A PRACTICAL GUIDE TO MANAGING FEATHER COVER IN BREEDING STOCK FEMALES

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INTRODUCTION

Rearing modern female breeding stock can present several challenging scenarios for farm managers. As such, it is crucial for them to be:

- Forward thinkers who are able to prepare for possible challenges before they arise;
- Detectives who are willing to search for the root cause of an issue; and
- Action-oriented managers ready to implement changes within their control that may affect flock performance.

One critical strategy is maintaining an appropriate feather cover and preventing feather loss in females once they come into production. An inadequate amount of feather cover can cause a decline in mating and fertility, loss of body weight, poorer feed efficiency due to the inability to properly thermoregulate body temperature, and possible physical injury to the female.

Although it may be difficult to diagnose the specific cause of feather loss once it has occurred, management practices during both rear and production can be implemented to maintain good feather cover in the flock. Along with visual cues, feather-scoring females on a numerical scale is just one method that can be used to identify which birds have less than optimal cover and where the actual loss is occurring. Other factors that help to preserve female feathering are housing environment, flock and feeding management, overall bird health, and nutrition. The purpose of this article is to serve as a practical guide to achieving and maintaining good female feathering and to provide sensible management techniques that can be implemented in the field.

MANAGEMENT DURING REAR

Correct management of females during rear can greatly impact feather development and feather maintenance throughout the production period. As birds enter the rearing house, it is important to consider several factors that can potentially influence feather quality and consistency.

Access to the total rearing area — One major factor impacting feather quality is overcrowding, which impacts the bird's ability to uniformly and calmly access feeder and drinker space, as well as areas for dustbathing. Stocking density, in part, determines the biological output of the flock. Increases in stocking density must be accompanied by appropriate adjustments in environmental conditions, equipment provision and management practices to prevent reductions in biological performance (**Table 1**). Birds should have access to the total rearing area at no later than 28 days (4 weeks) of age. Proper stocking density allows pullets to utilize the entire rearing space and not become temporarily overcrowded as they grow.

Table 1. Example of increase in brooding area.

AGE	BIRDS/m² (ft²/BIRD)
1-3 days	40 (0.27)
4-6 days	25 (0.43)
7-9 days	10 (1.08)
10 days	Final stocking density

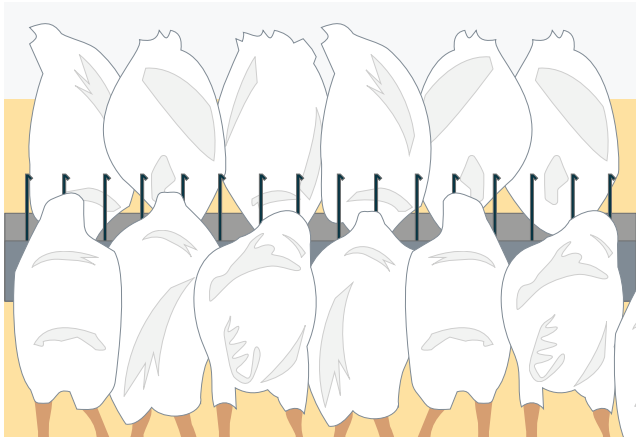
Reducing the temperature — When day-old chicks arrive at the rearing facility, it is recommended that the ambient house temperature is 30°C (86°F), at a relative humidity of 60–70% with a floor temperature of 28–30°C (82–86°F) and litter temperature of 28–32°C (82–90°F). These conditions ensure that chicks are maintained within their thermoneutral zone, remaining active in the facility to find feed and water. The correct temperature ensures that young birds stay warm and use their metabolic energy for growth, not thermoregulation. However, the house temperature can be gradually reduced to around 20°C (68°F) by 28 days (4 weeks) of age as chicks are better able to thermoregulate at this age.

Feeding space, feed distribution, and feed form — Maintaining the correct feeding space is a core principle of correctly managing breeding stock females. A guide for the recommended feeding space for females can be found in **Table 2** and **Figure 1**. Furthermore, feed distribution time should be less than 3 minutes, as longer distribution times can lead to inconsistencies in birds accessing the feed; all birds should have access to feed simultaneously. Filling the feeding system from the middle of the house or from the front and back helps to regulate this. Where feed distribution time exceeds 3 minutes, the addition of satellite hoppers should be considered to reduce the time. It is important to note that the feeding system should be filled when the lights are off so that feed is available almost instantly when the lights are turned on. Where floor feeding is the preferred feed distribution method, the feed distribution time should be less than 3 minutes, with populations of not greater than 1000–1500 birds, depending on the pen shape and spinner type.

