

**HUSBANDRY GUIDELINES
PREMIUM CHICKENS**



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INTRODUCTION

The objective of this Guideline is to provide the basic management principles suitable for all Hubbard Premium chicken breeds used in slightly slower, intermediate to very slow growth production schemes. It is important to recognise that there are some genetic and behavioural differences to conventional broilers which necessitate slightly adjusted management.

The production schemes for which these breeds are being used can vary in many aspects (stocking density, maximum permitted average daily growth rate, minimum age, enrichments, access to a covered range or free-range, etc). These different parameters also have consequences for the management required for the chickens. For example, in systems with separate ranging areas or outdoor access, the room temperature should be adapted to the actual outside temperature a few days before the chickens have access to the ranging area.

Because of the diversity of breeds, bodyweight objectives and production schemes, these Guidelines cannot cover all details for each different situation. Therefore, we have chosen to develop separate nutritional recommendations which are not included in these Premium Chicken Guidelines.

Nevertheless, like all animals, optimal management in the brooding period is essential to build robust and uniform chickens which will be able to exhibit their natural behaviour while efficiently converting vegetable proteins into meat with very high eating quality.

KEY POINTS

- >> Pre-placement house preparation with efficient control of the feeders, drinkers, heaters, thermostats and sensors, floor temperature and ventilation.
- >> Optimal starting period with a 7-day bodyweight of at least 3 to 4 times the initial chick weight depending on growth potential, and a uniform flock.
- >> Observation of chickens to better understand their needs and the way to fulfil them.
- >> Good ingredient quality, appropriate nutrient balance, and optimised feed intake with good feed presentation.

1. STARTING PERIOD

>> Premium chicks need special attention in the first week of life because of their different genetic characteristic. In particular, they will have a lower intake of feed and water, lower growth rate and therefore lower heat production and (often) a lower density per m² compared to conventional broiler chicks.

>> The first week of life is key to ensure future performance. Bodyweight increases 3 to 4 times over the first week compared to the day-old chick weight, so feeders, drinkers, temperature, and ventilation all need to be adjusted frequently. Good early growth is important for the development of the skeleton, physiology and immunity as well as achieving a good uniformity. Therefore, attention to detail is important in this period.

1.1. QUALITY OF DAY-OLD CHICKS

>> Check the quality of the day-old chicks (a sample of at least 30 chicks) using the table below.

>> Weigh a representative number of chicks at random to get an accurate initial bodyweight and uniformity, in order to adapt your management according to the results.

Parameters	Characteristics
Eyes	Dry, clean, and bright
Navel (Fig. 1)	Sealed and clean
Beak	Clean, free from red spots (Fig. 2) and malformation
Feet	Warm, free from deformed toe, imperfections, red and swollen hocks (Fig. 3)
Activity (Fig. 4)	Place a chick on its back, it should turn over within 3 seconds
Down and appearance	Clean and dry



Fig. 1 – Navel not sealed properly



Fig. 2 – Red spot



Fig. 3 – Red hock



Fig. 4 – Activity

>> A good quality chick is mainly perceived by its activity, some chirping, the absence of respiratory anomalies and a properly healed navel.

1.2. ENVIRONMENTAL PARAMETERS

>> Newly hatched chicks are not capable of fully regulating their body temperature.

- Make sure the house and the floor is nice and warm (see Appendix 1 - page 14). The optimum temperature zone for a young chick is very narrow (90 - 93 °F). Below 90 °F, the chick is not capable of maintaining its body temperature. Above 93 °F, the chicks are less active and are at risk of low feed intake.
- Check and record the temperature, humidity, air speed, and observe chick behaviour (Fig. 5): distribution throughout the house, chirping, attitude, and their feeding and drinking activity.

