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THE INSIDE CHIRP

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FEMALE PERSISTENCY POST-PEAK

Managing fertility and production

AVIAGEN MANAGEMENT ESSENTIALS

Aviagen®

INTRODUCTION

Managing breeding stock fertility and egg production is critical to achieving good breeder production and welfare. However, maintaining persistent egg output and fertility / hatchability remains challenging, especially between 40 and 60 weeks of age. This article highlights potential causes for an accelerated decline in egg production and hatchability persistency in breeding stock flocks post-peak and provides advice on addressing these challenges. During production, a well-performing flock has:

- A predictable and uniform onset of egg production in response to light stimulation.
- Pin-bone spacing of around 2-2.5 fingers (3.8-4.2 cm) for more than 85-90% of the females prior to first light stimulation.
- A steady, regular increase in daily egg production from 5% production.
- A peak hen-housed egg production level of greater than 90%.
- Cumulative hatchability of greater than 87% up to 64 weeks of age.
- Good feather cover for age.
- Positive net energy balance for males and females considering body weight and egg production level.

All traits above play critical roles in achieving hen-housed chick numbers close to the current performance objectives.

In most cases, when targeted cumulative chick production is not achieved, poor egg production persistency and fertility are the main drivers. Monitoring the following **Key Management Points** must be part of a daily management routine. It can make the difference between a top and bottom quartile result. Each area is discussed in more detail in the next section.

KEY MANAGEMENT POINTS

1. Rearing conditions.
2. Environment - temperature, lighting, and ventilation.
3. Sexual synchronization and mating ratio.
4. Body- and egg-weight control.
5. Production house conditions.

Rearing Conditions

The rearing period forms the foundation for the future performance of the flock. Without detailed management of all aspects of the rearing period, from brooding to mating-up, and particularly the uniformity (i.e., body weight, skeletal, and sexual) of a flock, future egg production performance can be compromised. A poorly-reared flock is less predictable, with a quicker decline in persistency post-peak and, therefore, a lower hatching egg and chick output than a well-reared flock.

A good performing flock in rear should have the following:

- A weight-gain profile closely following the breed body-weight standards throughout rear and achieves female and male target body weight at 20 weeks.
- Appropriate fleshing and body conformation for age.
- Good sustained female and male uniformity throughout rear, with a coefficient of variation (CV%) of <8% or uniformity >79% at the end of rear.

ENVIRONMENT

Effective Temperature

The relationship between effective temperature (the temperature the bird perceives) and its effect on bird performance is often overlooked. Many managers feed the same feed amount for age throughout the year, regardlessof the effective temperature that the birds are experiencing.

During winter or cooler months, feed allocation may need to be increased or held at a higher, more static level as production progresses through the cooler period. Adjustments in the digestible lysine content proportionate to an energy increase are crucial to keep up with higher feed volumes to overcome low temperatures without resulting in excessive body-weight gain.

During summer or warmer months, birds may reduce feed intake in response to the hot weather. Supplying cool water can be helpful. Reformulate the diet to balance the feed intake so that nutrient intake fulfills the birds' requirements. This can be achieved by providing a good physical feed form (less fines), using feed ingredients with higher digestibility, and increasing the proportion of the feed's energy that comes from fat.

Temperature Effect on Energy Requirements

Feed intake must be altered as the operating temperature decreases or increases from 23°C. Energy intakes should be adjusted pro rata as follows:

- Increased by 6 kcal (1.2 kcal/1°C extra feed based on a 2,800 kcal ME/kg diet) per bird per day if temperature is decreased by 5°C from 23-18°C.
- Reduced by 7 kcal (1.4 kcal/1°C less feed based on a 2,800 kcal ME/kg diet) per bird per day if temperature is increased from 23-28°C.

The influence of temperatures above 28°C on feed allocation is not as straightforward as the effect of cold temperatures. At temperatures above 28°C, the birds' need to dissipate heat results in an increased daily energy requirement. This, however, is difficult to achieve because of reduced appetite.

Parameters such as egg production, egg weight, egg mass, body weight, and feather coverage must be considered before any feed allocation changes are made. When feather cover is poor at lower temperatures, an additional increase in feed allocation (above levels mentioned earlier) is essential to maintain production traits. For example, in addition to the increase in the maintenance requirements under cold weather, there is another slight increase of feed between a well-feathered (score 0) and a poor-feathered (score 5) bird **(Figure 1)**.