Table 2: Recommended feeding space for breeding stock females.

AGE (days)	TRACK FEEDER cm (in)	PAN FEEDER cm (in)
0-36	5 (2)	4 (2)
36-70	10 (4)	8 (3)
71 - depletion	15 (6)	10 (4)

Figure 1. Uniform distribution of females around a track feed when adequate feeder space is given.



Feed form can also influence feather development during rear. Good quality feed form is essential for optimum nutrient intake, and a good, uniform grist size ensures that all birds get the most out of the feed. For the starter ration (up to 6 weeks of age), a sieved crumb or mini pellet is recommended, and for the remainder of the rearing period, either a crumb, pellet, or a good mash is a good choice for pullets. Poor pelleted feeds, which in turn can make a poor crumb, can often lead to under-consumption due to the build-up of fine particles within the feeders, which may cause birds to resort to feather pecking. Likewise, a poor-quality pellet, when used in spin feeders, can result in the fine particles being lost into the litter.

Drinker space and water management — Just as important as feeder space is drinker space and water management. Breeding stock females should always have unlimited access to clean, fresh water. The recommendations for drinker space can be found in **Table 3**. Checking the consistency of the crop contents to see if water is present is a good indicator of whether or not the birds have good access to the drinkers.

Table 3: Recommended drinker space.

TYPE OF DRINKER	DRINKER SPACE
Bell	1.5 cm (0.16 in)
Nipples	8-12 birds per nipple
Cups	20-30 birds per cup

Flock illnesses (diseases) — Frequent flock monitoring for enteric diseases such as coccidiosis or necrotic enteritis is a key responsibility for proper flock management. These diseases reduce the nutrient absorption and availability required for proper feather development. Monitor the flock for these diseases by checking litter quality, inspecting fecal material for any discolorations or diarrhea, and observing flock behavior daily. Promptly treating illnesses/diseases helps maintain a good feather cover.

Litter quality — Dry, friable litter is essential for the health and development of a flock. Wet litter can influence feathering as birds sit on the litter. It can cause overly wet or broken feathers and prevent proper dust bathing behavior. It can also lead to a build-up of microbiological contaminants and an increased risk of bird illnesses.

MANAGEMENT DURING PRODUCTION

In addition to the management principles applied during the rearing phase, some techniques are specific to the production phase. Although some degree of feather loss is inevitable, by considering the following, it is possible to reduce the amount of feather loss and maintain female feather cover. The important thing to remember is that prevention is key. It can be very difficult to remedy extreme feather loss once it has occurred. Areas of focus regarding feathering during production should be heavily weighted toward:

- Flock management and mating-up
- Environmental conditions
- Feed management
- Flock health
- Nutrition

Flock management and mating-up — As mentioned in the rearing section, management practices such as adhering to stocking density guidelines, avoiding overcrowding, maintaining feeder and drinker space, and equipment maintenance also apply to the production phase. Furthermore, this is the point in the life of the breeding stock female, where they are mated-up with males (**Table 4**). Because of this, proper synchronization of sexually mature males and females is essential. Correct sexual synchronization between males and females in the flock ensures harmony, where the female will be willing to accept the male as part of the mating process. Mating synchronization prevents unwanted feather damage in the females, especially to the dorsal (back) and head regions.

Table 4: A guide to typical mating ratios as a flock ages.

AGE		NUMBER OF GOOD QUALITY MALES PER 100 FEMALES
DAYS	WEEKS	
154 - 168	22 - 24	9.50 - 10.00
168 - 210	24 - 30	8.50 – 9.50
210 - 245	30 - 35	8.00 – 8.50
245 - 280	35 - 40	7.50 – 8.00
280 - 350	40 - 50	7.00 – 7.50
350 to depletion	50 to depletion	6.50 – 7.00

Figure 2. Mating males and females.

Over-mating can also lead to excessive female feather wear. In the breeding stock industry, it is often assumed that birds with the most feather wear are mating more frequently than fully-feathered birds. However, studies have shown that females with large amounts of dorsal feather loss are less receptive to males and may have decreased mating and fertility. Because of this, it is not recommended to subjectively judge the amount of mating or fertility of the flock based on the feather cover on the female's back.

