

Abstract

Light-dark Rhythms during Incubation of Broiler Chicken Embryos and their Effects on Embryonic and Post Hatch Leg Bone Development

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There are indications that lighting schedules applied during incubation can affect leg health at hatching and during rearing. The current experiment studied effects of lighting schedule: continuous light (24L), 12 hours of light, followed by 12 hours of darkness (12L:12D), or continuous darkness (24D) throughout incubation of broiler chicken eggs on the development and strength of leg bones, and the role of selected hormones in bone development.

In the tibiatarsus and femur, growth and ossification during incubation and size and microstructure at day (D)0, D21, and D35 post hatching were measured. Plasma melatonin, growth hormone, and IGF-I were determined perinatally. Incidence of tibial dyschondroplasia, a leg pathology resulting from poor ossification at the bone's epiphyseal plates, was determined at slaughter on D35.



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24L resulted in lower embryonic ossification at embryonic day (E)13 and E14, and lower femur length, and lower tibiatarus weight, length, cortical area, second moment of area around the minor axis, and mean cortical thickness at hatching on D0 compared to 12L:12D especially. Results were long term, with lower femur weight and tibiatarus length, cortical and medullary area of the tibiatarus, and second moment of area around the minor axis, and a higher incidence of tibial dyschondroplasia for 24L.

Growth hormone at D0 was higher for 24D than for 12L:12D, with 24L intermediate, but plasma melatonin and IGF-I did not differ between treatments, and the role of plasma melatonin, IGF-I, and growth hormone in this process was therefore not clear.

To conclude, in the current experiment, 24L during incubation of chicken eggs had a detrimental effect on embryonic leg bone development and later life leg bone strength compared to 24D and 12L:12D, while the light-dark rhythm of 12L:12D may have a stimulating effect on leg health.

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