ENHANCEMENT OF IMMUNOCOMPETENCE AND ENVIRONMENTAL STRESS TOLERANCE IN POULTRY

By

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B.Sc. Agric. Sc. (Animal and Poultry Production), Ain Shams University, 2011

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ABSTRACT

Mona Ahmed Mohamed Hemida: Enhancement of Immunocompetence and Environmental Stress Tolerance in Poultry, Department of Poultry Production, Faculty of Agriculture, Ain Shams University, 2016.

Five hundred and ten broiler breeder eggs were obtained from Cobb-500 broiler breeder flock at 48 WOA.

At the embryonic day 16 (E16), eggs were randomly divided into two equal main groups, each of 240 eggs. The first group of eggs was set under the normal incubation conditions and served as control (T_0), while the second group (T_1) was subjected to 39.5ºC ± 0.1°C in another automatic incubator where the incubation temperature was raised for only 5 h/day (d) from (E16-E18).

On the 4th day of age (DOA), 90 chicks from each of the main two groups (T_0 and T_1) were randomly subdivided into two sub-groups, each of 45 chicks. One of each sub-group was exposed to a thermal conditioning at 38.0 ± 0.1°C and 42.0% RH for 5h/d in another controlled chamber through the 4th, 5th and 6th DOA, while the other sub-group was kept under the optimal brooding conditions, resulting finally in four sub-groups; T_0T_0, T_1T_0, T_0T_1 and T_1T_1.

The egg temperature, hatchability and embryonic mortality percentages; post-hatch performance and muscles traits; some blood and histomorphometric measurements of pectoral muscles and immune lymphoid organs were investigated.

Embryonic TC decreased embryo weight, breast muscles relative weights at E18 and late embryonic mortality as well as embryonic heat production compared to control group. At 42 DOA, all TC groups, particularly T_1T_1 had higher ($P \leq 0.01$) growth performance and carcass traits, as well plasma total proteins, globulin, calcium and phosphorus values than the non TC group **(**T_0T_0). Likewise, bursa and thymus relative

weights were increased significantly in TC groups. Converse trends were exhibited for values of Hb, PCV% and plasma MDA**.** With pre and postnatal TC, whether singly or in combination, IGF-I level was increased; T_4 was reduced, while T_3 level did not significantly change at 42 DOA**.** Highly significant elevation was obtained in both rectal temperature and respiration rate at 6 DOA, and disappeared at later ages. hsp70 expression was enhanced at E18 for T_1 and at 42 DOA for T_1T_1 more than T_0T_1 and T_1T_0**,** while T_0T_0 had the poorest hsp70 expression. Chicks of T_1T_0 and T_1T_1 had increased the number and dimensions of myocytes in major pectoralis muscles. The worst histomorphometric measurements of bursal sections were associated with T_0T_0 compared with TC groups, especially T_1T_1. Thymus sections showed lower changes due to TC, while the lowest changes among all groups including control one was observed for spleen sections, indicating that bursa is the most sensitive lymphoid organ to heat stress and spleen is the least sensitive.

In conclusion, pre and/or postnatal TC treatments are practical application to enhance the thermotolerance acquisition and immunocompetence of broiler chicks, and therefore productive and physiological responses under the conditions of heat stress. Moreover, superior benefit could be achieved by the combination of both procedures as established by T_1T_1 group.

Key words: Thermal conditioning, broiler, embryo, growth, hormones, thermotolerance, hsp70, lymphoid organ, histomorphometric.

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Mona Hemida

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