There is also evidence of a correlation between female uniformity, feather coverage, and female fertility. Considering the feeding principles mentioned earlier, there is an increased likelihood of rearing a uniform female flock for production. A uniform flock (CV <8%/uniformity >79%) has similar individual bird feed requirements and, therefore, intake so that all birds can receive their daily feed allowance. In addition to uniformity, birds on the recommended body-weight standard tend to have better feather coverage and are more likely to mate.

Early photostimulation of a flock that is not uniform may have a negative impact on the reproductive development of the smaller, lighter birds, which are still developing.

Feather development is most important before light stimulation (147 days/21 weeks). After light stimulation, there is minimal feather growth since the hormonal response is geared toward reproduction; at this point, the objective is to avoid losing what the bird has already developed.

Environmental Conditions — Besides maintaining a temperature of 20°C (68°F) from 28 days (4 weeks) of age onward, providing adequate ventilation plays a key role in feather condition. Maintaining adequate ventilation helps to:

- Control house relative humidity (RH%) levels.
- Ensure the air is sufficiently warmed before reaching the birds/litter.
- Allow any excess moisture to be ventilated out of the building.
- Maintain litter that is dry and friable.

Correct ventilation also helps maintain acceptable carbon dioxide (CO_2 <3000 ppm) and ammonia levels (NH_3 <10 ppm). Good quality litter and environmental conditions can encourage dust bathing, preening, and, in turn, the maintenance of feathers. If conditions of the production house are kept close to that of the rearing facility, it is more likely that the birds seamlessly transition from rear to lay. This transition can be done by using the same feeding, drinking, and lighting systems in both phases and providing a consistent temperature. After light stimulation, it is best to use a uniform light intensity between 30–60 lux (3–6 fc), as light intensities of more than 100 lux (10 fc) increase the risk of feather pecking.

Feed Management

Set feeding times to avoid the peak of egg-laying activity. Feeding time should be within 30 minutes of "lights-on" or 5–6 hours after "lights-on" to prevent birds from feeding when most eggs are likely to be laid. The feed should also be distributed as fast as possible, and it is recommended that feed is allocated uniformly within 3 minutes of starting the feeding system. In the first few weeks after transfer, delivering feed in the dark may be helpful to limit anxiety within the flock. During the early stages of the production period, feed increases must be directly related to increases in production as well as egg weight, body weight, and feed clean-up times. Giving birds the correct amount of feed for their physiological state ensures they are not overfed or underfed. It may also be helpful to spread insoluble grit over the litter to stimulate natural scratching and foraging behavior. Doing so tends to alleviate feather pecking and may also regulate hen digestion by stimulating the gizzard and controlling the feed transit time.

Feeding Space — Providing optimal feeder space as the bird ages is essential to managing flock uniformity (**Table 1**). Provide enough feeder space so that feed is distributed uniformly to enable all birds to eat simultaneously. Bird-to-bird feed intake uniformity is compromised if there is inadequate feeder space. Birds that consume insufficient or excessive amounts of feed damage flock body-weight uniformity. Excessive feeder space can also be a problem by allowing individual birds a greater opportunity to overconsume feed. Providing equal opportunity for all birds to access feed is crucial to achieving the correct nutrient intake and ensuring good flock body-weight uniformity.

Flock Health — Monitoring the physical condition of the hens can significantly reduce health issues within the flock. Some cases of feather pecking can be related to an infestation of mites or other parasites that live on the body of the hen. Although there is no vaccination program for mites, if feather pecking and loss are observed, it is essential to the well-being of the entire flock that a mite problem is either ruled out or treated if discovered.

Supporting the intestinal health of the birds using vaccination/treatment is instrumental in preventing outbreaks of coccidiosis, necrotic enteritis, or worms. If the farm manager notices a change in bird behavior along with wet litter, discolored feces, or diarrhea, the birds are

likely experiencing an intestinal imbalance. Any intestinal imbalances should be treated immediately to avoid further issues within the flock.

NUTRITION

Breeding stock females have the genetic potential to grow at comparable rates as their broiler offspring and can be just as efficient. Both genetic and environmental circumstances can influence the daily feed requirement of the females.

Key points to consider:

- Birds respond to daily intakes of nutrients. Therefore, feeding programs (and feed levels) must relate to dietary nutrient content, especially energy and the nutritional requirements of the bird at a given age.
- Economic and management practices may demand flexibility in diet nutrient concentration, but in general, variability in nutrient specifications should be avoided.
- Nutritional problems are observed as failures of the hen to achieve production and welfare targets and should be discussed with nutritionists at the earliest opportunity.
- Diets need to be regularly sampled and the samples analyzed to ensure that the diet is as it should be; this includes samples that assess the physical feed quality.

