A Practical Guide to Managing Feather Cover in Broiler Breeder Females

Dr. Vanessa Kretzschmar-McCluskey, Global Technical Transfer Manager, Aviagen Inc.
Dr. Colin Fisher, Nutrition Consultant, Aviagen Ltd.
Otto Van Tuijl, Technical Director, Aviagen EPI.

SUMMARY
When discussing female feathering, whether development during the rearing phase or maintenance and re-growth during the production phase, one of the most critical points to bear in mind is that there are no quick and simple solutions to change feather condition in a poorly feathered flock. Once extreme feather loss has occurred in broiler breeders that are 35 weeks of age or older, there is most likely not much that can be done to remedy the situation. The emphasis must be placed on good feather cover development from the beginning of rear, prevention of feather loss from the middle of rear, and maintenance of feather cover during production. By implementing the management strategies found 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 3 weeks (21 days) of age.
- Reduce the house ambient temperature to 20°C (68°F) by 4 weeks (28 days) of age.
- Ensure feeding space follows the recommended guidelines for the type of feeding system used.
- Ensure that feed distribution time is no longer than 4 minutes during rear and 3 minutes during production.
- Maintain correct feed form.
- Monitor drinker space, water, and litter quality.
- Adhere to the Aviagen® recommendations or local legislation regarding stocking densities.
- Do not over-mate.
- Ensure that both males and females are synchronized for sexual maturity before mating-up.
- Monitor flock uniformity.
- Use red lights for a short period upon transitioning to the production house and then standard lighting thereafter.
- Ensure that feed is available to the hens as soon as the “lights on” period begins or fill the feeding system during the dark.
- Monitor the physical condition of the birds for mites and intestinal distress such as coccidiosis and necrotic enteritis.
- Implement a feather scoring system during rear and every 10 weeks during lay.
- Take into account dietary formulations to make sure that the birds are getting enough fiber, amino acids, trace minerals, and vitamins.
INTRODUCTION
Rearing modern female broiler breeders can present several challenging scenarios for farm managers. They must be forward thinkers – able to prepare for possible challenges before they arise; they must be detectives – willing to search for the root cause of an issue; and they must be action oriented – implementing changes within their control that may affect flock performance. One critical strategy is maintaining the appropriate amount of 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, a loss of body weight, a poorer Feed Conversion Ratio (FCR) 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, there are management practices during both rear and production that can be implemented to maintain good feather cover in the flock. Besides 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 have a great impact on not just feather production, but on feather maintenance throughout the production period. As birds enter the rearing house, it is important to take into account several factors that can potentially influence feather quality and consistency.

Access to the total rearing area – Birds should have access to the total rearing area at no later than 3 weeks (21 days) of age. This will allow the pullets to utilize the entire rearing space and not become overcrowded as they grow. It is well documented that higher stocking densities can have a detrimental effect on feather quality, as birds can become aggressive without adequate feeding space and can resort to feather pecking and, in extreme cases, cannibalism.

Reducing the temperature – When birds arrive at the rearing facility, it is recommended that the ambient house temperature be 30°C (86°F), with a floor temperature of 28-30°C (82-86°F). This ensures that young birds stay warm and that they use their metabolic energy for growth and not thermoregulation. However, by means of a gradual reduction in temperature, the house should be reduced to around 20°C (68°F) by 4 weeks (28 days) of age to stimulate feather growth.

Feeding space, feed distribution, and feed form – Maintaining the correct feeding space is a core principle of the correct management of broiler breeder females. A guide for the recommended feeding space for females can be found in Table 1 below. Furthermore, feed distribution time should not exceed 4 minutes, as longer distribution times can lead to inconsistencies in feeding; all birds should have access to feed at the same time. Filling the feeding system from the middle of the house or from the front and back will help to regulate this. 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.

Table 1: Recommended feeding space for broiler breeder females in rear.

<table>
<thead>
<tr>
<th>Females</th>
<th>Track Feeder cm (in)</th>
<th>Pan Feeder cm (in)</th>
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<tbody>
<tr>
<td>Age (days)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-35</td>
<td>5 (2)</td>
<td>4 (2)</td>
</tr>
<tr>
<td>36-70</td>
<td>10 (4)</td>
<td>8 (3)</td>
</tr>
<tr>
<td>71-105</td>
<td>15 (6)</td>
<td>10 (4)</td>
</tr>
</tbody>
</table>

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 will ensure that all birds are getting the most out of the feed. Many times poorly pelleted feeds can lead to under-consumption due to the build-up of fine particles within the feeders and this may cause birds to resort to feather pecking.
Drinker space and water management — Just as important as feeder space is drinker space and management. Breeder females should have unlimited access to clean, fresh water at all times as part of a balanced water management program (see also AviaTech: *Management Tools to Reduce Footpad Dermatitis for Broilers*, 2012; Aviagen Brief: *Practical Considerations for Reducing the Risk of Pododermatitis*, 2010). The recommendations for drinker space can be found in Table 2 below. Checking the condition of the crop to see if water is present is a good indicator of whether or not the birds have good access to the drinkers.