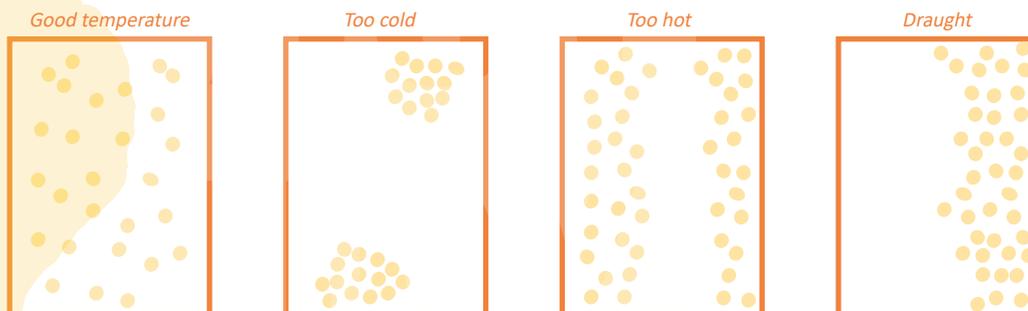


Fig. 5 – Interpretation of the distribution of chicks in their brooding area

- The adjustment of the equipment is based on observation of chick behaviour.
- Chicks from young breeder hens are smaller and so require a higher temperature approximately 2 °F higher for the first week.
- If chicks have cold feet, increase the ambient temperature to 93 - 95 °F for at least 4 - 6 hours. Reassess feet temperature regularly until it returns to normal before decreasing the house temperature. Monitor chick condition hourly at these temperatures as the risk of dehydration can be high.
- Vent temperature can be checked with an accurate and regularly calibrated digital thermometer without moving chicks outside the brooding area to ensure no bias in the measure. The target temperature is 103 - 105 °F.

>> Recommended environmental parameters:

Age (in days)	Temperature (°F)			Relative humidity (%)	Air speed (ft/s)	Minimum ventilation (ft ³ /lb LW/hour)	
	Using brooders *		Whole house heating			Cold weather (<41 °F)	Temperate and humid weather
	Under brooders	Ambient temperature					
0	100	86	90-93**	40-60	0.3 to 1	16.0-19.2	24.0-32.0
7	91	82	84-86	40-65		14.4-17.6	19.2-28.8
14	86	81	81-84	50-65		12.8-16.0	19.2-24.0
21	84	77***	77-81***	50-65	1 to 6.6	12.8-16.0	19.2-24.0
28		73-77	73-77	50-65		12.8-16.0	19.2-24.0
35		70-72	70-72	50-70	1.6 to 9.8	12.8-16.0	19.2-24.0
> 42		66-70	66-70	50-70		12.8-16.0	19.2-24.0

* For canopy / traditional brooders the thermometer height should be 4 In from the litter and 12 In from the edge of the brooder.

** The floor temperature should be at least 84 °F at the time of placement.

*** For flocks which have an access to outside as early as 21 days, lower room temperature may be targeted according to weather conditions.

1.3. FEED AND WATER

>> Feeding and drinking equipment recommendations:

Type of equipment		Ratio
Water	Round	1/100 chickens
	Trough	0.79 in/chicken
	Nipples	1/10-15 chickens
Feed	Pans	1/60-80 chickens

>> Feeding from 6 - 12 hours after hatch stimulates the development of the chick’s gastrointestinal system and promotes resorption of the yolk sac.

- The floor area needs to be covered with feeding points (paper, egg trays, pans and/or troughs) when the chicks arrive, and placed next to a water source so that the chicks can also find clean fresh water straight away.
- 0.03 to 0.06 lbs of crumb feed per chick on paper is recommended in 40 to 50 % of the brooding area (Fig. 6). It is important not to give more than 0.04 to 0.06 lbs at placement as Premium chicks eat less and the feed may quickly become old and stale for them.
- 0.01 lbs of fresh feed per chick should be added twice a day until end of day 2 or 3. The paper, if not biodegradable, should be removed on the third or fourth day.
- Supplementary feeders or egg trays (1 for 100 chicks) should be provided the first 7 - 10 days when automatic feeders are not easily accessible at the time of paper removal.



Fig. 6 – Feed on paper at start

- It is very important to observe eating behaviour by the chicks to ensure they have easy access to feed and water when paper is removed or feed equipment is changed especially around 3 - 5 and 10 - 14 days of age.
- After 2 weeks the chickens should be allowed to clean out the feeding pans 1x per day but make sure not to leave them empty for more than 1 hour per day.

>> Water is very important as chickens can drink 1.6 to 2.5 times as much as they eat, depending on age, temperature and watering system. The water intake of Premium chicks is lower compared to conventional broilers. Therefore, good hygiene of the water system is even more important to make sure that fresh water is provided at placement and that the water lines are regularly (automatically) flushed.