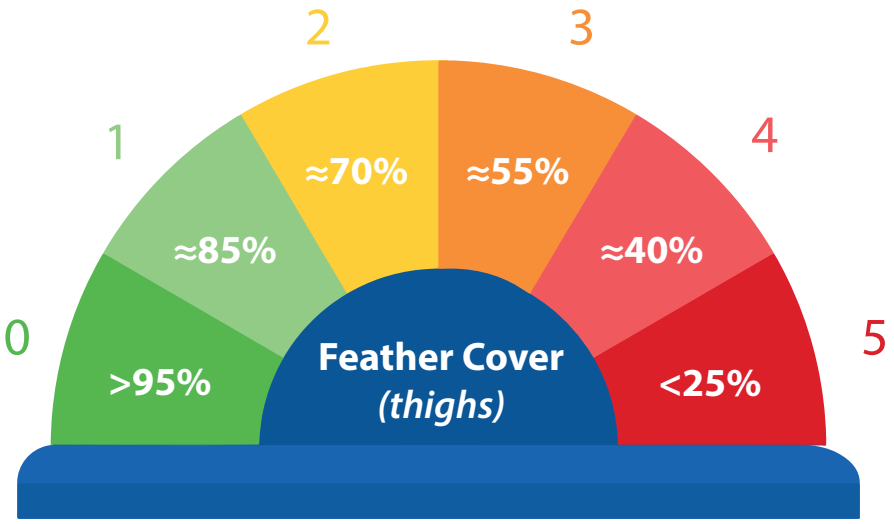
Several aspects of female nutrition play invaluable roles in feather development and integrity. However, it may be very difficult to pinpoint one simple change to the diet that can remedy feathering issues once they have occurred. Nevertheless, there are key areas of nutrition that should be considered during both the rearing and production phases.

- ***Amino acids*** — Several amino acids are utilized in feather development and maintenance. Methionine and cystine are among the most crucial amino acids for feather development, but other essential amino acids also play a vital role. Therefore, it is strongly recommended to adhere to the latest parent stock amino acid guidelines, particularly during the rearing period when the birds are growing. Feed cost is lowest due to lower feed volumes compared to production. The rearing phase is a good stage for investing in nutrients and is also key in feather development; the majority of molts happen in the juvenile stage during rearing and before light stimulation. Few dietary ingredients contain enough methionine to maintain bird growth and promote good feather development, so synthetic methionine must be added to the diet. Also, adding tryptophan or methionine to the drinking water has been shown to calm the birds, reducing the intensity and incidence of feather pecking.
- ***Energy*** — The nutritional imbalance or energy deficiency may trigger a cascade of neuroendocrine effects, which alter the pattern of hormone release with subsequent reduction of fat reserves, catabolism of muscle tissue for sustaining yolk precursors, involution of the reproductive tract, and drop of feathers.
- ***Sodium and Chloride*** — Sodium levels should remain 0.18–0.23%, while chloride levels should be 0.18–0.28% in rear and breeder diets. Using sodium bicarbonate as a sodium source can help with this, especially during summer months.
- ***Trace elements*** — Zinc is just one trace element essential to feather growth. Not only is it important for other areas of production, such as wound healing, but a zinc deficiency could be responsible for a suppressed immune system, poor feathering, infertility and poor eggshell quality. Selenium is also important; both selenium and zinc can be partly supplemented using a more bioavailable form.
- ***B-complex vitamins*** — Just as with trace elements, B-complex vitamins are essential for correct bird development, including feather coverage. Administering vitamins and trace elements via drinking water in times of flock disturbance for vaccination, grading, etc., may help improve feathering by reducing feather licking or pecking.
- ***Crude fiber*** — Minimum crude fiber levels should be maintained, using values between 3% and 7% as a guideline. There is evidence that feather eating may be associated with a craving for fiber; thus, low fiber levels in the feed may lead to feather pecking among the hens. It may be useful to observe the bird's environment and note any changes in the feathers found in the litter, which may suggest feather eating.

FEATHER SCORING

Although visual observations of female feathering are a good way to determine what is happening in the flock, conducting feather scoring helps place a numerical value on the amount of feather coverage and is less subjective.

