

## The relationship between physical activity and leg health in the broiler chicken

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The relationship between physical activity and leg health of broiler chickens (Ross 308) was assessed at a semi-commercial scale with the hypotheses 1) a step-wise change in light intensity would increase group activity and 2) an increase in individual activity would improve leg health. Three batches of birds (n=2,128 per batch) were raised under 2 lighting regimes during the photoperiod; either a step-wise change of light intensity alternating between an illuminance of 200 and 10 lux or a constant illuminance of 10 lux. The activity of focal individuals (n=24 per batch) was observed at 2, 4 and 6 weeks of age and leg health assessed weekly, based on gait score, the prevalence of burns on the hock and foot pad, and angulation and rotation of the leg at the intertarsal joint. Cortical bone density and area moments of inertia of the mid-physis tibiotarsus were measured post mortem at 6 weeks of age. The majority of analysis involved data from all weeks from all batches, however the more detailed investigation of activity and leg health (both before and after death) was undertaken only on the final batch of birds at 2, 4 and 6 weeks of age due to the time taken to complete data collection and analysis of this part of the study. Data were analysed using GLMs unless, where inappropriate, due to non-conformation with the assumptions of a parametric test. The step-wise change in light intensity did not affect overall performance, activity or leg health. Individual activity levels did not affect gait score, the prevalence of either hock burn or foot pad burn, or cortical density or shape of the tibiotarsus ( $p>0.05$ ). Sex of the bird was the only factor to significantly affect horizontal ( $p=0.04$ ) and vertical ( $p=0.002$ ) planes of the tibiotarsus, with females showing lower moment of inertia values for both (lower resistance to bending). Mean cortical density was low across the birds (972 mg/cc) and may indicate that, when allowed to move as much or as little as they choose, broiler chickens do not exercise enough or do not perform the higher impact activities required to affect bone quality. These findings imply that the activity of broiler chickens raised at a semi-commercial scale is unaffected by step-wise changes in light intensity and that other husbandry measures are needed to raise activity and hence improve leg health.

**Keywords:** broiler chickens, activity, lameness, leg health, gait scoring