For more information on managing female feather cover, please refer to the following Aviagen® article: **A Practical Guide to Managing Feather Cover in Breeding Stock Females.**

Figure 1: Feather cover scoring scale (score 0–5)

Lighting

Breeding stock males and females are photorefractory when they hatch (juvenile photorefractoriness). Juvenile photorefractoriness must be dissipated for birds to respond to a stimulatory increase in daylength. To dissipate photorefractoriness, birds must experience at least 18 weeks of short day lengths (8 hours) during rear. Birds can then be given and respond to increased day length (light stimulation), thus initiating production. If the birds experience prolonged exposure to long daylengths in rear (>11 hours), they will not dissipate their juvenile photorefractoriness, causing a delayed onset of production.

It is recommended that a day length of 13-14 hours of light be provided during production. Providing more than 14 hours of light during production generally leads to the flock exhibiting poorer persistency due to the advanced onset of adult photorefractoriness and production declines more rapidly. When open-sided production houses are used, the day length should preferably be kept to 13-14 hours, using blackout curtains at the beginning and end of each day. Trials and field examples have shown an improvement in egg production by adding 2 hours post-50 weeks, which can have the effect of late light stimulation in controlled-environment housing where the photoperiod does not exceed 14 hours. If a positive response in total egg production is seen after providing the additional 2 hours of light, a small temporary feed increase of 2-3 grams (commensurate with the level of increased production seen) may further support the response.

Ventilation

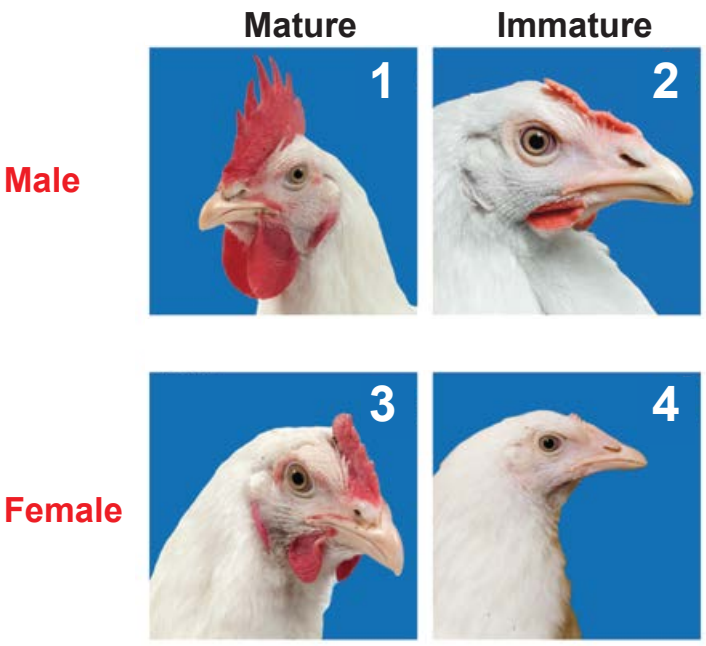
Ventilation is a key part of the management system and should be monitored as closely as possible for the whole life of the flock. It is essential to highlight the importance of ventilation and its link with production persistency. Ventilation must be accurately matched to bird biomass, feather cover, and external environmental conditions. Incorrect ventilation can increase floor eggs and ocular discharge and reduce egg production, daily livability, and fertility. For more information on the principles of breeder house ventilation, please refer to the following Aviagen® articles:
Environmental Management in the Broiler Breeder Rearing House and **Environmental Management in the Broiler Breeder Laying House.**

SEXUAL SYNCHRONIZATION AND MATING RATIO

Males that are reared more mature than females (not sexually synchronized) or excessive mating ratios can cause damage to females early in the production cycle and reduce production and fertility persistency later on. Female feather cover can be a good indicator for this damage. Normal mating behavior is affected when a female does not have the protection of a layer of feathers.

A poorly-feathered female becomes less receptive to male mating activity; therefore, reduced fertility is observed as the flock ages. The process of mating impacts feather loss; however, it is important to monitor and understand the normal pattern of feather loss and respond appropriately if it becomes excessive.

Figure 2:



It is important to ensure males and females are synchronized in sexual maturity prior to mating up **(Figure 2)**. If the facility has separate male pens and variation exists in sexual maturity within the male population, the more mature males should be mixed with the females first. This ensures the smaller, less sexually mature males have time to develop and mature prior to mating up with the females. It also helps prevent less developed males from accessing the female feeders.

Figure 2 presents an example showing:

1 a mature young male with a well-developed, red comb and wattles;
2 an immature male with an underdeveloped, pale comb and wattles;
3 a young female with a well-developed, red comb and wattles;
4 an immature female with an underdeveloped comb and wattles.

In many cases where flocks exhibit lower fertility levels through peak and particularly post-peak, mating ratios are above those recommended **(Table 1)**. It is important to check true fertility to be able to determine the cause.

