Plumage & Performance

Why feathering is more than a welfare indicator and how to preserve healthy plumage.

The presence and condition of plumage on chickens is often viewed as a welfare indicator. Generally, it means they are well fed, with ample room to move, and are not stressed or in any way that would provoke them to attack one another.

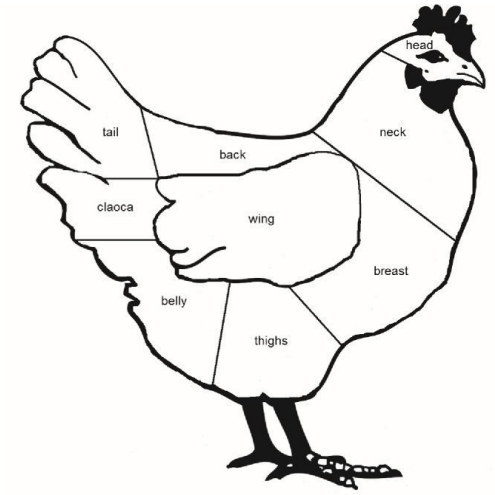
Feathering's biggest role is to serve as protection from the elements. It's an insulation factor that keeps birds' bodies warm so that energy can be better used to lay eggs or grow muscle tissue.

Birds with poor feathering radiate more heat from their exposed body areas. Naked areas of skin lose heat up to 25% faster than covered parts of the body [2]. This increased heat loss results in an increased requirement for maintenance energy, or food intake. Consequently, farms see increased feed costs, decreased productivity, and decreased farm income.

But why do birds lose their feathers? The answer is sometimes complex. Factors range from housing structures and equipment, to nutrition and diet, cannibalism, breed, age, and even group size.

Housing Systems

Housing systems for laying hens, whether it be a conventional cage, enriched system, or aviary system can all cause abrasion. Perches and feed troughs are often the primary culprits. Perching, often viewed as a welfare enrichment, is shown to improve back feather scores. However, it was noticed that breast and tail feather scores were poorer, potentially due to contact and rubbing of breast and tail feathers on the metal roosts [3]. These poorer scores may also be caused by feather pecking from flock mates, as when perched, breast and tail feathers are more accessible.



Feather Pecking

Perhaps the largest contributor to plumage loss is feather pecking, or cannibalism. Mutual feather pecking is when hens destroy the plumage of their flock mates, often pulling out the feathers and eating them.

In one study in laying hens, most feather pecking behavior was observed on the perches, with belly feathers as the first to be plucked [3].

Stress factors that contribute to feather pecking include crowding, lack of feed or water, or a lack of proteins, salts, and phosphorous in the diet.

Hunger & Nutrition

Hunger is a well-known trigger of feather pecking. Birds may form a temporary aversion to new diets, be in competition for feed such as in pullet or breeder houses, or be competing for a share of a new, more attractive diet.

Further, hunger causes nutrient imbalances which have shown to increase the likelihood of feather pecking [5]. Nutrient-deprived birds peck feathers of fellow birds to eat them and meet their amino acid requirements. Amino acids play a key role in feather development and health. Poor feathering could be attributable to a deficiency in both sulfur-based amino acids cysteine and methionine. Studies found cannibalism was reduced in laying hens when dietary methionine was increased from .22-.36. The total feather score increased when the digestible lysine intake level was increased from 560 mg/hen/day to 858 [5].

Feather condition is further affected by a bird's dietary protein level. Feather score was shown to improve significantly when crude protein was increased from 11.1% to 19.3%. A maximum score was achieved at 15.3% [5].

Parasites

Birds infested with external parasites often have irritated skin and will pull out their own feathers to try to remedy the problem. Similarly, birds with internal parasites show signs of malnutrition, encouraging feather pecking in an attempt to meet nutrient requirements.

Group Size & Age

Small groups of birds show better plumage scores than those in large groups, most noticeable when assessing tail feathers [6]. Smaller groups decrease competition for food and nesting spaces and promote a more stable heirarchy. These smaller groups create less stress overall, improving bird comfort and security.

Plumage condition worsens with age, especially in laying hens. Presumably, they show worse feather scores because of the length of time they are exposed to the housing equipment.