- Refilling and cleaning drinkers (bell and nipple) should take place several times a day during the first week and regularly at older ages especially after treatment has been provided through the water.
- Use supplementary drinkers for the first 24 - 72 hours where bell or trough drinkers are used.
- Adjust the height of the drinking lines (nipples) and the water pressure every day.
- If nipple drinkers are utilised, they need to be triggered prior to or during placement of chicks to ensure a droplet is formed on the tip of the nipple to attract the chicks. Ensure that water pressure is low and constant through the complete length of the line.



Fig. 7 – Full, soft, and rounded crop

>> Eight hours after placement, at least 80 % of the chicks must have their crop full of feed and water (Fig. 7). This must increase to 96 % about 24 hours after placement. If not, review feed placement, feed quality and water supply and the brooding conditions (temperature, light intensity, chick quality...).

1.4. LIGHTING DURING THE BROODING PERIOD

>> Recommended lighting programme:

Age (days)	Number of dark periods	Hours of darkness*	Intensity* (FC)
0 - 4	6	6 times 30 min = 3 hours	> 4.6
5	1	4	3.70
6	1	4	2.80

* Check local and production scheme regulations for the permitted hours of darkness, access to natural light and light intensity.

- In case the chicks are huddling against the side walls a few hours after placement, check the ambient temperature first and if possible rectal temperature of the chicks which should be in the range 103.1 to 105 °F. If the temperature is normal, reduce the light intensity to 0.9 - 1.5 FC as the chicks sometimes tend to hide away from too high light intensity.
- Short dark periods alternating with longer light periods are useful to stimulate chicks to eat and drink each time the light is switched on again and prevent them from huddling and sleeping in certain areas (e.g. corners) for a long time.
- After 4 days of fractionated light, a “one dark” period lighting programme is necessary to synchronise the flock and optimise their physiological development through the production of the melatonin hormone.
- In dark-out and semi-closed houses, light intensity should be gradually reduced to 2.80 - 1.90 FC between 7 and 12 days.

2. GROWTH AND DEVELOPMENT

>> From the second week of life, further growth and development occurs in skeletal, organs and muscle mass. Growth should be monitored regularly, preferably at least every 7 days to check it is according to the target for the breed and growing system.

2.1. LIGHTING DURING THE GROWING PERIOD

>> Recommended lighting programme (see Appendix 2 - page 15):

Age (days)	Hours of darkness*	Intensity (FC)*
> 7	Min. 4 and up to 12	0.5-1.90

* Check local and production scheme regulations for the permitted hours of darkness, access to natural light and light intensity.

- The implementation of the lighting programme after 5 days of age may be further delayed by 1 to 3 days for chicks from young breeder hens.
- The optimal duration depends on final bodyweight, genotype, feed form and composition and the sensitivity of the farm to metabolic issues.
- In all breeds, irrespective of their growth rate, dark periods are especially useful from 7 to 21 days to allow chickens to grow a solid frame and thus result in strong legs.
- Because the natural feeding pattern of chickens is to eat and drink before the dark period, it is important to switch off the lights every day at the same time.
- Long dark periods increase the activity of the chickens during daytime and may increase the risk of other factors such as skin scratches and tears. Shorter dark periods, if permitted, can be introduced when these factors are a concern.
- Lights should be switched on in the early morning, so that the chickens will be active again during the coldest period of the day.
- Use lights that will switch on and off slowly (dawn-to-dusk systems).
- Where windows are used, whether in the side walls or roof, avoid direct sunlight shining onto the chickens. Preferably use windows which can be closed or shaded.
- Appendix 2 gives more information on how to build a lighting programme depending on breed type, market age and field observations.

2.2. GROWTH MANAGEMENT

>> Because the growth rate of chickens depends on genotype, season, feed characteristics, housing system and the production objectives, it may be necessary to manage the growth rate to reach the right bodyweight at the right age. Growth may be managed by nutrient specifications, feed presentation, meal feeding, environmental temperature or light restriction without compromising the natural requirements of the chickens.

2.2.a. Nutrient specifications

>> A decrease in nutrient density of diets impacts growth and increases feed conversion (FCR) as chickens try to partially compensate with increased feed intake to maintain nutrient intake. Some alternative feeding strategies may be interesting to manage growth depending on the season.

