Making genetics work – part one

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The modern commercial layer has dramatically improved over the past 30 years. This improvement is largely due to the genetic selection for performance traits by the primary breeding companies. To keep pace with these genetic advances the feeding and management practices have improved along with the housing and bird's environment.

We have a better understanding of the needs of the chicken. Improved health, vaccination and biosecurity programmes have occurred. The eradication of vertically transmitted diseases, like Mycoplasma gallisepticum and Salmonella pullorum, has contributed to increased productivity.

The eradication of lymphoid leukosis from breeding stock by one primary breeding company has resulted in dramatic improvements in livability.

Realisation of the genetic potential in the modern egg type layer begins with a good quality pullet at the point of lay. Pullets with the correct body weight and body composition at the start of egg production will best be able to achieve the performance goals set by the primary breeder.

Problems fostered during the growing period cannot be easily corrected after egg production begins. The body reserves needed to maintain egg production and shell quality during the production period are made during the growing period. Many of the problems encountered in layer flocks are a consequence of problems with pullet development and growth during the growing period.

Table 1. Annual genetic improvements in brown egg layers.

Trait	Current change per year
Egg weight – first eggs (g)	+0.5
26 weeks (g)	+0.3
56 weeks (g)	–
Body weight at 72 weeks (g)	-10
Shell colour	1 unit darker
Shell strength (g)	+8.0
Haugh units	+1
Feed conversion (%)	+1.5
Age at 50% production	0.7 days earlier
Peak rate of lay (%)	+0.2
Rate of lay 65-72 weeks (%)	+1.0
Hen housed eggs to 80 weeks	+2.9
Livability – lay house (%)	+0.2
Grow house (%)	+0.1

Day	Management schedule
- 14 days	Remove old feed; completely clean and disinfect the house; implement a rodent control programme.
- 7 days	Fumigation of the house, environmental testing of the house to confirm cleanliness.
- 2 days	Turn on the brooder; clean and disinfect water lines; place paper on floor of growing cages and brooding rings.
- 1 day	Bring the house temperature to 35°C (Brown) or 32°C (White) and minimum 50% relative humidity; set the light clocks for 23 hours of light at 10-20 lux minimum light intensity; fill the feeders to the highest level with starter feed; adjust drinker height to the appropriate level.
+1 day (arrival of chicks)	Stimulate water consumption by the chicks by filling cup drinkers or allow nipple drinkers to have a hanging drop; use vitamins and electrolytes in the drinking water; place starter feed on the cage paper in front of the feeders after chicks have had a opportunity to drink.
+ 3 days	Begin to reducing the house temperature by 2°C per week to prevent dehydration and overheating and pasting of cloacas.
+ 7 days	Reduce to 20 hours of light, reduce light intensity to 5-10 lux minimum; begin beak trimming.
+ 14 days	Remove the cage paper; separate chicks into upper and lower levels to give more space.

Table 2. Management schedule.

Brooder house preparation

The brooder house should be carefully prepared well in advance of the arrival of the chicks. The cleaning and disinfection process should begin at least two weeks prior to the arrival of the flock. Complete cleaning/disinfection and rest time between flocks reduces the infection pressure for a new in-coming flock.

Multiple aged facilities increase infection pressure. The brooder house should be cleaned of all organic matter by high pressure, warm water spray application of a detergent/disinfectant.

Allow adequate time for the detergent to soak surface areas to maximise cleaning. After drying completely, the house should be disinfected or fumigated and again allowed to dry.

Heating the house improves the removal of organic matter and the effectiveness of disinfectants. The effectiveness of the cleaning and disinfection process should be confirmed by visual inspection and environmental swabbing for coliforms and salmonellas.

Particular attention should be paid to controlling rodents on the brooder farm. Rodents are known carriers of many poultry diseases and the most common reason for recontamination of a cleaned poultry house.

Set out rodenticide bait stations prior to removing the old feed to prevent rodents from fleeing to another house.

Rodenticides should be placed in any areas of rodent activity in and around the house.

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Age (days)	Cage brooding		Floor brooding	
	Brown *	White **	Brown	White
1-3 (40% minimum RH)	35-37	32-33	35	33
4-7	32-34	30-32	33	31
8-14	29-31	28-30	31	29
15-21	26-29	26-28	29	27
22-28	24-26	23-26	26	24
29-35	21-23	21-23	23	22
36 onwards	21	21	21	21

* Hy-Line Variety Brown ** Hy-Line variety W-36, Commercial Management Guide 2006-2008

Table 3. Brooding temperatures (°C) for egg type pullets.