Table 1: A guide to typical mating ratios

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 - depletion	50 - depletion	6.50 - 7.00

Initial mating ratios (22–35 weeks) are often higher than recommended due to the incorrect belief that this improves early and peak hatch. Avoid having high mating ratios, as this leads to over-mating, feather damage, non-receptive females (due to poor feather cover and overly-eager male mating behavior), and poorer persistency of fertility post-peak.

BODY WEIGHT

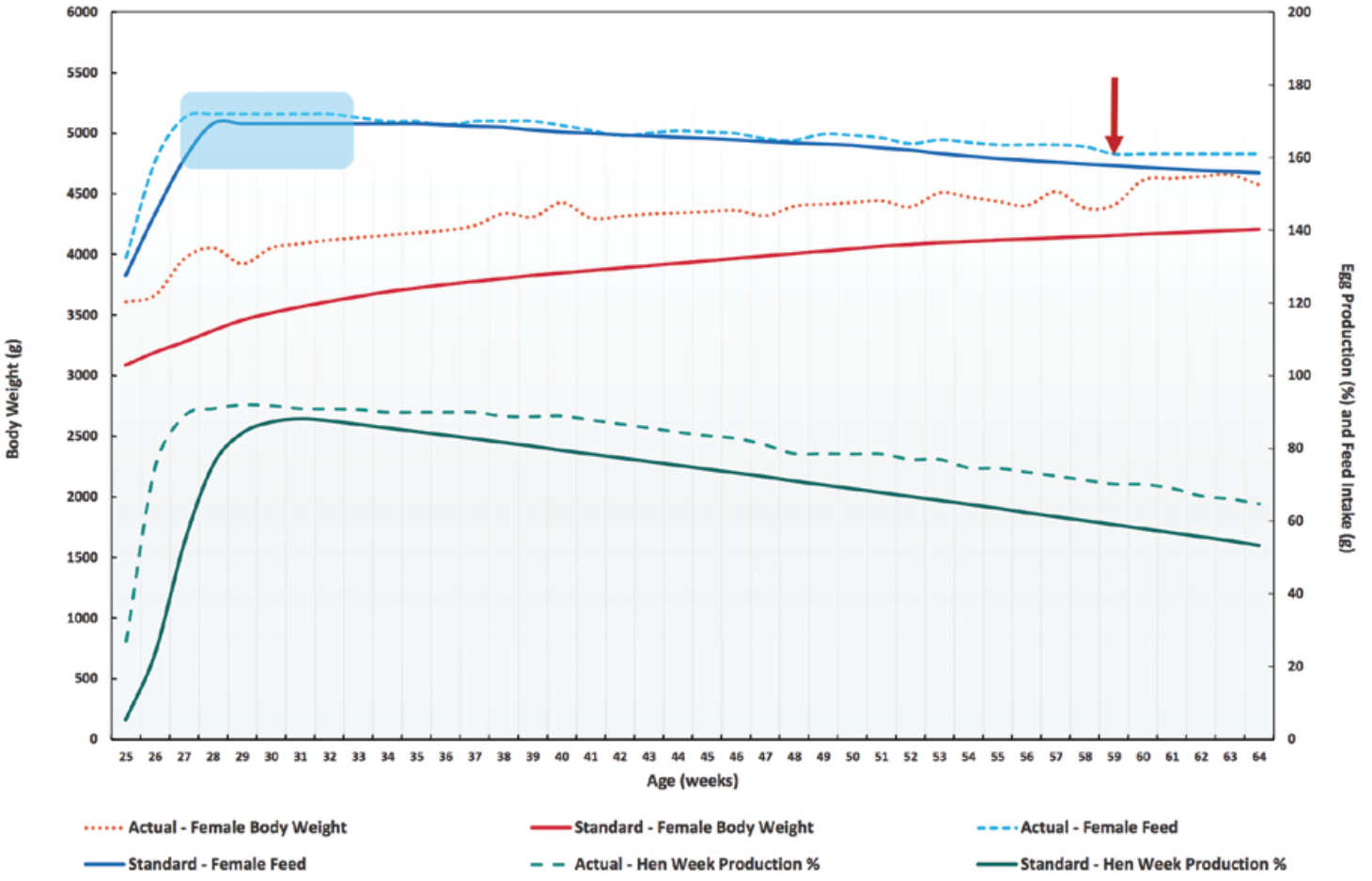
Body-weight control is critical in day-to-day management practices, but in many cases, feed allocation follows a set company profile from one flock to the next. Adjusting feed levels according to set company guidelines to stay within budgetary constraints may not allow for what a flock requires when it is over or under standard weight. Body weight, persistency, and feed levels must be managed quantitatively:

- Reducing feed too aggressively or without allowing or compensating for an overweight flock can cause a decline in production persistency, altering the balance of body-weight gain.
- Increasing feed too quickly to bring a flock back to target when it is underweight generally pushes birds overweight and reduces egg production.
- When making any adjustments in feed level, it is essential to consider the impact that this has on total nutrient intake rather than just grams of feed per bird per day.