Pullets — The feather development in pullets starts on day 1. Chicks hatch with down feathers that are progressively molted as they grow. Feather coverage occurs in various parts of the body of the pullet at different times, and the thigh area is one of the last areas to be covered. Therefore, evaluating the thigh area serves as a good indicator of feather coverage. Thigh feather coverage is also important as it becomes a point of contact between birds at feeding time. If the thighs are not properly covered, then pullets are more susceptible to lesions and can reduce their time in production. The objective is to have >95% of thighs covered with feathers before light stimulation (≈21 weeks). If the flock does not achieve this percentage, the recommendation is to evaluate at earlier ages and adjust. At 16 weeks, there should be >70% coverage, and at 12 weeks, feather coverage should be >55%. The pullet feather scoring system for thighs is as follows:



Hens — It is important to conduct this test on areas of the female that have the most contact with males during mating, including the back, thighs, wings, and tail. The feather scoring system is as follows:

For more information and a photo guide to feather scoring, see **Appendix 1**.

SUMMARY

A critical point to remember when discussing female feathering, whether it is development during rear or maintenance and regrowth during production, is that if the flock is poorly feathered, there is no quick and simple solution to improve feather condition. Once extreme feather loss has occurred in breeding stock 35 weeks or older, little can be done to remedy the situation. The emphasis must be placed on good feather cover development from the beginning of rear, continued development and prevention of feather loss from the middle of rear, and maintenance of feather cover during production. By implementing the management strategies presented in this article, it may be possible to ensure good feather cover development and to safeguard hens from excessive feather loss.

Some key points to consider are:

- Allow birds complete access to the rearing area no later than 28 days (4 weeks) of age if feeder space allows.
- Reduce the house ambient temperature to 20°C (68°F) by 28 days (4 weeks) of age.
- Ensure feeding space follows the recommended guidelines for the type of feeding system used.
- Ensure that feed distribution time is less than 3 minutes.
- Maintain the correct feed form for the feeding phase/age of the bird and feeding system used.
- Monitor drinker space, water, and litter quality.
- Adhere to the Aviagen® recommendations or national and local laws and regulations regarding stocking densities.
- Manage mating ratios to avoid over-mating.
- Ensure that males and females are synchronized for sexual maturity before mating-up.
- Monitor flock CV%/uniformity.
- Feeding time should be within 30 minutes of “lights-on” or 5–6 hours after “lights-on.”
- Monitor the physical condition of the birds for mites and enteric diseases such as coccidiosis and necrotic enteritis.
- Implement a feather scoring system during rear and every 10 weeks in production; the majority of birds need to be fully feathered by 21 weeks or before light stimulation.
- Consider dietary formulations that ensure birds get enough fiber, amino acids, trace minerals, and vitamins.

APPENDIX 1. FEATHER SCORING

To properly assess the development of feather cover over time, flocks should be scored every 4 weeks during the rearing period with measurements taken at 12, 16, and 20 weeks of age and every 10 weeks after peak production, with measurements taken at 25, 30, 40, 50, and 60 weeks of production. It is important, however, to remember that birds can begin to go through a natural molting period around 40 weeks of age. These birds should not be scored, as they may not be typical feathering examples of the whole hen population.

Figure 3. Example of the feather scoring system applied to the back area of the hen.