<table>
<thead>
<tr>
<th>Type of Drinker</th>
<th>Drinker Space</th>
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<tbody>
<tr>
<td>Bell drinkers</td>
<td>1.5 cm (0.16 in)</td>
</tr>
<tr>
<td>Nipples</td>
<td>8-12 birds per nipple</td>
</tr>
<tr>
<td>Cups</td>
<td>20-30 birds per cup</td>
</tr>
</tbody>
</table>

Flock illnesses (diseases) — Frequent monitoring of the flock for intestinal distress due to coccidiosis or necrotic enteritis is a key responsibility for proper flock management. This can be done by checking litter quality, fecal material for any discolorations or diarrhea, and daily observations of flock behavior. Promptly treating illnesses/diseases will help maintain good feather cover.

Litter quality — Dry, friable litter is essential for the health and development of a pullet 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 increased risk of bird illnesses.

MANAGEMENT DURING PRODUCTION
In addition to the management principles applied during the rearing phase, there are techniques that are specific to the production phase and, although some degree of feather loss is inevitable, by taking into account 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 the key. It can be very difficult to remedy extreme feather loss once it has occurred. Areas of focus in regards to feathering during production should be heavily weighted toward:

- Flock management.
- Environmental conditions.
- Feed management.
- Flock health.
- Feather scoring.
- Nutrition.

FLOCK MANAGEMENT
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 broiler breeder female where they are mated-up with males. Because of this, proper synchronization of sexually mature males and females is essential. If properly synchronized, males will tend to remain calmer and not become overly aggressive toward the females at the onset of production. This will prevent severe feather damage in the females, especially to the dorsal (back) region.

Over-mating birds can also lead to excessive female feather wear. In the broiler breeder industry, it is often assumed that the birds with the most feather wear are mating more frequently than birds that are fully feathered. However, studies have shown that females with large amounts of dorsal feather loss are less receptive to males and so may have decreased matings and fertility. Because of this, it is not recommended to judge the amount of matings or fertility of the flock based on the amount of feather cover on the hen’s back.
There is also evidence of a correlation between hen uniformity, feather coverage, and female fertility. By keeping in mind the feeding principles mentioned earlier, it will be easier to produce a more uniform female flock for production. A more uniform flock will have similar feed intakes, so that all birds can receive their daily allowance of feed. A more uniform flock will also have similar body weights. Early photostimulation of a flock that is not uniform will have a detrimental effect on reproductive development of the smaller, lighter birds, which are still developing. In many instances, birds with a higher body weight will tend to have better feather coverage and will be more likely to mate.

ENVIRONMENTAL CONDITIONS
Besides maintaining a temperature of 20°C (68°F) from 4 weeks of age (28 days) onward, providing adequate ventilation plays a key role in feather condition. Maintaining the correct amount of ventilation will help to control house relative humidity levels and ensure the air is warmed before reaching the litter. This will allow any excess moisture to be evaporated away, and keep the litter dry and friable. Correct ventilation will also help CO$_2$ levels to be maintained at less than 3000 ppm and NH$_3$ levels at less than 10 ppm. This is important because good quality litter and environmental conditions can encourage preening, and in turn, the maintenance of feathers. If the conditions of the production house are kept close to that of the rearing facility, it is more likely that the birds will have a seamless transition from rear to lay. This can be done by using the same type of feeding and drinking systems in both phases, providing a consistent temperature, etc.

Lighting must also be taken into consideration. The use of red lights for a short period immediately following transfer into the production house will help to keep the birds calm and reduce the incidence of feather pecking. After this, it is best to use a light intensity between 30-60 lux (3-6 fc), as light intensities of more than 100 lux (10 fc) will increase the risk of feather pecking. The optimal light spectrum would be one which utilizes warm white light or daylight with a frequency greater than 160 Hz.

FEED MANAGEMENT
Just as in the rearing phase, feed should be available to birds in lay as soon as the lights come on and the feeding system should be filled with the lights off. This will help the females to associate “lights on” with feeding. Feed should also be distributed as fast as possible and it is recommended that all feed be allocated within 3 minutes of starting the feeding system. In the first few weeks after transfer, it may also be helpful to deliver the feed in the dark to help limit anxiety within the flock. During the early stages of the production period it is essential that feed increases are in direct relation to increases in production. This will help to ensure that the birds are receiving the correct amount of feed and are not being over or under fed. It may also be helpful to spread insoluble grit over the litter to stimulate natural scratching and foraging behavior. Doing so will tend to alleviate feather pecking and may also improve hen digestion.