- Increasing the energy content of diets in winter may promote higher energy intake to compensate for higher maintenance energy requirements caused by colder temperatures when chickens have access to a covered range or a free ranging area. Therefore, a reduction of protein content of the diet maybe also necessary if the bodyweight objective at a given slaughter age is similar throughout the year to avoid excess protein intake.
- Increasing protein content of diets in summer may compensate for a lower feed intake due to higher temperatures. Energy may be slightly reduced and some added fat may be included to stimulate feed intake. In these conditions promoting feed intake is important. Pay attention to the factors that affect the opportunity for chickens to consume feed easily such as feed presentation, feed access especially during the cooler parts of the day.

>> It is important to keep in mind that seasonal effects on growth may not be fully compensated by nutrition. Air speed management and evaporative cooling will have a bigger impact than nutrition on feed intake and the ability to sustain growth performance during hot weather.

2.2.b. Feed presentation

>> Switching to a mash diet from 14 days old is one method to slow down the growth. It is still highly recommended that chicks get a good start by using crumbled feed.

>> A finer mash with few coarse particles will reduce growth more than a coarse mash, but may also reduce uniformity.

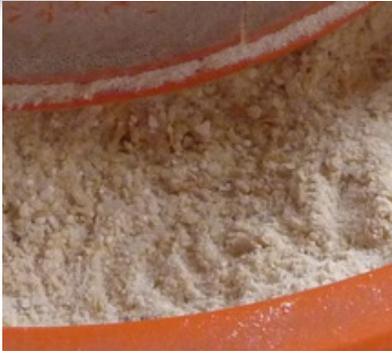


Fig. 8 – Very fine mash



Fig. 9 – Intermediate mash



Fig. 10 – Coarse mash

2.2.c. Meal feeding

>> Regulations in some countries or production schemes require ad libitum access to feed. In case meal feeding is permitted, this can be a powerful tool to prevent feed particles segregating and a build-up of dust in the feeders. It also can help to reach the bodyweight objective irrespective of the season. This requires careful management to ensure the requirements of the breed are being met.

- Once chicks can reach easily to the bottom of the feeder (normally from 10 - 14 days of age), a regular procedure to empty the feeders may be implemented. Chickens may be allowed to eat almost all the feed before fresh feed is distributed, in order to reduce the amount of fine particles accumulating in the feeders.
- A short period without feed is beneficial for growth as chickens are able to compensate their feed intake later in the day and get accustomed to meal feeding.
- The period without feed should evolve according to the actual weekly growth. Every week, the duration of the 2 meals should be assessed and adjusted for the following week.
- To prevent any competition and nervousness the feed access time should not be less than 6 - 8 hours a day, feed equipment should be increased accordingly, and meals always to be given at the same time of the day.

2.2.d. Temperature

>> Because chickens are not capable of fully regulating their body temperature before 14 days of age, the ambient temperature needs to be optimal according to the chickens' requirement.

>> If the chickens are kept in closed controlled environmental housing for the whole growing period, then higher environmental temperatures may be maintained from 14 days of age to avoid chickens overeating feed to regulate their body temperature.

>> This strategy cannot be implemented when the chickens have access to a (covered) indoor ranging area or given access outdoors after a given age (generally around 4 - 6 week of age). In this case the chickens should be acclimatised to the outside temperature during the week before opening the pop holes.

2.2.e. Dark period extension

>> In countries with a latitude less than 66, growth may be managed by applying only natural light from 4 days of age in summer and from 8 days of age in winter. In case of long dark periods at an early stage in the growing period, it is important to have a good control of the brooding temperature and to prevent chicks from moving too far from the heat sources.

>> Longer dark periods after 4 - 5 weeks of age similar to the natural length of the night do not have much impact on growth because chickens have the ability to increase their feed intake according to the daylength.

3. ENRICHMENTS

>> More and more production schemes stipulate mandatory access to enrichments to help chickens express their innate behaviours like perching, pecking, foraging, preening, dust bathing, etc. These enrichments encourage the chickens to explore their environment and also escape from social pressure. Enrichments stipulated for indoor systems can be termed 'indoor enrichments'. For systems with outdoor access, then the same 'indoor enrichments' are often stipulated for the chickens main housing but there may be requirements for other specific outdoor enrichments.

>> There are various categories of indoor enrichment for premium systems (see pictures page 9):

- Natural light (windows in the side walls or roof);
- Covered range;
- Equipment for perching (perches, platforms, straw bales);
- Playing material (straw bales, strings, balls, pecking blocks);
- Distribution of scratch grain on litter.