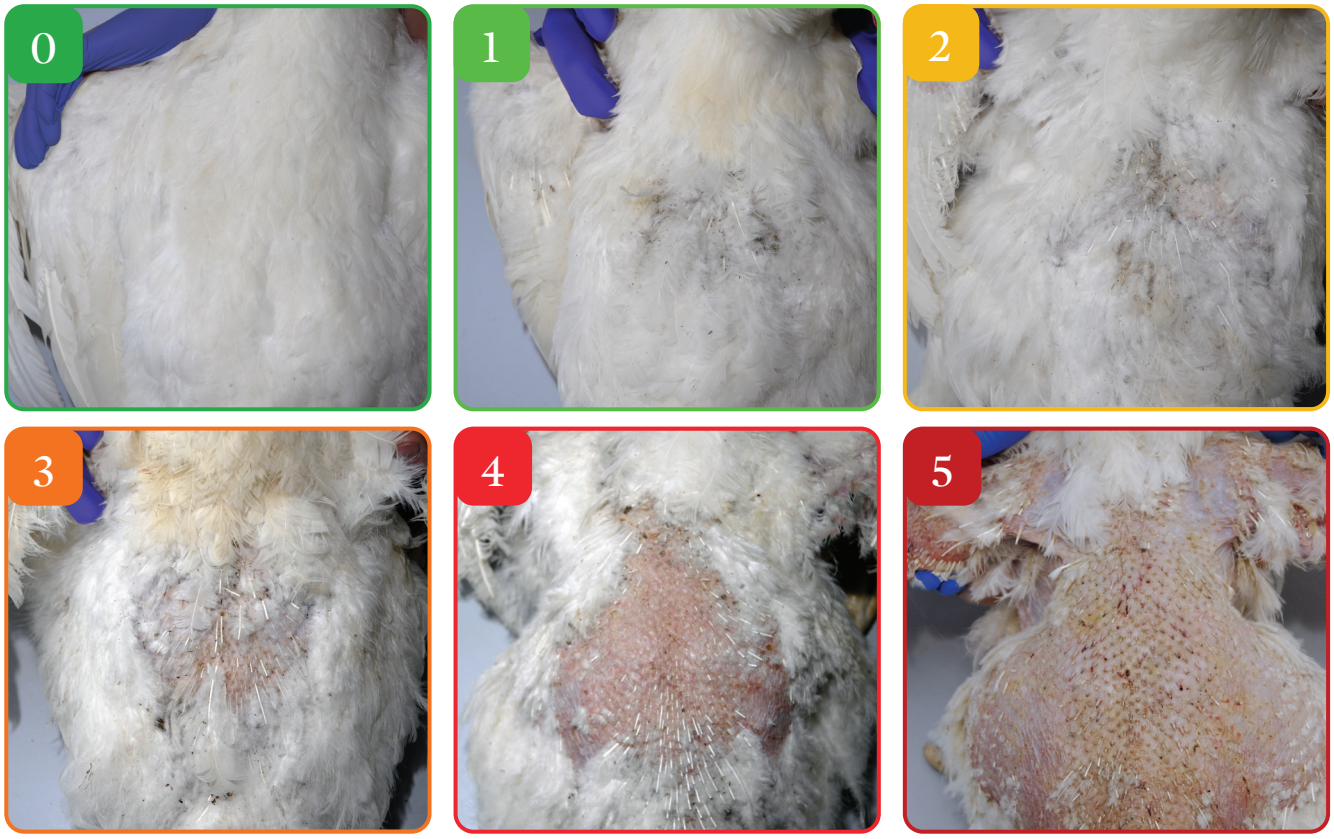


Figure 4. Example of the feather scoring system applied to the wings of the hen.

