



Aziz reflects

A series of articles from Aziz Sacranie,
Technical Director Poultry, Alltech Inc

Physiological development

To be successful in lay requires the right bird at point of lay and this is dependent on what happens in rear.

Detailed below are the physiological requirements of the bird in rear from hatching through to point of lay:

Day old to 21 days

This period is characterised by rather flat growth as well as the development of various key bodily systems.

- Chicks developing feather cover
- Immunological responses development
- Learning to eat, i.e. 'Getting Started'
- Intestinal development
- Dependent on passive immunity from the mother
 - Importance of maternal diet
- Supply organs – In particular cardiovascular system
 - Status of nutrients in the yolk is important
- Thermoregulator mechanism (TRM)
- Skeleton
 - The gastro-intestinal tract grows four times faster than the body weight of a broiler during the first two weeks of life
 - The maximum development of villi in the duodenum occurs at four days of age and of the villi of jejunum and ileum at 10 days of age
 - Histology of intestinal villi of broilers fed NuPro (rich in nucleotides), at 2% inclusion, from 1-7 days. The result showed fully developed intestinal villi which resulted in improved performance through the growing period (Zauk et al, 2006)

21-42 days

- Feather cover continuing
- Skeletal development now very rapid.
 - Skeleton achieves ~ 80% of full skeletal size by eight weeks
 - Skeletal size determines the bodyweight at which bird achieves its physiologically mature tissue composition

105 days to sexual maturity

- Accelerated growth
- Rapid development of reproductive organs
- Sexual maturity at approximately 24+ weeks



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Management techniques

The objective of rearing broiler parent stock is 'to rear according to bodyweight targets for age, uniformly' so that we can ensure uniform sexual maturity.

In order to meet this objective following management and housing criteria are a prerequisite.

Before considering placing birds there must be facility to:

- Weigh daily feed allowance.
- Distribute feed rapidly (within three minutes or less).
- Provide adequate feeding space (12-15cm per bird in rearing).
- Accurately sample weigh birds individually every week.
- Rear males and females separately.
- Plot feed levels and bodyweight on a graph weekly starting at day one.
- Bulk weighing at day old, 7 days, 14 days, and 21 days.
- Start 28 day individual bird weighing of samples as well as calculating uniformity.

Procedure

The decision for feed adjustment is made immediately after sample weighing and bodyweights are plotted on the graph, to help compare with bodyweight standard targets.

- Feed levels can only be held or increased, never decreased, during the rearing period.
- Feed increases in weeks 1-4 are given at intervals of 2-3 days.
- Feed increases prior to 15 weeks at 1-3g level.
- Flocks must be on target weight by 28 days.
- Ensure uniformity in frame size and fleshing (condition).
- Before light stimulation the birds should be on target bodyweight and with appropriate fleshing.
- Make sure that the birds are distributed uniformly in the house.
- Always place males in the first pen, providing 20% more space, feeding and drinking space, than the females.
- Feed texture is important and needs to be uniform. Fine mesh is not recommended.



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Day-old to 21 days

- Day-old chick weight must increase three times by seven days.
- Feed ad libitum until approximately 30g/bird/day is consumed.
 - Start feed control.
 - Feed increases based on bodyweight every week.
 - Two small increases in a week are better than one big increase a week.
- Bodyweight and uniformity measurements every week is necessary for correct decisions on feed increases weekly.
- Brooding temperature should provide comfort zones.
 - For example 30-31°C under brooder.
 - 27-28°C 1m away from brooder to 'simulate nature'.
- Minimum ventilation is required during the brooding stage, approximately one air exchange every five minutes.
- Feed and water should always be adequate and fresh.

22-42 days

- Ensure adequate feed and water space. Feed distribution is critical for maintaining flock uniformity.
- Achieve target bodyweight by 28 days for a 'good start'.

Note: skeletal size dictates the bodyweight at which the birds achieve sexual maturity; therefore it is critical to ensure bodyweight as well as skeletal uniformity prior to 10 weeks of age.

35 days is therefore a good time to improve uniformity by grading and separating lighter and/or heavier birds from the rest of the population.

The whole grading procedure would require weighing all the birds.

Once the birds are graded it is important to take a sample weight of each group and plot the weights on the bodyweight graph. Thereafter, plot the new bodyweight profiles for the heavy and light birds so that they attain standard bodyweight by 10 weeks of age, gradually.

Note: gradually attaining the bodyweight target at 10 weeks of age will ensure appropriate physiological development. There is no short cut!

Every effort must be made to feed to the redrawn bodyweight targets.