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 is observed, it is essential to the wellbeing of the entire flock that a mite problem is either ruled out or treated if discovered. Controlling intestinal distress in the birds by means of vaccination is instrumental in preventing outbreaks of coccidiosis or necrotic enteritis. If the farm manager notices a change in bird behavior along with wet litter and discolored feces or diarrhea, it is likely that the hens are experiencing intestinal distress. This should be treated as soon as possible to avoid further issues within the flock. Mycotoxin contamination of the feed can cause similar symptoms, so any incoming feed should be checked for contamination.
FEATHER SCORING
Although visual observations of female feathering are a good way to determine what is happening in the flock, conducting feather scoring will help to place a numerical value on the actual amount of feather coverage. It is important to conduct this test on the areas of the female that have the most contact with the males during mating, including the back, thighs, wings and tail. The feather scoring system is as follows:

0 = fully feathered
1 = rough
2 = some broken feathers and small bald areas
3 = heavily broken feathers and some bald areas
4 = almost bald or large bald areas
5 = bald with no feather cover

It is also necessary to score the thigh area for damage and wounds. This area should be given an additional score from 6-8:

6 = damage with some small spot wounds
7 = minor wounding
8 = serious wounding

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

NUTRITION
Broiler breeders have the genetic potential to grow at rates that are comparable with their broiler offspring, and may just as efficient. Because of this, it may be necessary to practice a controlled feeding program from rear, where local legislation permits, to help the development of an appropriate appetite during rear, ensure bird health and prevent obesity. Although this may be common practice in many regions, if the balance is not struck precisely, it can lead to behavioral issues such as feather pecking and aggression due to feeding motivation. This, in turn, can have an unfavorable effect on feather development and maintenance.

There are several aspects of hen nutrition that play invaluable roles in feather development and integrity. However, it may be very difficult to pinpoint one simple change to the diet that will remedy feathering issues once they have occurred. Nevertheless, there are preventative measures that should be accounted for both during the rearing and production phases.

**Crude fiber** – Minimum crude fiber levels should be maintained, using the values of between 4 and 7% as a guideline. There is evidence that feather eating may be associated with a craving for fiber and low levels in the feed may lead to feather pecking among the hens.

**Sodium and Chlorine** – Sodium levels should remain somewhere between 0.18 and 0.20%, while chlorine levels should be no more than 10% higher than sodium. Using sodium bicarbonate as a sodium source can help with this.

**Amino acids** – There are several amino acids that are utilized in feather development and maintenance. Methionine and cystine are two of the most critical for feather development. Few dietary ingredients contain enough methionine to maintain bird growth and proper feather development, so it is important that synthetic methionine be added to the diet to ensure that the birds get adequate amounts. Also, the addition of tryptophan to the drinking water has been shown to calm the birds, therefore reducing feather pecking.

**Trace elements** – Zinc is just one trace element that is essential to feather growth. Not only is it important for other areas of production, such as wound healing, but a deficiency in zinc could be responsible for a suppressed immune system, poor feathering, infertility and poor egg shell quality. Selenium is also important and there may be an advantage in bio-availability to using both zinc and selenium in their organic forms.

**B-complex vitamins** – Just as with trace elements, B-complex vitamins help to ensure that the birds are getting the proper nutrient ratios. Administering both vitamins and trace elements via the drinking water may help to improve feathering.
APPENDIX 1. FEATHER SCORING

Figure 1: Example of the feather scoring system applied to the back area of the hen.

- Score 0 = fully feathered
- Score 1 = rough
- Score 2 = some broken feathers
- Score 3 = heavily broken feathers
- Score 4 = almost bald
- Score 5 = bald

Figure 2: Examples of the feather scoring system applied to the wings of the hen.

- Score 0 = fully feathered
- Score 1 = rough
- Score 2 = some broken feathers
- Score 3 = heavily broken feathers
- Score 4 = almost bald
- Score 5 = bald
Figure 3: Examples of the feather scoring system applied to the tail of the hen.

Score 0 = fully feathered  Score 1 = rough  Score 2 = some broken feathers
Score 3 = heavily broken feathers  Score 4 = almost bald  Score 5 = bald

Figure 4: Examples of the feather scoring system applied to the thighs of the hen.

Score 0 = fully feathered  Score 1 = rough  Score 2 = some broken feathers
Score 3 = heavily broken feathers  Score 4 = almost bald  Score 5 = bald
To properly assess the development of feather cover over time, flocks should be scored every 10 weeks during lay, with measurements being taken at 20, 30, 40, 50, and 60 weeks of production. It is important, however, to remember that birds will begin to go through a molting period around 40 weeks of age. These birds should not be scored, as they may not be typical examples of feathering of the whole hen population.