Development of Beak in chicken embryo

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ABSTRACT

The beak in chickens is a common organ between the two systems (digestive and respiratory). The beak consists of two parts, an inner bony part, and an outer, leathery paired part with flat cells strongly connected to each other. 60 fertilized eggs were collected and divided into two groups, with 30 eggs for each group. The eggs were then placed in the incubator at a temperature of 37°C for a period of two weeks and samples were taken for histological study. The results showed that the beak consists mainly of the ectoderm, but the rest of the layers participate in its composition as well, where the beak developed into two parts in the first week of incubation of chicken eggs.

Keywords: Beak, respiratory system

Introduction

The beak in chickens is an organ shared between the digestive system and the respiratory system. The embryonic digestive system consists of 3 layers called ectoderm, mesoderm, and endoderm, which lead each of the previous layers to develop a specific part of the digestive system, according to the following method : (1)

Mesoderm: tissue in the wall of the intestinal tube and smooth muscle cells develop from it.

Endoderm: the lining layer of the digestive system develops, as well as the liver, gallbladder, and pancreas.

ectoderm: the nervous system, nails and hair develop from it, as well as the formation of neural cells in the cells of the digestive system organs.

The digestive system consists of the digestive tube, which is divided into three sections, and these sections include : (2):

Foregut: From which organs develop from the mouth, esophagus, stomach, liver, and pancreas.

The midgut: From which the intestine develops.

The hindgut: from which the rectum and the outlet opening (the cloaca) develop

The outer covering of the beak is called rhamphotheca, which is a hard horny covering in most species of birds. It is noted in some bird species a change in the hardness of keratin to a membranous tissue adjacent to the forehead region, while the region of the richus mouth includes a shift from the hard cornea to the soft corneal skin tissue. (3)(

The beak consists of two parts, a bony inner part, and a paired outer, leathery part with flat cells closely connected to each other. This layer in birds takes the form of bone and forms a number of plates, knobs, or ridges depending on the nature of the bird's feeding. (4)(

The epidermal layer consists of a basal layer with broad and long cells and contains in this layer the epidermal papilla, which is believed to increase the rigidity of the organ. As for the rest of the layers, which are the middle, transitional and stratum corneum, they are very thick. (5)(

The dermis occupies the space between the epidermis and the periosteum, and is thick and similar to the dermis in the rest of the regions, except that it does not want subcutaneous tissue in relation to the beak. The ramfuthica are strong and solid bundles of horny cells, and these cells secrete beta-keratin. And that calcium salts are deposited in the cytoplasm of the cells of the ramphothica layer between the keratin protein to add strength and hardness to the beak. The strong contact of the dermis with the bone gives the beak rigidity. (6)

Materials and methods

This experiment was conducted in the laboratories of the College of Education for Pure Sciences during a period from 9/15/2020 to 12/20/2020. 60 fertilized eggs were collected from local drivers and divided into two groups:, Group No. (1): it contained 30 eggs, which is a group the control.

Group No. (2): It contained 30 eggs, which represents the experiment group.

The eggs were placed in the incubator at a temperature of 37 °C for a period of 15 days, and the eggs were monitored during this period by means of a photodetector (7). During this period, the sample was taken from the embryos for histological study, according to the method. (8)

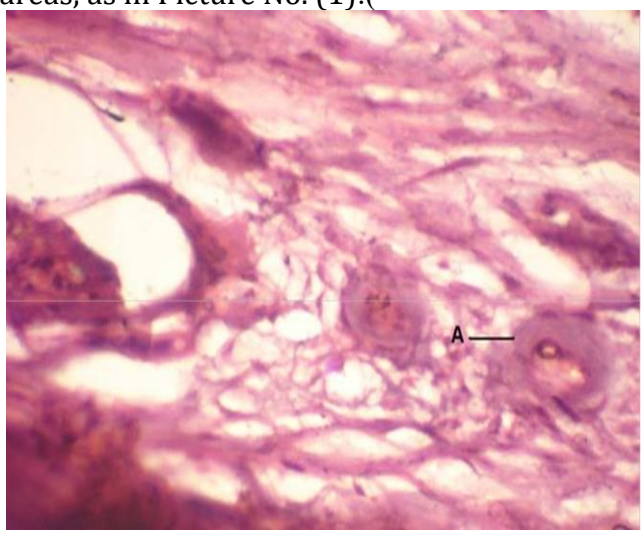
Results

It was noted through the macroscopic study that the beak consists of two parts, upper and lower, and the edge is sharp to adapt to the living environment of the chicken, and in this way it helps the bird to catch food

Histological study of the beak showed that it consists of bony tissue covered by a layer of keratinized tissue

Rhamphotheca, the epidermis contains a very thick stratum corneum, with

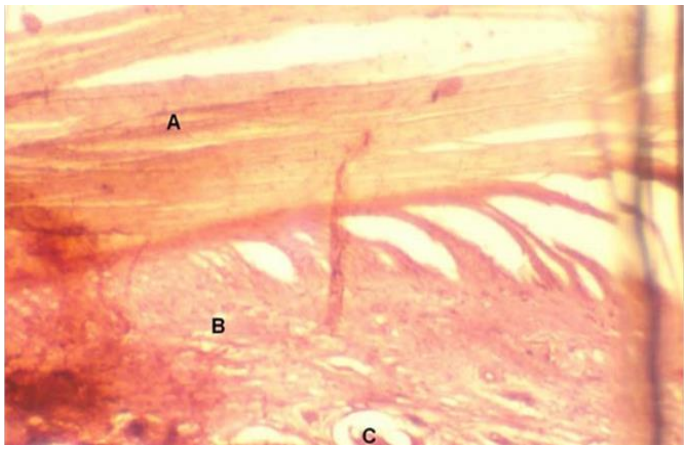
Thick keratin is of a solid type that remains cohesive with the skin, unlike the rest of the areas, as in Picture No. (1).(



Picture No. (1) A cross section of the chicken beak and notes the beginning of the composition.

Either the dermis of the beak occupies the space between the epidermis and the periosteum of the outer bone and is formed

It is made of dense connective tissue, and the dermis contains nerve bodies called Herbst bodies Sensory nerve endings surrounded by connective tissue as in Figure (2



Picture No. (2) A cross section of the chicken's beak. The arrangement of the layers and the composition of the beak where it appears

A) stratum corneum

B) Generated layer

C) Neuronal layer (Herbst bodies(

Discussion

The chicken embryo is the preferred model for tracing the genesis and formation of the organs of vertebrate embryos, and it has been used in many fields of scientific research and education since a long time, beginning with Aristotle, who described the chicken embryo in all its growth (9). It is relied upon in monitoring and experimentation during growth and the stages of organ formation without the birth female suffering any harm. This is why it is considered a major source when studying mammalians (10)(

The beak is one of the organs of the digestive and respiratory systems, and it is very important in feeding birds, and its shape varies from one bird to another consistent with (11) The beak in chickens consists of two parts, the hard part and the soft part, and this was confirmed by (12) the beak develops from the ectoderm at the basic level But its formation is shared by the mesoderm and endoderm, and this agrees with (13) the formation of the beak begins in the form of simple cartilage, then it develops into a solid beak, while the soft part remains and does not harden, and this is consistent with (14) the development of neurons begins in the form of assemblies called herbst bodies in This last layer agrees with (15).

Conclusions

The beak is a common organ between two systems (the digestive system and the respiratory system.(

The beak consists of two parts, the hard beak and the soft beak

The ectoderm, endoderm, and mesoderm participate in the formation of the beak

The beak appears in chickens during the first week of incubation of chicken eggs

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