherent in the vital agent.

That the red particles or colouring matter of the blood owe their or its production and existence, not to anything inherent in or belonging to the egg, but to the energized condition of the vital agent. And from what has been quoted from the writings of Berzelius, Bostock, and Prout, we may infer that several other kinds or properties of matter existing in the animal economy owe their production and existence to the same influence or condition.

That heat modifies or changes the structures and functions of an animal invariably according to the amount existing in, or applied to, the surface of its body, and, consequently, that heat above or below the natural temperature of an animal, will produce corresponding changes in the composition of its body, and hence cause either an increase or diminution, suspension or destruction, of the vital functions.

That when cold suspends, but does not annihilate or destroy, the vital functions of an animal body, the several structures, solids and fluids, continue in a state of integrity, and the suspended functions can or may be reproduced or restored by heat corresponding with the natural temperature of the body.

That this reproducing or restoring power of heat exists in a greater degree during the generating process of the body than at any other period of its existence. And that although heat is merely the energizing and not the vital agent in the animal economy, a knowledge of its laws is of the utmost importance in the practice of medicine and surgery.

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Erratum.—Page 380, col. ii. line 36, *for* "connected," *read* "converted."

ON THE

OBSERVANCE OF METHOD IN CONDUCTING POST-MORTEM EXAMINATIONS,

ESPECIALLY WHEN THEY ARE INTENDED FOR LEGAL PURPOSES.

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A very slight acquaintance with the practice of our criminal courts is sufficient to point out this very prominent fact, that of all classes of persons who may be called upon to give evidence, medical men generally cut the worst figure. They are so undecided in their manner; have always omitted so many important points of the inquiry; are accustomed to rely so thoroughly on the opinions of others; and, in short, give their testimony with so much qualification and confusion, that they are looked upon as a prominent and an easy mark for the very worst advocates. Now, the secret of all this appears to lay in one or other of three great deficiencies, as—1st, a want of a good medical knowledge; 2nd, a want of method or system in conducting the inquiry; or 3rd, a want of caution in forming an opinion, and of steadiness in asserting it. Omitting the first of these, which is, unfortunately, a far too frequent cause, but which cannot be discussed here, then the second assumes the greater importance, for it is out of this want of method that the third is sure to flow; it begets incaution and uncertainty in the manner of the witness, and is suggestive of all the subtlety and misconstruction with which the case is sure to be surrounded; and if it does not beget, it will favour, the development of the other bad but plausible elements of jurisprudence.

I have more than once seen a good and a clear evidence broken into pieces, and made altogether worthless, because the observance of some little point, remote enough in the inquiry, had been omitted. Let me take an instance:—A man dies suddenly, and circumstances seem to show that he had been poisoned; the medical attendant does not entertain a doubt upon the question; he had, in fact, made up his mind before the body was looked at, and, to his thinking, there was no necessity for examining the head, or the spinal cord, or even the heart, beyond taking a glance at its position. When, therefore, he gets to be questioned in the witness-box, he is com-