Journal of Applied Biological Sciences 5 (2): 21-22, 2011
ISSN: 1307-1130, E-ISSN: 2146-0108, www.nobel.gen.tr

# The Effects of *in ovo* Glucose Administration on Hatching Results and Subsequent Blood Glucose Concentration in Newly-Hatched Chicks

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**Received:** January 24, 2011
**Accepted:** February 10, 2011

**Abstract**

The aim of this study was to investigation the effects of *in ovo* administration of glucose on hatching traits and blood glucose concentration in newly- hatched chicks. Six hundred fertile eggs were divided to four groups; 1) control (without injection), 2) group including 0.5 ml deionized water (sham group), 3) group including 0.5 ml glucose %15 in deionized water, 4) group including 0.5 ml glucose %20 in deionized water with three replicates per treatment and 50 eggs per replicate. After hatching, hatching traits and blood glucose concentration was determined. Results showed that group glucose %15 and group glucose %20 as compared with groups control and sham group had significantly higher blood glucose concentration and the weight of newly-hatched chicks. Control group than other groups had significantly higher percent of hatching, but there were no difference between experimental groups of glucose injection and sham group. Data Suggest, *in ovo* injection can be reduced hatchability and increase mortality in hatch period.

**Keywords:** *In ovo* injection, glucose, hatching traits, newly-hatched chicks

## INTRODUCTION

Glucose is the major energy source of living organisms [1]. Maintenance of glucose homeostasis during few days pre- and post- hatch is a great challenge in a chick's life. The frequent activity of embryos implies a large amount of energy consumption, and an increased glucose demand for fuel [2]. The primary source of glucose needed for hatching is depend on liver source and gluconeogenesis from protein reserves of amnion and muscle. Glycolysis rather than fatty acid oxidation is needed at hatching to provide energy as oxygen supply is limited during the transition from chorioallantois to pulmonary respiration [3]. Hence, the shortage if energy drives of critical body resources (primarily muscle) to provide the energy needed for maintenance, causing decreased body weight, pectoral muscle mass is reduction and organ weights is declining [4]. Therefore, at end of incubation and at first few post- hatching days are a critical period for survival and development of late-term embryos and neonates in poultry because of considerable energy catabolism. Glucose storage as glycogen was demonstrated to be very important energy resource in maintaining the normal metabolism and body growth during pre and post hatching days [5]. It has been observed that *in ovo* feeding of carbohydrates into the amnion increase hatchling weight in broilers and turkeys [6]. Owing to the importance of *in ovo* feeding and its role in improving the hatchling weight, a study was undertaken to examine the effect of in ovo injection of glucose on the hatchability characters in broiler breeder eggs.

## MATERIALS AND METHODS

This study was carried out in Poultry Educational and Research Center of Islamic Azad University, Shabestar branch, from 2 July to 29 September 2010. Six hundred fertile eggs used in the experimental were obtained from broiler breeder flock (Cobb-500) at 27 weeks of age. The eggs with 60 ± 1 g weights were incubated at 37.9 °C and %62 relative humidity. Then, the eggs were divided to four groups; 1) control (without injection), 2) group including 0.5 ml deionized water, (sham group), 3) group including 0.5 ml glucose %15 in deionized water, 4) group including 0.5 ml glucose %20 in deionized water with three replicates per treatment and 50 eggs per replicate. Purified glucose was purchased from Merck® (Item Cat.No.1 08337.0250). The injection (*in albumen* injection) was carried out on 7th day of incubation after candling and detection of live embryos. The control group was kept in the same environmental conditions during treatments. After hatching, hatchability was calculated by considering the ratio of chicks hatched to the mortality embryos. Chicks hatch weight was determined by weighing of all chicks. Blood samples were collected in non-heparinized tubes from 24 chicks (2 per replicate) at the newly-hatched chicks. Serum samples were analyzed to determine blood glucose concentration. Obtained data were analyzed by GLM procedure of SAS software [7]. Significant differences among treatment means were detected by Duncan's multiple range tests [8].

**Table 1.** Effect of *in ovo* injection of glucose on chick weight, hatchability and blood glucose concentration

| Group | Chick weight (g) | Hatchability (%) | blood glucose concentration (mg/dl) |
|---|---|---|---|
| Control | 41.06[b] | 85[a] | 220[b] |
| Group sham | 41.12[b] | 72[c] | 214[b] |
| Glucose (%15) | 42.22[a] | 75[b] | 240[a] |
| Glucose (%20) | 42.38[a] | 70[c] | 238[a] |
| P-Value | 0.001 | 0.001 | 0.0043 |
| SEM | 0.05 | 1.17 | 4.1 |

## RESULTS

Table1 shows *in ovo* injection of glucose had significantly negative effect on hatchability in comparison with control group (P<0.01). Chicks from injected eggs (with %15 and %20 glucose) had significantly higher body weight as compared to sham group and control group (P<0.01). Newly hatched chicks from *in ovo* glucose injection groups had higher levels of serum glucose as compared with group including 0.5 ml deionized water and control group (P<0.01).

## DISCUSSION

Based on results of present study, administration of glucose solution in the albumin can be effective tool to increase of newly-hatched chick weight without considerable negative effect on hatching rates in chicks. In the similar study [9] injection of glucose (*in albumin*) improved weight of newly-hatched chicks in comparison with the control group. On the contrary, in the present study, injection of glucose in the albumin, reducing the rate of hatching. probably the rate of hatching decreases in treatments 2, 3 and 4, were because of the injection of glucose solution in the albumin could partly caused allergic cavity, that is under the air sac had been causing stopped of respiration and death of developing embryo (at late embryonic stage). With attention to important role of glycolysis cycle is energy production during embryonic life, glucose injection into eggs can be good solution for using better and easier than the source of energy for the embryo. Therefore, this action causes to reduce the consumption of protein of muscle as energy source; finally we will observe the increasing of newly-hatched chicks [10]. Leitao et al.[11], investigated the effect of *in ovo* injection of glucose in varying levels to broiler eggs on the hatchability, reported that the utilization of 0.6 ml of glucose decreased the hatching rate. Adriana et al.[12], also found that decreased hatchability observed when chick embryos received *in ovo* glucose at 16 day of incubation. Bhanja, et al., [13] reported that day-old chicks had significantly higher levels of serum glucose follow *in ovo* injection of glucose. Amitav et al.[14], showed that chick weight had significantly higher ,when glucose was deposited either in the yolk sac or amniotic sac than un-injected control group. Results of present study suggest that *in ovo* injection of glucose at 7- day of incubation can improve hatchling weight.

**Acknowledgments**

This manuscript is summarized from my M.Sc thesis. We are thankful to Mr. Dolgari-Sharaf for his technical assistance in laboratory analysis and Alireza Lotfi for editing of present manuscript.

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