To recover underdeveloped birds:

- Small birds will eat slower; from 5 weeks of age, do not mix them with large birds.
- Provide 20% more feeding space, if possible.

If the birds are on 5/2 feeding program the smaller birds can eat six days instead of five days allowing them to recover in three weeks.

Uniformity

- Frame uniformity is defined by 8 weeks of age.
- Grading flocks after 12 weeks of age is not likely to give the desired performance as frame size is already fixed.



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Management techniques

42-70 days

- Feed increases are based on bodyweight each week.
- Prevent stalls or decline in bodyweight during this period as tendons and ligaments are in the process of development.
- Bodyweight is always increasing, approximately 100g/week.
- Avoid major grading as the frame is now fixed and grading by weight would not necessarily ensure uniform sexual maturity.

Uniformity of the frame is defined 0-8 weeks of age.

- Breast fleshing uniformity is achieved 16-21 weeks of age, therefore grading flocks after 12 weeks of age with good breast fleshing score does not make sense.
- From 15 weeks of age we have to live with any faults of management during 0-14 weeks.
- Grading by breast fleshing at 16 weeks of age may partially correct a flock that has poor uniformity. Note that fleshing score at this age should be 3 to 2, on a scale of 5.
- Checking the fleshing as a routine for both females and males is a good practice as it will give a good indication of the condition of the flock.
- Uniformity of the frame and fleshing should improve continuously as the bird gets older.
- Uniformity can be influenced by many management factors.
- Good controls will help reduce uniformity fluctuations.

105-161 days

- There should be positive increases in feed to ensure weekly bodyweight gain. Stalls or decline in bodyweight will delay sexual maturity.
- At 140 days, if the bodyweight is under or over, ACCEPT THE ERROR! Do not try to correct it.

AVOID accelerating bodyweight gain faster than standard. If underweight it is best to delay light stimulation and allow the birds to gain weight parallel to the standard weight.

Accelerated bodyweight at this age could result in 'erratic oviposition' which could in turn result in increased double yolk eggs, prolapsed, peritonitis and mortality (Robinson et al '97).

It is important that uniformity of bodyweight is close ($\pm 10\%$) to 80% or CV of 8% before light stimulation.

- Breast fleshing score, on a scale of 1 to 5, should be 4 to 3 at 140-147 days of age; and 90% of the females should have some pelvic fat.
- Once bodyweight, fleshing and fat reserve criteria are met, the decision to give light stimulation can be made.



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Rearing management of broiler breeders

It is recommended that males are allocated with 20% more space, feeders and drinkers compared to females. Providing high quality starter crumbs for the first 14 days followed by starter pellets through to six weeks will ensure a good early start for males in attaining target bodyweight by 28 days or earlier with a well developed early skeleton, intestinal tract, feather cover, immune system and other functional organs. A well developed skeleton sets the foundation for a well performing mature male in the laying house; body weight uniformity is of the essence.

Kirkby (1998) reported that Sertoli cell growth occurs between two and 12 weeks of age, therefore maximum potential of sperm production is established during the first 10 weeks. Bodyweight should always increase during this period with the least amount of stress or stalls possible. Selenium-protein (Sel-Plex) in the diet is also important as it maximises the Sertoli cell growth (Mahan 1997).

It is good practice to select the best males at five weeks, removing any males with defects such as leg weakness or those that are severely undersized. Uniformity is maintained thereafter by the correct stocking density, feed/drinking space and feed allowance.

From 10 weeks, it is critical that the bodyweight is continually gaining impetus. Development of the testes continues through to sexual maturity at 23-24 weeks. From 15 weeks there is rapid development of the testes and growth profiles must be followed or fertility will be delayed or lost.

Mating up

Males and females need to sexually mature together. Bodyweight as well as frame size uniformity is critical for both the sexes.

Once mating begins it is necessary to closely monitor male weight weekly, in order to prevent weight loss by increasing feed intake.

As most of the mating takes place in the scratch area (which should be full of birds particularly between 5-8pm), observation of mating behaviour will help to ensure the males are 'working' as they should and, if not, it is advisable to remove them. Successful mating requires cloaca contact.

Factors affecting mating behaviour

- Age.
- Body weight and breast fleshing.
- Mating ratio.
- Physical condition. Feet and legs should be free from deformities.
- Peck order or dominance – dictated by comb, body and wattle size.

The mating ratio at the onset will depend on the aggressiveness of the males, which is greatly influenced by bodyweight. The best males will be on or marginally above target bodyweight at mixing time. As a guide, the mating up ratios should be 8-10% for males in fair condition.