Figure 3 shows a high-peaking flock with a peak feed amount of 172 g per bird:

(i) The flock remains on this feed level until 33 weeks, and feed withdrawal is 5.2% from peak to 59 weeks.
(ii) Persistency is good even though body weight is higher than standard.

Figure 3:
Relationships between body-weight control, feed amount & egg production.



The increased feed level and appropriate feed withdrawal allowed this flock to maintain body weight without compromising production.

For example, if a flock is overweight, the weight difference from the standard must be maintained if persistent production levels are also to be maintained. Giving more feed over the life of the flock while ensuring correct total nutrient intake maintains egg production as a reward.

Following Aviagen's recommended production diets is important to balance the changing and opposed nutritional requirements of reducing crude protein (especially digestible lysine) to control fleshing while maintaining sufficient energy to sustain egg production persistency. It is significantly more favorable to move to the next breeder diet phase to control the nutritional needs of the flock as it ages, compared with aggressive feed withdrawals to control the fleshing status of the birds.

EGG WEIGHT

Along with body weight, monitor egg weight closely during the post-peak production period. Monitoring egg weights daily allows trends against the standard to be plotted so feed amounts can be adjusted appropriately. A deviation in the increasing egg-weight trend is often seen before a reduction in egg production and can be the first indication of a potential problem. Egg weights should be recorded daily starting from 10% hen-day production. The sample from the second collection of 120-150 hatching eggs (to avoid using eggs laid the previous day) should be bulk weighed each day. All non-hatching eggs (small, double-yolk, cracked, and abnormal, etc.) should be removed before weighing.

A flock performing below standard egg production post-peak and being overfed can show consistently (over at least 4 days) higher-than-expected increases in daily egg weights away from the standard. Overfeeding a poor-performing flock has a negative impact not only on production but also on overall hatchability due to poorer eggshell quality in larger eggs. In this case, further feed removal may be required.

If the feed is withdrawn too quickly or at too high a level for the egg output of the flock, a reduction in egg weight can precede a production drop. If a consistent drop in egg weight (over at least 4 days) occurs, feed should carefully be given back to the flock, and the results should be closely monitored over the following 4-6 days.

HOUSING CONDITIONS

Breeding flocks may be challenged to varying degrees daily. Identifying the ongoing, lesser challenges that may only be observed as a gradual change in flock persistency or reported fertility, particularly during the later stages of production, is challenging.

Housing conditions **(Table 2)** should be monitored regularly, and adjustments should be made where possible.

Table 2:
Housing conditions affecting breeding stock persistency.

HOUSING CONDITION	OBSERVATION	REMEDIAL ACTION
Stocking density	Reduced egg production per female. More floor eggs. Increased CV%. Issues with feed cleanup times. Dehydrated birds.	Reduce to the recommended level (3.5–5.5 birds/m²) before an issue is seen. Ensure that there is available feeder, drinker, and nest box space as recommended.
Feeder/feeding management	Increased feed cleanup times. Reduced egg production. Increased flock CV%. Increased floor egg levels.	Maintain recommended female feeding space: • 15 cm /bird – track • 10 cm /bird – pan Maintain a minimum distance of 100 cm between feeder lines. Decrease feed distribution time to less than 3 min and/or distribute feed without lights turned on. Adjust to the correct feeder height using a winchable system.
Drinker/drinking management	Reduced egg production. Dehydrated birds. Increased floor egg levels.	Maintain recommended drinking space • 6–10 birds/nipple • 2.5 cm /bird for bell drinkers • 15–20 birds/cup Improve water availability and quality. Adjust to ensure a 75–85° drinking angle for adult birds using nipples. Adjust to correct drinker height using a winchable system.
Litter quality	Caked/non-friable litter – birds cannot dust bathe.	Ensure adequate/correct ventilation to keep litter dry and friable.
Vermin	Reduced egg production. Increased water consumption.	Ensure vermin control is effective (bait stations, etc.), and minimize vermin access to the bird areas.

SUMMARY

Breeding flocks have been changing rapidly over the years. With primary breeding companies simultaneously selecting for improved broiler and breeding stock traits, providing detailed management practices for the day-to-day operation of facilities and breeding flocks has become even more essential.

Measuring and monitoring environmental temperature, lighting, ventilation, body condition, body- and egg-weight profiles, housing conditions, and external challenges are essential for efficiently and effectively responding to flock performance.

Adjusting feed levels correctly, reacting to incorrect mating ratios, and minimizing challenges within the flock allow post-peak persistency in egg production and fertility to be improved and maintained.

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