

# CORRELATION BETWEEN DEVELOPMENT OF CHICK AND TEMPERATURE

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**Abstract:** This present study aims to see the effect of temperature on the overall development of chick. The two days old chick embryos was exposed to the various temperatures *i.e.* 4°, 20°, 37° and 50° C for two days and then blastula was taken out by window preparation method. Embryos were fixed using fixatives. Then embryos were stained to study the growth. The stained embryos were observed under the microscope for any morphological or developmental changes. The study also throws light on the morphology and growth of chick, which tremendously slows down when kept at low temperature *i.e.* 4°C and 20°C, whereas when embryos were kept at high temperature the growth was totally retarded. Normal growth was observed at 37°C.

**Keywords:** Chick, embryo, temperature, development.

## INTRODUCTION

The vast majority of poultry hatching eggs are artificially incubated in incubators that must be designed to accurately control the temperature inside the machine to ensure that the temperature of the developing embryo does not deviate from this optimum.

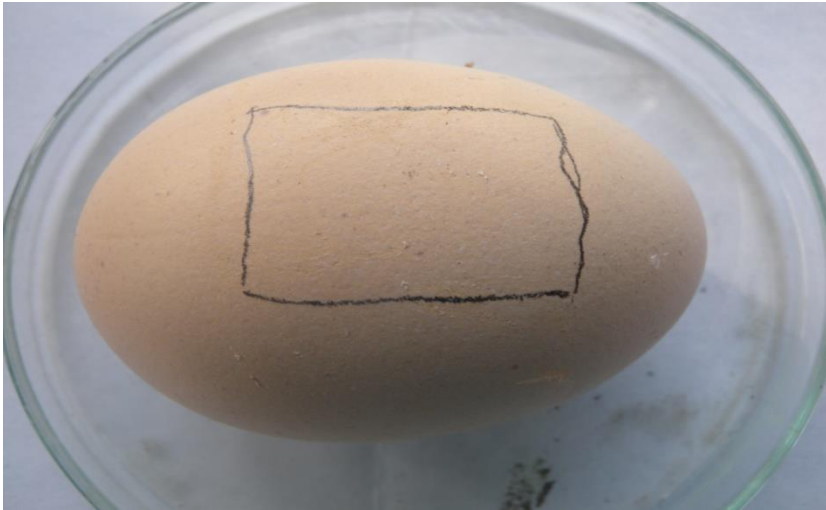
The temperature experienced by the developing embryo is dependent on three factors: Incubator temperature, ability of heat to pass between the incubator and the embryo, metabolic heat production of the embryo itself. The purpose of this study is to use a simple thermal energetic model of the artificial incubation process to describe the interrelationships among the three factors that determine embryo temperature. After incubation the growth of the embryo was studied by window preparation method ( Zareen and Shahid, 2011).

Studies on the effects of incubation temperature on embryo metabolism have been reviewed by Deeming and Ferguson (1991). As temperature changes, so does the oxygen consumption of the embryo and, hence, its heat production. Avian embryos for the majority of the incubation time are poikilothermic and therefore do not increase their metabolic heat. Tazawa *et al.* (1989) showed that at about 18 days of incubation the chick embryo could maintain oxygen consumption when temperature fell from 38° to 35° C but as temperature decreased further, oxygen consumption then declined. These workers also investigated the effect on oxygen consumption by varying temperature either during the second and last third of incubation or by using a lowering temperature regimen. Although temperature changed growth rate, oxygen consumption per unit of dry embryo mass remained the same. Contrary to the above observation, a study by Geers *et al.* (1983) showed that temperature could affect oxygen consumption per unit of dry embryo mass. These workers incubated chicken eggs for the first 10 day at either 35.8° or 37.8° C and then subsequently at 37.8° C. Although the cool incubator temperature reduced early embryo growth rate, once the cool embryos were returned to normal temperature at 11 day they grew faster than the controls, confirming observations in an earlier study (Geers *et al.*, 1982) that embryos can exhibit compensatory growth. The faster growth in the cool treated embryos resulted in a higher metabolic heat production per unit dry embryo mass. Studies also discussed the effect of acute temperature on the functioning of chick heart (Vostarek *et al.*,2016).