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Rotate the type of rodenticide used to maintain the effectiveness of the programme.

Brooding

The first seven days of life is a critical transition period for the chick. The transition from yolk sac derived nutrition to the consumption of starter feed must occur rapidly without delays.

The newly hatched chick has limited ability to regulate body temperature (pokilothermic) and must be provided with the proper temperature and humidity. The chick is able to regulate its body temperature by the end of the third week (homothermic).

Cage brooding requires stricter management control of house temperature and humidity levels because the chicks cannot migrate to an area of comfort like floor-grown chicks. Brooder cages should have paper on the floor from day one. Paper helps with temperature control, prevent chilling air draughts and allow supplemental feeding off the paper.

Humidity of the air should be a minimum of 50% during the first week to prevent drying of the mucus membranes of the respiratory tract and dehydration.

Low air humidity is more common in cold climates where heaters are required to maintain the correct brooding temperatures. Humidity can be added to the air with misters/foggers or by wetting the walkways between cage rows.

Generally in cage brooder houses with three or more cage levels, the chicks are placed at the top or middle level where the air temperature is warmer and the lights are brighter. This helps with chicks adapting to their new cage environments. By three weeks of age the chicks are divided into all cage levels to give more space.

The chicks must be trained to use drinkers and feeders quickly after arrival. Cup drinkers should be manually filled frequently during the first three days after arrival.

The pressure of the drinking system should be lowered to make drinking from the cup and nipple drinkers easy.

The column pressure of nipple drinking systems should be adjusted to allow a hang-

Table 4. Space recommendations for brown pullets (Hy-Line Variety Brown, Commercial Management Guide, 2006-2008).

	Cage	Floor
Floor space (cm^2)	350	1115
Feeder space (cm/bird)	8	8
Pan (per 20 birds)	–	1
Water space		
Trough (cm/bird)	3	3
Cups/nipples (per 8 birds)	1	1
Fountains (per 50 birds)	–	1

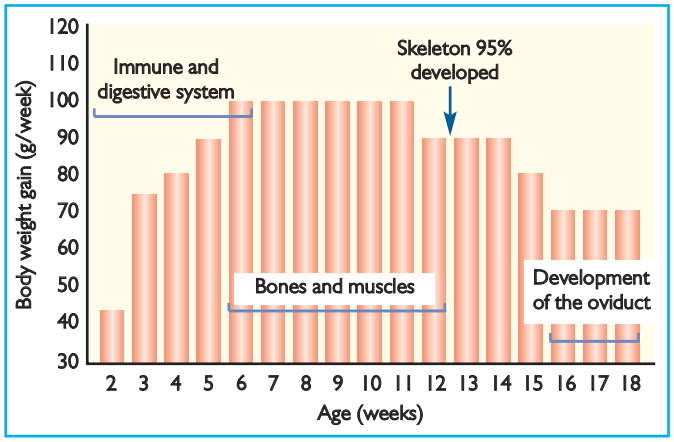

Fig. 1. Growth pattern of a layer.

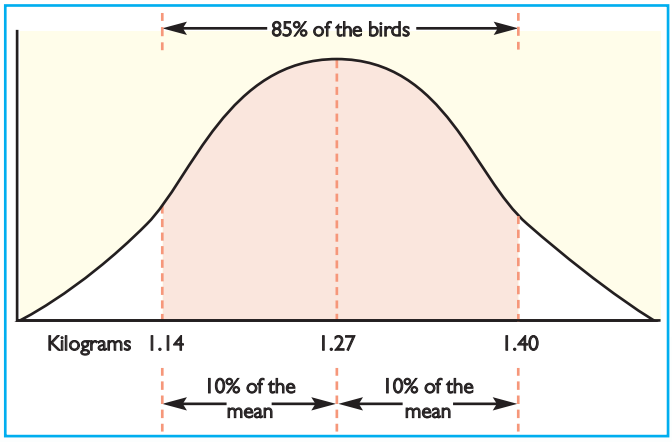

Fig. 2. Body weight uniformity.

ing drop of water to be visible to the chicks. Feed should be placed on the cage paper in front of the trough feeders. The trough feeders should be filled with starter feed to the highest possible level.

