Effect of Hypoxia (17% Oxygen) During the Plateau Period, on Broiler's Embryos Development

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Environmental alteration during development of an organism may alter development of physiological regulatory systems and induce permanent phenotypic changes in the embryo. It has been reported that mammalian neonates exhibited an unusual ability to withstand hypoxia. This results from a complex adaptation strategy of the embryo. There are several potential adaptive responses for hypoxia, which can be categorized as those affecting metabolism, and those affecting oxygen transports, including alteration in cardiac output and redistribution of oxygenated blood.

The purpose of this study was to elucidate the effect of exposing broiler embryos to 17% oxygen concentration for 12 hours a day or continuously for 72 hours between embryonic days E16 to E18 (the plateau stage) on embryo's growth, yolk sac utilization and heart rate up to hatch.

Two replicated trials, each with 880 fertile Cobb eggs, were incubated. At E16 eggs were divided into three treatments: control, 17% O2 concentration for 12 h/d (12H) or continuously for 72h (72H).

Exposure to hypoxic conditions during the plateau period significantly affected embryos heart rate. The higher heart rate in both hypoxic treatments facilitates their ability to cope under hypoxic conditions. However while the 12H embryos growth and yolk utilization weren't affected and resembled that of the control, the 72H embryos exhibited a decrease in both measured parameters. This decrease in yolk consumption was coincided with a reduction in fat utilization and an increase in protein intake. The expression pattern in the liver of lipin, lactate dehydrogenase, and glutamine synthetase, all involved in metabolic pathways, were also found to be effected by the hypoxic exposure and the shift in nutrients utilization.

It can be concluded that the long exposure period to hypoxic conditions had a negative influence on the 72H embryos. Those embryos utilized less yolk sac content, hence their hatch weight was lower. The shift in nutrient component supports their growth and surviving, however their performance was sparse compare to the control and 12H embryos.

Keywords: hypoxia, embryogenesis, adaptation, incubation, metabolism, RMR

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The Influence of Different Incubation Times on the Reproductive Traits in Layers

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This study investigates the effect of different incubation times on the reproductive traits embryonic mortality and hatchability in layers. Therefor about 42000 eggs from 6800 white laying hens of a commercial line were incubated in three different incubation systems for 514, 526 and 539 hours. After this time the incubation was terminated. The hens were kept in three different breeding factories of the company Lohmann Tierzucht. Per breeding factory were two hatches performed. The aim of the study was to investigate the causes of embryonic mortality and to analysis the components of genetic variation for embryonic mortality at different stages of development and hatchability of fertile eggs. Besides should the possibility of reducing the variation and duration of the embryonic development be proved, particularly with regard to consumption of resources, exoneration of environment and improvement of the chick quality. The fertility rates were high and between 96,4 % and 97,4 %. The hatchability for 514 hours incubation was quite low (59,7 %). For 526 hours incubation the hatchability was 78,7 % and for 539 hours 73,0 %. Regarding the reproductive traits early (until 7th day of incubation) and middle (from 8th to 18th day) embryonic mortality there was no considerable difference between the three incubation systems. The late embryonic mortality (from 18th day) was 28,0 % for 514 hours incubation and 16,0 % for 539 hours, which is significantly different. The reason therefor is, that in a shortened incubation period (514 hours) embryos with a pronounced embryonic development are not able to hatch in time and as consequence die. The estimated genetic parameters variance and heritability (h2) are influenced by the different incubation environments respectively by a challenge situation. But interesting is, that the heritabilities for late embryonic livability and hatchability regarding the different incubation systems are similarly high. The coefficients of h2 for late embryonic mortality are: 0,051 (514 hours), 0,040 (526 hours), 0,063 (539 hours) and for hatchability: 0,046, 0,003 and 0,055. Because of the low heritability a successful selection of the analyzed traits will be limited. However, is a genetic improvement regarding hatchability possible in consideration of the high reproductive performance and the low generation interval. A directly trait determination of the duration of embryonic development isn´t practicable in poultry breeding, however a selection of a shortened incubation period is easily possible.

Keywords: embryonic mortality, hatchability, heritability, genetic parameters

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