## MATERIALS AND METHODS

- **Procurement of Eggs:** Fertilized eggs were obtained from Department of Animal Husbandry, fisheries Central Poultry Development, Industrial area, Chandigarh.
- **Instruments required:** An egg incubator set at 37°C, Water bath (oven) set at 50°C, Refrigerator set at +20°C and another one at 4°C.

- **Experimental Design:** Two day old chick embryos were used for the experiment. Eggs were divided into four groups, each group having two eggs. After that, each group of eggs were placed at different temperatures *i.e* 4°, 20°, 37° and 50°C for 48 hours. Size and external morphology was carefully observed under dissection microscope. Embryos were taken out by window preparation method (Fig. 1) (Zareen and Shahid, 2011).



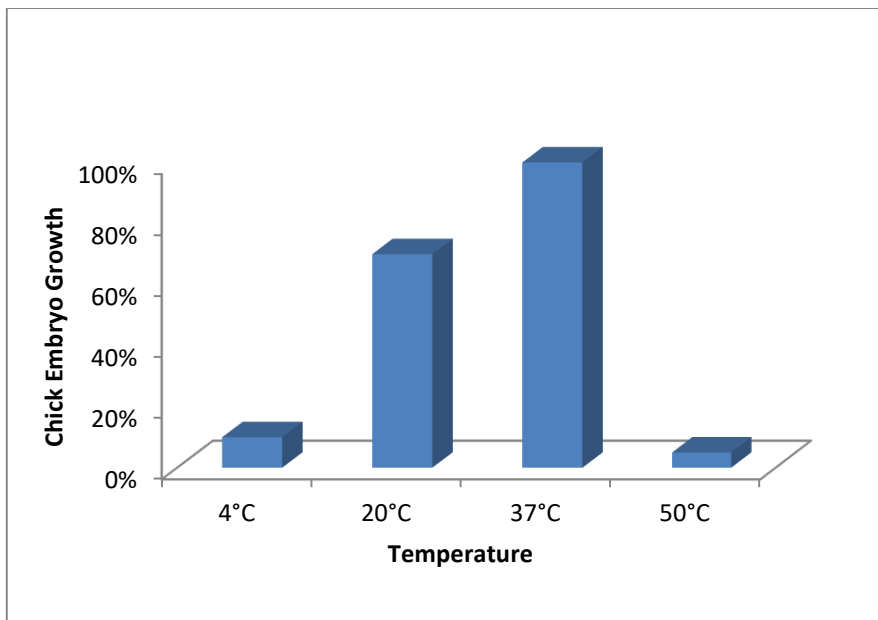
**Fig1: Window Preparation of an egg**

## RESULTS AND DISCUSSION

The results clearly showed the effect of different temperatures on the development and morphology of embryo. After keeping embryos for 48 hours at different temperature the results obtained are summarized in Table 1 and Fig. 2, 3, 4, 5 and 6.

**Table 1 showing results after incubating chick embryo for 48 hours at different temperatures.**

Groups according to temperature	Results after 48 hour incubation
4°C	Embryo showed shrinkage and growth arrest
20°C	Embryo showed delayed growth
37°C	Embryo showed normal growth and morphology
50°C	Embryo got totally retarded and damaged