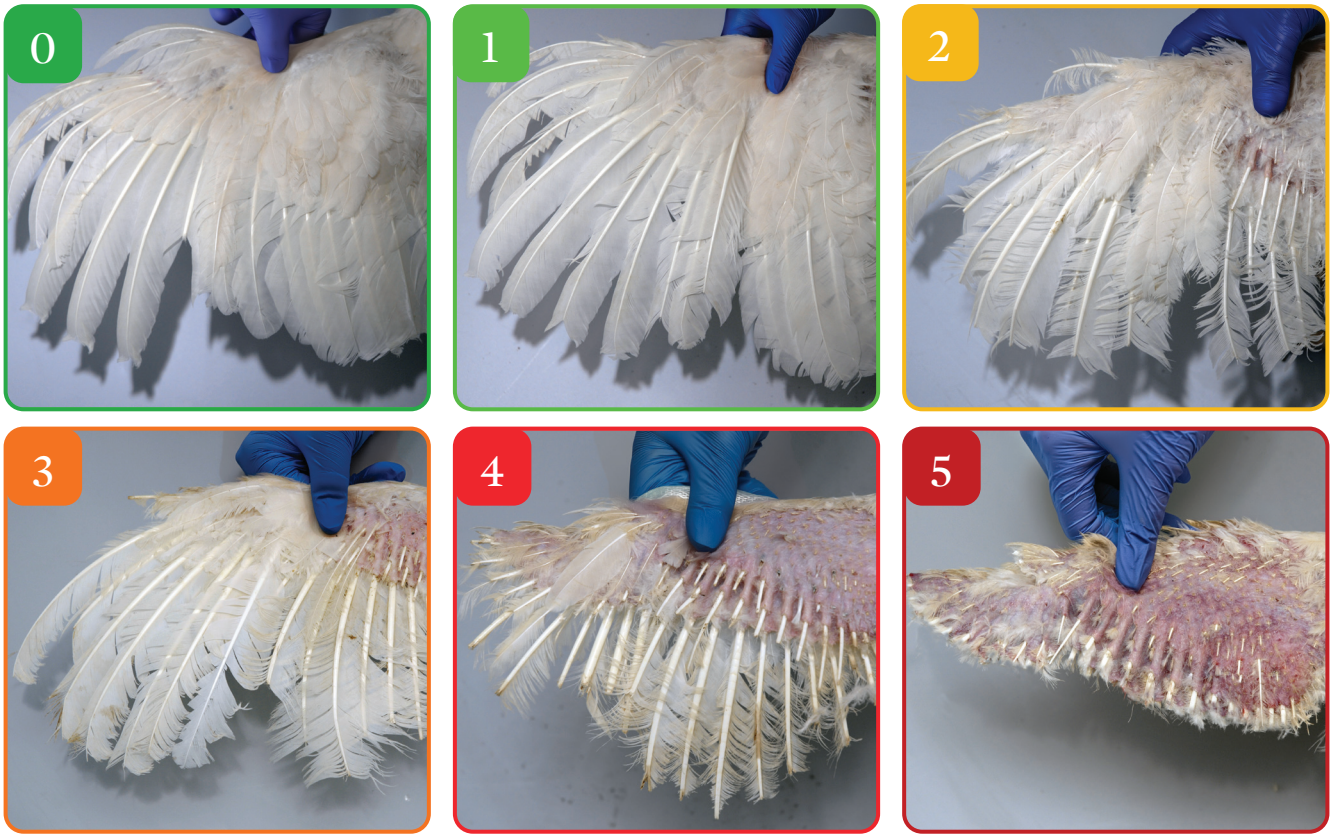


Figure 5. Example of the feather scoring system applied to the tail of the hen.

