



PO Box 550  
Truro, NS B2N 5E3  
CANADA

Tel: (902) 893-6657  
Fax: (902) 895-6734

[apri@nsac.ns.ca](mailto:apri@nsac.ns.ca)  
<http://www.nsac.ns.ca/apri>

**FACTSHEET #20**  
**August 2004**

## **INCIDENCE OF BONE BREAKAGE IN THREE STRAINS OF END-OF-LAY HENS**

K.L. Budgell<sup>1</sup> and F.G. Silversides<sup>1,2</sup>

<sup>1</sup>Nova Scotia Agricultural College, <sup>2</sup>Agriculture and Agri-Food Canada

### **Introduction**

Genetics is a determinant of bone strength and thus bone fragility that occurs in end of lay hens, leading to bone breakage during housing, depopulation, shipping, and processing of these birds. Gregory and Wilkins (1989) reported that broken bones were found in 29% of hens before slaughter and that the proportion had risen to 98% by the time the carcasses had reached the end of the processing line, with an average of 6 broken bones per bird. The ischium, humerus, and keel showed the highest fracture incidences, with pubis, ulna, coracoid and femur also breaking frequently. The aim of this study was to determine the effect of breed on the incidence of old, shipping, and processing breaks of end of lay hens.

### **Trial**

At 18 weeks of age, 72 pullets from each of three lines (Babcock B300, ISA Brown, and Brown Leghorn) were housed 6 per cage in a cage facility. At 20 weeks of age, another 72 pullets per line were housed. The pullets were fed an isonitrogenous and isoenergetic standard layer diet. Egg production parameters were recorded throughout the experiment from 19 to 74 weeks of age.

At 77 weeks of age the hens were picked from the cages and carried to shipping crates by a non-commercial catching crew, with three birds in each hand. 21 hens were placed in each crate until slaughter time. Neck slitting was performed manually with an electric knife. The

birds were then sent through the water bath for 2 minutes and continued into the plucker for 30 seconds at a speed of 150 revolutions/minute. Upon completion of manual evisceration, the carcasses were placed in a chill tank for 1 hour, hung upright by placing the carcass on a pole, and drained. The carcasses were then frozen until time for dissection. Where a fracture showed signs of fusion, it was classified as an old break. Shipping breaks refer to breaks that had bloody show on them, while processing breaks were all other breaks.

### **Results - Old Breaks**

The commercial layers, the ISA Brown (ISAB) and Babcock B300 (BAB), had the highest incidence of old breaks at 11.1 % and 11.7% respectively. The Brown Leghorns (BL) experienced no breaks throughout caging (Table 1). Older unimproved strains, such as the Roslin J-line Brown Leghorn, have been proven to be relatively resistant to problems associated with bone fragility, such as osteoporosis (Rennie et al. 1997). A broken sternum was the most prevalent break in the commercial layers of the current study.

### **Shipping Breaks**

A similar pattern emerged throughout shipping whereby the ISAB and BAB hens experienced higher incidences of bone breakage, 7.9% and 10.0% respectively, while the BL hens only had 3.5% of hens with broken bones (Table 1). The scapula experienced most breaks during shipping,

**Table 1. Effect of Breed on the Proportion of Spent Hens Experiencing Old, Shipping and Processing Breaks**

Bone	Old Breaks			Shipping			Processing			Specific Bone Breaks (%)
	BL <sup>z</sup>	ISAB	BAB	BL	ISAB	BAB	BL	ISAB	BAB	
Femur	0	0	0	1	0	0	3	1	3	8 (4.4)
Tibia	0	0	0	0	0	1	2	1	1	5 (2.8)
Humerus	0	0	0	1	0	0	2	7	4	14 (7.8)
Radius	0	1	0	0	0	0	0	1	1	3 (1.7)
Ulna	0	1	1	0	0	0	0	0	1	3 (1.7)
Wing Tips	0	0	0	0	0	0	0	0	0	0 (0.0)
Keel	0	0	0	0	0	0	1	2	4	7 (3.9)
Sternum	0	4	4	0	2	1	36	59	55	161 (89.4)
Scapula	0	1	0	0	3	1	19	16	29	69 (38.3)
Coracoid	0	0	0	0	0	1	12	22	31	66 (36.7)
Furculum	0	0	1	0	1	2	15	34	29	82 (45.6)
Rib Cage	0	0	0	0	0	0	31	45	53	129 (71.7)
Ilium	0	0	0	0	0	0	6	5	21	32 (17.8)
Ischium	0	0	1	0	1	1	45	57	58	163 (90.6)
Pubis	0	2	0	0	1	0	54	61	58	176 (97.8)
Proportion of Birds with Broken Bones	0.0	11.1	11.7	3.5	7.9	10.0	100	100	100	-

<sup>z</sup> 57 BL, 63 ISAB, 60 BAB were observed.

which may have been caused by wing flapping while in the crates or during placement into the crates.

#### *Processing Breaks*

Processing had a huge impact on the incidence of bone breakage with 100% of each strain of layer experiencing at least one broken bone. This may be best explained by the evisceration process as well as the method by which the birds were hung for draining. There was a very high incidence of birds with a broken ischium and pubis which agrees with findings of Gregory and Wilkins (1989).

**Table 2. Incidence of Broken Bones in Spent Hens**

Total Breaks (Avg./Bird)	BL <sup>z</sup>	ISAB	BAB
Old	0 (0)	9 (0.14)	7 (0.12)
Shipping	2 (0.04)	8 (0.13)	7 (0.12)
Processing	495 (8.7)	850 (13.5)	1133 (18.9)

<sup>z</sup> 57 BL, 63 ISAB, 60 BAB were observed

#### *Strain Differences*

BL hens had the lowest number of breaks per bird at 8.7 while ISAB and BAB hens had an average of 13.5 and 18.9 broken bones respectively (Table 2). This may be an indication of the loss of bone strength in hens bred for high commercial egg production.

#### **Conclusions**

There is indeed a strain difference with regards to bone fragility. It appears as though those hens selected for improved longevity of egg production do so at a compromise of bone strength. The non-selected BL hens, while liable to processing breaks, are more resistant to breaks as a result of caging, depopulation and shipping than that of commercial layers.

#### **References**

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#### **Funding Sources:**

- Agriculture and AgriFood Canada
- Canadian Egg Marketing Agency
- Poultry Industry Council

**Special Thanks:** Day-old chicks used in this study were kindly provided by George Ansah of ISA Poultry.

*For more information on this project contact Fred Silversides at: silversidesf@agr.gc.ca*