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Keel bone damage in laying hens; Comparisons of longitudinal radiographic measures versus post-mortem measures

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Keel bone damage, including deviations and fractures, is common in both white and brown laying hens, regardless of housing system. Previous studies proposed radiography as a tool for assessing keel bone condition, though radiographs only show 2 out of 3 dimensions of the dissected keel bones. Our study aimed to explore the association between radiographic optical density (keel and tibiotarsal bone) and geometry (keel bone) with keel bone pathology, and to examine the link between pelvic dimensions and keel damage.

Two hundred hens at a commercial farm were radiographed at 16, 29, 42, 55, and 68 weeks, then culled at 74 weeks at the end of the production cycle. Post-mortem examinations included pelvic dimension analysis, radiography of the whole body and bones, keel bone dissection, and scoring. Radiographs were used to estimate bone optical density and keel bone geometry. A reproducible on-farm radiography method was developed, including

live bird restraint, positioning, and post-imaging measurements.

Longitudinal measurements of keel geometry and optical density showed associations with keel damage. The geometry ratio of keel length to mid-depth at weeks 42, 55, and 68 was linked to larger deviations at 74 weeks. Higher tibiotarsal optical density at week 55 was associated with fewer keel bone deviations and fractures at 74 weeks. Larger pelvic cavity dimensions correlated with higher body weight and increased keel bone damage.

These findings support the use of on-farm radiography to supply knowledge about phenotypes for genetic selection by the breeding companies targeting improved keel bone health in laying hens.