Fig. 11 – Natural light



Fig. 12 – Covered range («Wintergarten»)



Fig. 13 – Platform



Fig. 14 – Perches



Fig. 15 – Straw bales



Fig. 16 – Pecking block

>> There is still a lot to learn about the preference of chickens for different types of enrichment and the best way to provide each enrichment option. All types of chickens may use enrichments, but studies and practical experience suggest slower growing breeds show a stronger preference for perching and playing activities especially at older ages.

>> Most Premium production schemes require indoor enrichments are provided and from no later than 7 days of age.

>> Typically, more than one type of enrichment must be provided such as a combination of perching or platform, straw bales and a pecking aid such as a pecking block or suspended strings. The required number of enrichments should be checked with production scheme requirements but the following may serve as a minimum guideline per 1 000 chickens for each chosen enrichment.

- 1 straw bale or similar bedding bales;
- 80 inches of linear perch space or 3.25 ft² of platform perch;
- 1 pecking aid.

>> For all enrichments it is important to consider the risks to biosecurity, especially from straw bales and also the ease of washing of fixed enrichments like platforms. Platforms and perches should not have sharp edges that may damage birds.

4. FREE RANGING AREA

>> Outdoor access is very common in some countries like France and the United Kingdom, where Label Rouge or Free-Range chicken production has a significant share in the market.

>> In these production schemes, the minimum surface of free-range area typically varies from 10.76 to 43.06 ft² per chicken, but this is usually stipulated as part of the scheme or (inter)national regulations which should be respected.

>> Ranging will increase the risk of contact with wild animals and birds. For this reason, it is advised in accordance with most schemes that no feed or water points are provided outside the main chicken house.

>> Good water drainage in front of the house helps to reduce the risk of foot pad lesions and unhealthy natural drinking points. The health control plan must include a monitoring programme for internal and external parasites. For example, a deworming programme is generally required.

>> The effective use of a free ranging area depends mainly on its design. Chickens need to feel safe and comfortable to roam outside. The key points are:

- The front of the pop hole should be well protected from the wind and offer some protection from sunlight.
- Small trees or bushes placed perpendicular to the house will give shelter to the chickens against predatory birds such as raptors and strong direct sunlight.
- Trees may cover up to 30 to 40 % of the ranging area and be placed 49 - 66 ft from each other. If spacing between trees is less than 49 - 66 ft, then grass growth may be impaired.
- It is possible to use artificial shelters for shading before vegetation has grown or to complement existing vegetation.

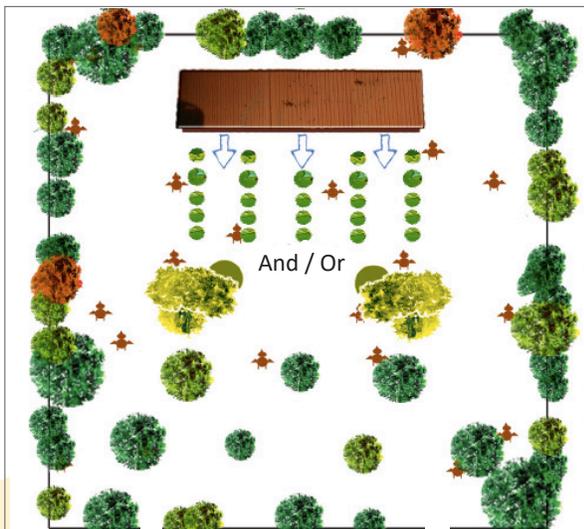


Fig. 17 – Example of an “ideal” ranging design

>> A project involving several French public and private organisations have been working extensively on the best ranging design for chickens, how to improve biodiversity and give extra income to the farmer. The following website presents a lot of information on this topic:

<https://parcoursvolailles.fr/>

5. VENTILATION

>> Ventilation management should meet 2 objectives:

- Keep the ambient parameters within a defined range depending on birds' age;
- Ensure a good distribution of fresh air around all the birds wherever they are located in the house.