Inspecting Feather Condition

Inspect birds regularly. Sitting with them and monitoring their behavior can give vital insight to their health and well-being. You may notice gentle feather pecking, where birds lick feathers and cause no harm. Often this gentle grooming turns more severe in time, causing birds to squawk in pain and creating noticeable damage to the feathering [12]. Early feather damage is often seen along the back or at the base of the tail, though in systems where perching is common, it may first be evident on the belly.

When assessing feather condition it is important to remember that not all parts of the hen are feathered equally. There are different types of feathers and some areas are covered more thinly than others. There are two basic types of feathers: contour feathers that form continuous, coherent vanes and soft underlying down feathers. Chicken feathers are grouped in areas separated by nearly bare spaces without contour feathers, which are frequently covered with downs.

When scoring flocks, it is suggested to record scores over several cycles. This can aid in properly assessing management strategies and monitoring performance.

Feather damage may look like small cracks in the feather shaft, or completely missing feathers. You should know what you are looking for as you begin scoring your flocks.

There are multiple methods for feather scoring, with the LayWel Method [11] and the AssureWel Method [10] being the most common. Always use the same one for accurate comparisons. Use an appropriate sample size - at least 50 birds is recommended, though more is always better. Assess birds from all areas of the house and be sure to select them at random, avoiding any obviously well-feathered or poorly-feathered birds. Assess the scores every one to two weeks and make adjustments where possible.

Preserving Feather Condition

Improving feather condition isn't something that can be done overnight, and perhaps should be something that farmers are conscientious of from the beginning of the rearing period.

Lower stress levels will always result in better feather scores and better bird performance. Here are some ways to reduce stress.

- Keep birds divided into smaller groups.
- Formulate a diet consistent with the birds' age, breed, and purpose.
- Provide an ample amount of food to reduce competition at the feeders.
- Establish a pest control program that targets both internal and external parasites.

1. Feather loss	
Sample size:	50 birds
Method of assessment:	Assess and score 5 birds in each of 10 different areas of the house and/or range. Visually assess the head/neck area and back/vent area of the bird (without handling birds). Score separately for **head/neck** area and **back/vent** area.
Scoring:	0 = **No/Minimal feather loss** No bare skin visible, no or slight wear, only single feathers missing 1 = **Slight feather loss** Moderate wear, damaged feathers or 2 or more adjacent feathers missing up to bare skin visible < 5cm maximum dimension 2 = **Moderate/Severe feather loss** Bare skin visible ≥ 5cm maximum dimension

Resources:

1. A guide to the practical management of feather pecking & cannibalism in free range laying hens. Department for Environment, Food and Rural Affairs. 2005.

2. Plumage Condition, Feed Consumption, and Egg Production Relationships in Laying Hens. C. Hagger et al. Institute of Animal Production, Swiss Federal Institute of Technology. 1987.

3. Evaluation of plumage condition and foot pad health in laying hens kept in a small group housing system. C. Habig & O. Distl. Institute for Animal Breeding and Genetics, University of Veterinary Medicine Hannover. 2013.

4. The effect of perches in cages during pullet rearing and egg laying on hen performance, foot health, and plumage. P.Y. Hester et al. Department of Animal Science, Purdue University. 2013.

5. Analysis of the influences on plumage condition in laying hens: How suitable is a whole body plumage score as an outcome? A. Campe et al. Poultry Science Association Inc. 2017.

6. Production performance, use of nest box, and external appearance of two strains of laying hens kept in conventional and enriched cages. E. E. Onbasilar, et al. Poultry Science Association. 2015.

7. Effect of cooled perches on performance, plumage condition, and foot pad health of cages White Leghorn hens exposed to cyclic heat. J. Y. Hu, et al. Dept. of Animal Science, Purdue University. 2019.

8. The feed factor in poor feathering. Dinesh Kumar. All About Feed. 2 Oct 2017.

9. Adaptive behaviour in chickens in relation to thermoregulation. Arch.Geflügelk., 70 (5). S. 199- 207 , 2006, ISSN 0003-9098.

10. AssureWel Feather Scoring Method: http://www.assurewel.org/layinghens/featherloss.html

11. LayWel Feather Scoring Guide https://www.laywel.eu/web/pdf/deliverable%2072%20manual-2.pdf

12. A guide to the practical management of feather pecking & cannibalism in free range laying hens. www.defra.gov.uk