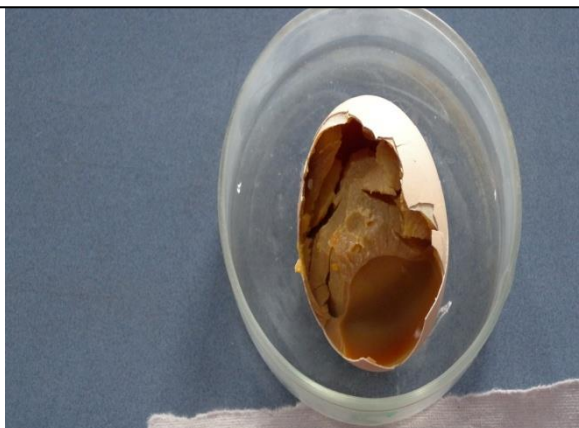
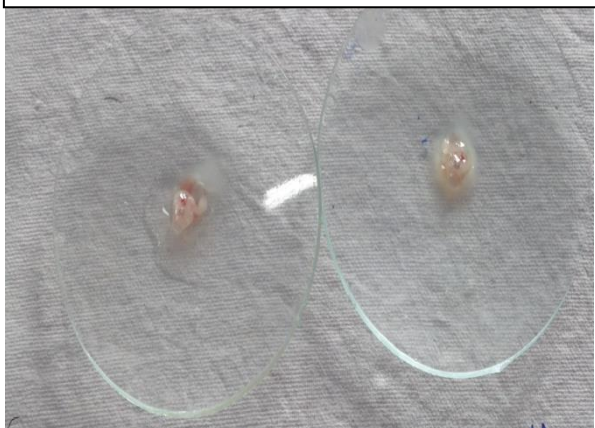


**Fig. 2. Histogram showing effect of different temperatures on chick embryo growth**

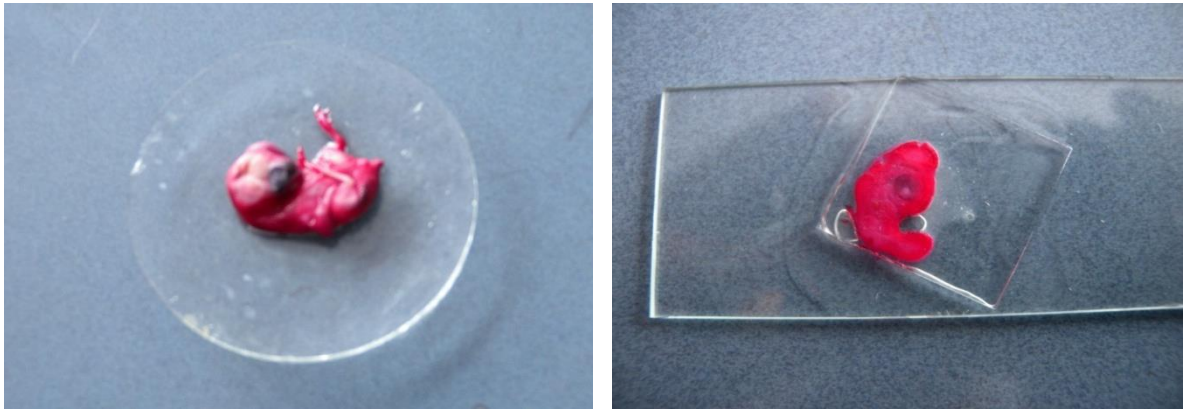
After taking out the embryos, the embryo were washed in normal saline, fixed in Bouin’s fixative. The fixed embryo were then stained with the dye *i.e.* acetocarmine dye and then mounted with the DPX to observe under microscope as shown in Fig 7 and 8.



**Fig. 3. Egg at 4<sup>0</sup> Celsius shows Shrinkage of Embryo      Fig. 4. Egg at 20<sup>0</sup>C shows delayed growth**



**Fig. 5. Egg at 37<sup>0</sup> C shows normal growth      Fig. 6. Egg at 50<sup>0</sup> C shows totally damaged embryo**



**Fig. 7.** Embryo stained with dye acetocarmine **Fig. 8.** Embryo mount with the DPX to observe under microscope

## CONCLUSION

The development of an embryo is dependent on the incubation temperature, the metabolic heat production of the embryo and the thermal conductance of the egg and the surrounding air. This study confirms that 37°C incubation temperature has been found to be optimum temperature as embryo at this temperature showed normal growth.

The study also throws light on the morphology and growth of chick, which tremendously slows down when kept at low temperature *i.e.* 4°C and 20°C, it was probably due to less of oxygen available resulting in slowing down of growth whereas when embryos were kept at high temperature the growth was totally retarded. The study also shows that the growth of chick embryo was temperature sensitive.

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