This should be done prior to chick arrival or in the first hours after placement.

Training chicks to use the feeders and drinkers usually take three days.

Chicks that fail to adapt to their environments will usually die at three, four and five days of age, when the yolk sac is depleted.

Pullet development

Pullets grow according to a well orchestrated sequence of events. There are three critical phases in pullet development:

● 0-6 weeks of age.

During this period, the organs of the digestive and immune system undergo substantial development. The pullet's capacity for digestion of feed is determined in this phase. Arrested growth during this period will have permanent negative effects on digestion and immunity. Coccidiosis and infectious bursal disease can affect pullets during this time. Immunosuppression can result in Gumboro and Marek's infections during this period and could render the bird more susceptible to other infections later.

● 6-12 weeks of age.

During this phase, the body grows rapidly with increases in muscle and bone mass. The pullet attains most of its adult stature by the end of this phase. The skeleton should achieve 95% of adult size by the end of the 12th or 13th week.

At the conclusion of this phase of growth the epiphyseal growth plates at the ends of the long bones will mineralise and no further increases in bone length will occur. Poor growth during this phase results in small framed layers that lack sufficient body calcium and protein reserves to sustain a high level of egg production.

Any compensatory body weight gains after this phase will not increase bone and protein reserves in the pullet. Stressful vaccinations, beak trimming, unnecessary handling of birds and other inappropriate management practices should be avoided during this critical period of rapid growth.

● 12-18 weeks of age.

The growth rate slows and the reproductive tract matures and readies itself for egg production. Low body weights and stressful events during this period can delay the onset of egg production. Infections with infectious bronchitis can result in oviduct damage. Rapid weight gain over the breeder's recommendations leads to fat cell proliferation which may cause layers to become fat later in life and should be avoided.

The body weight at the time the first egg is laid is an important predictor of layer performance. Generally, heavier pullets at age of first lay have better peaks and persistency of egg production, better shell quality and larger egg size than lighter weight pullets.

The goal for body weight uniformity during the growing period is 85-90%.

Poor uniformity can be caused by many factors including:

- Diseases.
- Overcrowding.
- Inadequate nutrition or feed management.
- Stress.
- Poor beak trimming.
- Insufficient feeder space.
- Insufficient access to drinking water.
- Feed refusal (mycotoxins, poor quality).
- Enteric diseases (coccidiosis).
- Abrupt feed formulation or ingredient changes.

When poor weight uniformity occurs it may be necessary to sort the pullets by weight, if possible. Floor grown pullets can be separated into pens of different weight classes.

Pullets in cages can be sorted by cage level and fed separately, but this is difficult in large flocks. Where the birds cannot be sorted into weight groups, the flock should be fed according to the requirements of the lighter birds in the flock.

Body weight monitoring should begin when the flock is four weeks old. Birds should be weighed weekly during the growing period and every two weeks from the start of egg production until the peak egg production is reached.

After peak the flock can be weighed monthly. At least 100 birds should be weighed.

For pullets in cages, a selection of cages from all levels and positions within the house should be marked. Select cages at the beginning and the end of feed lines. These same cages should be weighed every week. All the birds in these cages should be weighed individually. Weighing should occur about the same time of the day.

Weekly monitoring of pullet body weights makes it possible to identify when growth problems occur. It is common that poor growth is associated with a change in feed or following a stressful vaccination or management practice.

Always weigh birds prior to a scheduled change in feed formulation (for example, starter to grower to developer feeds). Scheduled changes in feed formulations should always be based on achieving target body weights and not the age of the flock.

Underweight pullet flocks or flocks with poor uniformity should be retained on the more nutrient rich feed formulation.

Pullets grown on the floor will typically grow slower than cage grown pullets. ■

Table 5. Body weights in brown egg pullets.

Age in weeks	Cage[1]	Cage-free[2]
1	70	70
3	190	160
5	385	330
7	600	540
9	815	760
11	1020	960
13	1190	1130
15	1330	1290
17	1460	1430
18	1520	1500

[1]Hy-Line Variety Brown, Commercial Management Guide, 2006-2008.
[2]Hy-Line Variety Brown, Commercial Management Guide, Alternative Systems, 2004-2005 (UK).