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Managing males during the laying period

Both males and females need to be sexually mature together. When the ratio of males to females and body weight are synchronised this will result in appropriate mixing of sexes thus preventing females avoiding males by remaining on the slatted area for a prolonged time. This will also prevent unnecessary mortality. As a guide to the appropriate mating ratio required at the time of sexual maturity the following is suggested:

- Birds in good physical condition: 7.5-8.5%.
- Fair condition: 8-10.
- Poor condition: 9-12.
- Excellent condition: 6-7.5

All mating takes place in the scratch area. It is important to closely monitor bodyweight at sexual maturity. To prevent weight loss adjust feed intake appropriately.

Overmating by males may result in feather loss and side damage in the females without causing mortality. In such cases, a reduced mating ratio at the beginning, while increasing the mating ratio later in the production period, leads to reduced female damage.

Nutrition plays an important part in ensuring good fertility. Organic selenium, particularly Sel-Plex, has been shown to maximise Sertoli cells during the rearing period in males as well as maximise sperm quality during the laying period. Sel-Plex also maximises sperm quality, as seen in Table 1, reported by *Eden et al.*

Sel-Plex in the female diet will also ensure maximum viability of sperm once deposited in the oviduct, providing a higher probability of fertilisation and subsequent hatchability and an improvement in chick quality as reported by Ranema.

- To prevent excessive weight gains in maturing males it is essential to have a good separate sex feeding equipment.
- Feed levels should increase slowly and steadily for males to maintain body condition and activity.
- Male growth after 40 weeks of age is minimal; approximately 20g every week. Males should never stall in weight gain.
- Males need low but constant feed increases which is best obtained with a well balanced diet ensuring appropriate body weight gain, macro and micro nutrient intake to support overall production adequately

Table 1. Spermatozoal abnormalities found in semen from roosters given feeds with either sodium selenite, selenomethionine or no supplemental selenium.

Spermatozoal form	Basal (%)	Selenite (%)	Sel-Plex (%)
Normal	57.9 ^c	89.4 ^b	98.7 ^a
Bent midpiece	18.7 ^a	6.2 ^b	0.7 ^c
Swollen midpiece	1.6 ^a	0.4 ^b	0.1 ^c
Ruptured midpiece	0.9 ^a	0.1 ^b	0.0 ^b
Swollen head	1.3 ^a	0.2 ^b	0.2 ^b
Cork screw head	15.4 ^a	1.8 ^b	0.2 ^c
Coiled	3.2 ^a	0.8 ^b	0.0 ^c
Fragment/other	1.0 ^a	1.1 ^a	0.1 ^b



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Feeding during the laying period

Feed management is critical when it comes to getting the most from your flock during production. Having reared the flock uniformly on target bodyweight and profile, it is now important to continue to feed according to bodyweight until 5% hen day production. Thereafter it is important to increase according to production. Feed increase is based on bodyweight for age; therefore avoid excessive increases to ensure appropriate follicle hierarchy.

The objective of increasing feed is to stimulate and support production, this commences at 5% HD. Initially feed increases should be small and grow in line with production; while peak feed is best given by 60-70% HD. Avoid bringing the flock into production too early (23 weeks or earlier). Early production will result in a good peak but with less consistency, more wear and tear of feathers and a smaller egg size.

Body weight

It is important to note that bodyweight should increase (18% to 20%) from start to peak production. This helps to plan feed reduction post peak. The control of bodyweight as the flock approaches peak production will allow more flexibility during post peak bodyweight, resulting in a higher rate of persistency until the end of the production cycle.

Many flocks in the field become overweight (3-5 weeks after peak production) indicating that excess feed was available in peak or just after peak. Total feed reduction from peak should be between 8-14% depending on the time of the year, production persistency and bodyweight of the females. Females need to continue to gain bodyweight slowly, (approximately 20g/week) so that production is maintained. Bodyweight should not plateau or drop.

Post peak production

When peak production is achieved, feed reduction can be implemented by 2g per week for two weeks in a row and then by 1g per week until 40 weeks of age. After this period, reduce by 1g every two weeks. By reducing the feed on time you can avoid overweight birds after peak production. Be particularly careful if females are not prepared to start production. In this case post peak feed reduction needs to be delayed, when hen day production drops after peak production.

Try to avoid any feed changes at 40-45 weeks of age that involve a change in the feed ingredients. Every change is a stress and can affect production from which the females may not recover. Feed quality and feed consistency is important to maintain production performance and also ensure appropriate bodyweight control. The maintenance of vital organs, bone and muscle, have the highest priority followed by reproduction. An oversupply of nutrients can result in excess fat and follicle production (this can lead to SDS and haemorrhagic liver syndrome as a direct consequence from start to peak production).