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The Observation of 3 Developmental Stages of Chick Embryos Using Compound Microscopy

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ABSTRACT

Chick embryo development is a very complex process. Microscopy observations is the one way to understand what occurs in the egg. This paper explores microscopy visualisations of chick embryo development across a 72 hour period.

KEYWORDS: Brain Structures, Gut, Beating Heart, Yolk, Avians, Mammals, Chick.

Chick embryos are easy to visualise. However, they are perhaps the most difficult to study under the microscope, with regard to their development. Often in biology, chick embryos are studied at 3 stages. These stages are represented by hours, often across a three day period. In the laboratory, at the University of KwaZulu-Natal in Durban, chick embryos were observed during a practical session. The observations were made from glass slides that were views at 4x objective, as the embryos viewed were at 24, 48 and 72 hours of development (UKZN, 2019). Embryo development for the chick begins in the egg, provided optimum warm conditions are provided. The first division within the egg occurs within 24 hours. However, the systems that develop for the developing chick differ across the 72 hours (Singh, 2019). These systems are the circulatory system, cardiac system, nervous system as well as the gastrointestinal system. In the 24 hours embryo, the three brain structures that are prominent are the pro-encephalon, myelincephelon and the mesencephalon (Watt *etal*., 1993; Singh, 2019). Also, another distinct feature of the 24 hour embryo is the presence of 3 - 5 pairs of somites. In addition, the neural groove which results in spinal cord also develops (Sellier*etal*., 2006; Watt *etal*.,1993; Singh, 2019). An important fact that must be noted for the 24 hour embryo is the fact that the cardiac system is underdeveloped, and therefore, a beating heart is not an important feature at this stage (Singh, 2019). After 48 hours, the developing chick embryo is seen as having a beating heart. At this stage of development, the ottic and optic systems are also seen as being developing (Watt *et al*., 1993; Singh, 2019). The somites are found to be available in a greater number compared to the 24 hour embryo. The spinal cord is still visible, and the head structures such as the metencephalon, diencephalon and mesencephalon are well developed (Watt *etal*., 1993). During the stage of development, the head is found to be a little folded. At the 24 hour stage, the embryo lacks a distinct head, and this 'head' isn't well depicted at that stage (Singh, 2019). Furthermore, another distinct feature at the 48 hour embryo is the presence of the tail, and a distinct backbone (Watt *etal*., 1993). After 3 days, however, the somites and all 5 heads and/or brain regions are well developed (Watt *etal*., 1993). There is also a robust spinal cord and the embryo appears to be folded on its side. In contrast to the 24 hour embryo, when the epidermal cells push upwards to form the head region and the start of the gastrointestinal system, at the 72 hour stages, this is no longer observed (Singh, 2019). Furthermore, the ottic and optic systems are well developed. In addition, to the gut being developed, the tail region is more

robust. Furthermore, the hindlimbs and forelimbs are also well developed. Throughout the 24 hour period within the egg, there is a network of blood vessels that connect the developing embryo, so that the embryo can grow and become a chick (Singh, 2019). Each region of the embryo is formed by either the endoderm, ectoderm and mesoderm. The intestine or gastrointestinal tract is formed by the endoderm, whereas, the skin, for example, is formed by the ectoderm and mesoderm (Sellier*etal*., 2006; Watt *etal*., 1993). The mesoderm also forms part of the integument and the internal organs of the embryo, while the ectoderm gives rise to the nervous system tissues and the integument outerlayer (Watt *etal*., 1993). A unique structure known as the allantois is found in avians and not in mammals. This structure is found in avians because again development begins in the egg which is enclosed. The allantois forms part of the gaseous exchange system and a route through which waste is excreted. The allantois is not required in mammals because this function is performed by the placenta in pregnant females. The placenta houses the developing embryo, and the waste is excreted by the pregnant females from the placenta (Singh, 2019). In the chick egg, after 18 - 22 days, the fully developed chick emerges.

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Rishan Singh is a biologist based in the province of KwaZulu-Natal in Durban, South Africa. He has published widely in the plant sciences. During the early phases of his career, his research focussed on the physiology of plants. He has had several career transitions as a biologist. At the University of KwaZulu-Natal and the Durban University of Technology, he has had some teaching responsibility in addition to laboratory exposure with students. He has enjoyed scholarships from the South African National Research Foundation and a private institution in South Africa. His science contributions have varied over the years, and have encompassed many disciplines. He has also published English literature.