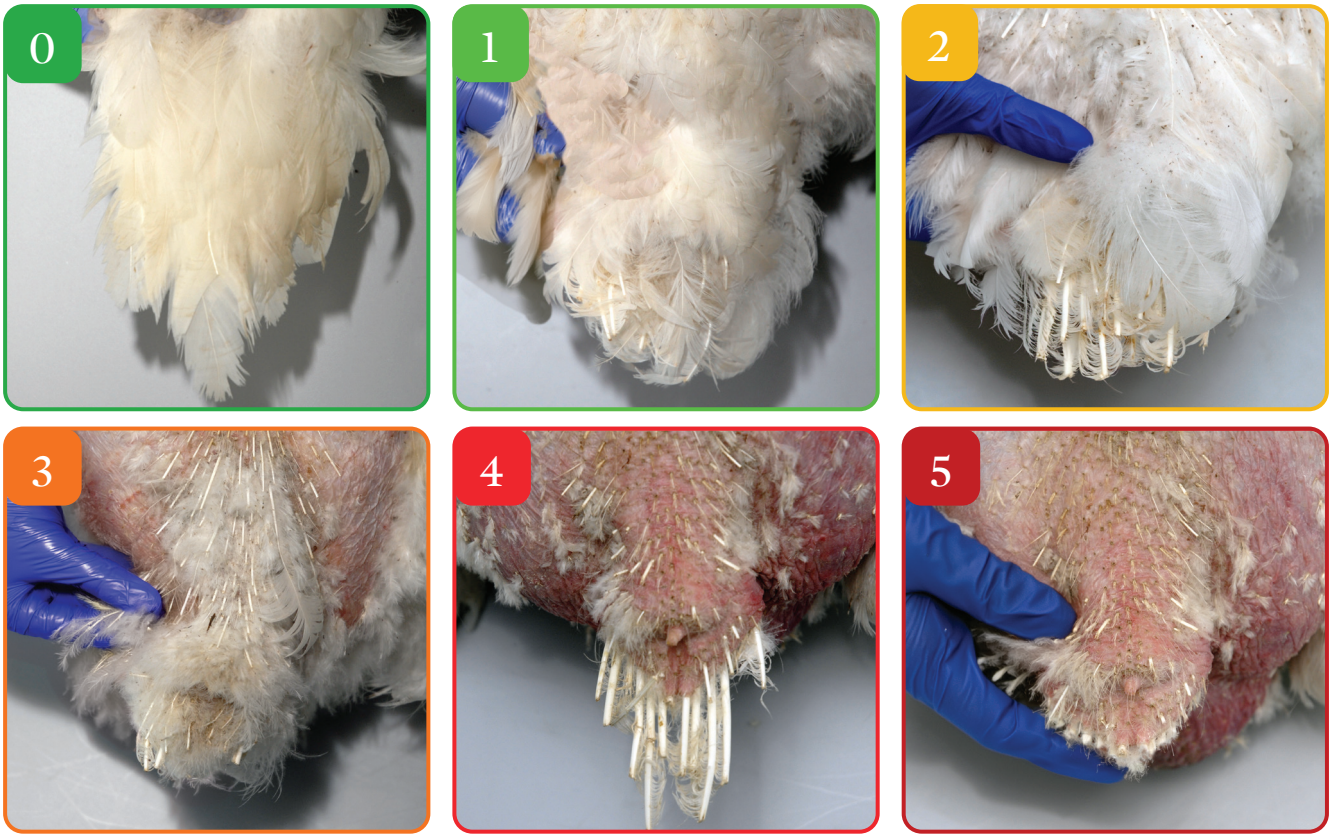


Figure 6. Example of the feather scoring system applied to the thighs of the hen.

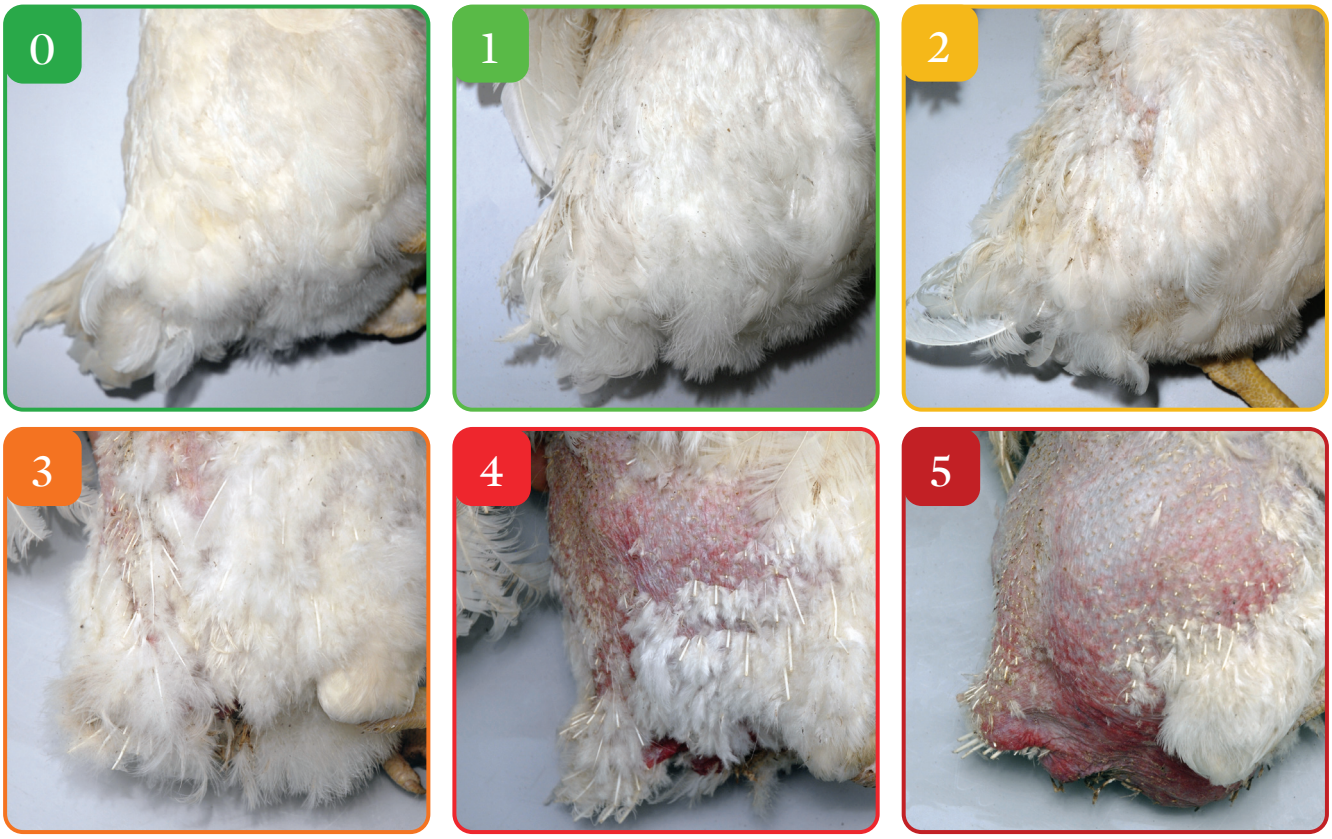


Figure 7. Example of the feather scoring system applied to the thighs of the pullet.