Introduction
Environmental conditions during incubation can significantly affect the production performance of laying hens. The common practice in commercial hatcheries is to incubate in complete darkness. Recently, hatcheries using equipment to provide water and feed during the hatching phase will provide light following transfer to the hatcher in the last three days of incubation. Under natural conditions, a mother hen turns her eggs, and leaves the nest thus exposing the shell to day light. Light is received by the chicken embryo mainly through the eyes but also through the skull. Studies have shown that the chicken is sensitive to a range of light from infrared wavelengths to ultra-violet and various physiological functions of the bird are influenced differently depending on the wavelength of the light source. Light received during incubation is potentially responsible for establishing circadian rhythms in embryos through rhythmic melatonin production which would improve epigenetic adaptation. Studies have found that this occurs as early as the third day of incubation improving the chicks’ ability to adjust to the post-hatch environment. Uniformity in the post-hatch condition of chicks is important in maximizing early survival and increasing production performance. Long day photoperiods are recommended post-hatch to increase time for acquiring first nutrients. However, more readily adapted birds may not need extremely long photoperiods early in life to ensure water and feed are accessed appropriately.

Objective
To determine if providing a photoperiod during incubation will positively affect the hatch, post-hatch and egg production performance of laying hens, and to determine if reducing day length early post-hatch impacts production, growth and egg quality.

Trial
Two incubation experiments were conducted using hatching eggs from two layer hen lines - Lohmann Brown Lite and Lohmann LSL Lite. In Trial 1, a total of 2400 eggs were incubated. There were 300 hatching eggs of each line incubated using 4 treatments for 21 days. Treatment 1 (the control) - 24 h of dark; Treatment 2 - 12 h of white LED light and 12 h dark; Treatment 3 - 12 h red LED light and 12 h dark; and Treatment 4 - 12 h of red LED light and 12 h of dark for the first 18 days, followed by 24 h of dark for the remaining 3 days.

In Trial 2, 1280 hatching eggs were incubated with 4 treatments for 21 days. The same two lines of birds were used with 80 eggs/line/incubator. Treatments included, the control, 24 h dark, and Treatments 2-4 : 12 h light and 12 h dark using red LED, blue LED and white LED light, respectively. Post-hatch conditions for both trials were the same evaluating 2 different lighting treatments. Birds of the same hen line and treatment were randomly assigned to a cage with 8 birds per cage for Trial 1 and 6 birds per cage for Trial 2, using traditional pullet rearing cages. One post hatch control lighting treatment was 23L:1D from day 1-3 and 20L:4D from day 4-14. The second treatment had shorter
first days with 18L:6D including two 30 minute phases of light during the dark period in the first 3
days followed by 17 h of continuous light with two 30 min phases of light for days 4-14. For both
regimes, day length was reduced over time to the point of 9L:15D at 7-16 weeks of age. Day length
was increased at 17 weeks by 1h of light/week to 14L:10D by 21 weeks of age. During this study hatch and post-hatch growth and feed consumption were monitored and egg production and quality were measured.

Results
Trial 1 – Treatment 4 (18 days red LED; 3 days dark) chicks at placement had a reduced body weight
than the control chicks hatched in the dark. However, after 6 h with access to feed and water, the
chicks from Treatment 4 weighed less than those from Treatment 3 (Red LED for 21 days) and not the
other treatments. Chicks from Treatment 3 had a higher weight gain as a percentage of their original
weight during this time than the control. This response was repeated in Trial 2 with the chicks from
the red LED light weighing less at hatch than the control but having a higher percentage weight gain
6 h post-hatch. In both trials the difference in weight between treatments disappeared over time,
with the only difference being between hen lines.
The chicks from the red LED lighting treatment in Trial 2 also had a significantly shorter hatch window
(490 hrs) of all treatments (control & blue = 496 hrs; white = 494 hrs) and they had a superior navel
scores than chicks from the blue LED lighting treatment.
In Trial 1, hens from the red LED lighting for 21 days produced significantly more eggs (27.6 eggs/hen)
than the white LED lighting treatment (25.1 eggs/hen) in the first 47 days in the laying hen house. In
Trial 2, the combined effect of the red lighting hatchery treatment and the long day post-hatch
significantly reduced the age to lay the first egg (132.7 days vs 140.2 days) and resulted in a higher
egg production (111 eggs/hen vs 105 eggs/hen) when compared to the combination of short early
days and blue LED hatchery lighting treatment.
There was no significant difference in Trial 1 or Trial 2 on egg quality between lighting treatments or
post-hatch day length treatments.

Industry Impact
The results of this research indicate that the use of red LED light during incubation can improve overall
chick health and production performance without negatively affecting egg quality.

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Funding for this project was provided by Egg Farmers of Canada, Canada/Nova Scotia Growing
Forward II – Research Acceleration Program and Egg Farmers of New Brunswick via Atlantic
Poultry Research Institute.

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