>> Recommended range for ambient parameters and the required rate of ventilation to meet them:

Parameters	Range	Required ventilation (ft ³ /lb/h)	Factors affecting the optimum level and required ventilation
Temperature	93 to 64 °F	96.1 to 12.8	Age and feather cover
Humidity	40 to 70 %	12.8 to more than 32.0	Inside and outside conditions
Air speed	0.3 to 11.5 ft/s	12.8 to 96.1	Age, feather cover and temperature
Ammonia (NH ₃)	< 15 ppm	12.8 to 64.0	New litter or not, litter humidity, litter treatment, litter temperature
Oxygen	> 19.5 %	1.6	Never a limiting factor
Carbon Monoxide	< 50 ppm	16.0	Maintenance of direct combustion heaters
Carbon dioxide	< 3 000 ppm (EU)	11.2 to 16.0	Direct combustion heaters, poor insulation, low outside temperature
Particles		Undefined	Low humidity, litter material, chickens' activity

>> Several ambient parameters are inter-dependent on each other, so modifying one can affect others. A good example is the relation between temperature, humidity and air speed on the actual temperature felt by chickens. During the first 3 weeks, each 0.3 ft / sec above 1.0 ft / sec reduces the temperature felt by chicken by 0.75 to 1.0 °F. Also, very low humidity at the start reduces significantly the temperature felt by chicks (up to 3 - 5 °F).

>> Preventing air draughts at chicken level when outside temperature is low requires that a sufficient level of negative static pressure is created in the house in order to introduce fresh air at high speed below the ceiling. This ensures cold incoming air can be mixed with warm air before reaching chicken level.

>> In contrast, when temperature is higher than desired, fresh air is more efficient in cooling chickens when it is directed on them. Evaporative water cooling becomes advisable in addition to air speed when temperature rises above 93.2 - 95 °F after 6 weeks of age. Premium chickens with intermediate growth are more likely to cope with high temperature by lowering their feed intake. This prevents them from severe heat stress and associated mortality but may affect their growth. Good summer ventilation helps to stimulate feed intake and growth.

>> Where a covered range or a free-range system is used chickens require access through pop holes. When the house is managed under negative static pressure, open pop holes will disturb the air circulation through the main house. It is recommended when pop holes are open to lower the static pressure by opening the inlets to avoid pulling air at high speed through pop holes.

>> The management of ventilation relies more and more on controllers and sensors which can control ventilation more accurately on a 24-hour basis, than manual adjustments, provided that they are well set and regularly calibrated. Temperature sensors should reflect the condition experienced by the chickens and be placed close to the floor at start then raised progressively to prevent the reading being affected by the presence and movement of the chickens underneath or around the sensor.

>> Data loggers and diagnosis tools (smoke emitters, air speed meters, etc...) are useful tools to understand how the ventilation works in each situation and to find adapted solutions.

6. FEEDING

>> Feed intake determines the rate of growth. According to the characteristics of the breed being grown and the market requirements, stimulating or reducing feed intake can be a useful tool to achieve optimum performance without compromising the natural needs of the chickens. It is important to ensure the nutrient intake of the chickens is balanced to avoid hunger or nutritional issues.

6.1. FEED PRESENTATION

>> Feed intake is directly linked to the physical quality of the crumbs, pellets (hardness and durability) or mash (particle size and uniformity) provided to the chickens. To promote maximum feed intake, ensure:

- To provide the chickens feed with a consistent physical quality and a physical size adapted to their ability to eat and swallow. This will also reduce feeding time and energy used.
- Growth and FCR will be improved if the starter feed is provided as sieved crumbles or mini pellets followed by crumbs/pellets of an appropriate physical size through to catching.

- Poor feed presentation with high level of fines will have a negative impact on feed intake. By instinct, chicks pick up larger and more palatable particles of feed. Because fine feed particles contain higher levels of additives, vitamins, and trace minerals, failure to consume fine particles may increase the risk of an imbalanced nutrient intake.
- The change from crumbs to pellets must be carefully managed to ensure feed intake is not impaired. Pellets can cause waste if they are too big for the age of the chickens and the size of their beak.
- Pellet and mash quality can be assessed using the Hubbard Feed Sieve (Fig. 18).



Fig. 18 – Hubbard Feed Sieve

>> Optimal distribution of feed particles depending on the age of the animals and the presentation of the feed:

Age (days)	Feed presentation	Sieve Ø	
		< 0.5 mm	+ 2 mm
0 - 10	Sieved crumble	=< 10 %	=< 30 %
	Mash	=< 25 %	=< 20 %
	Mini pellet	1.8-2 mm Ø and 4 mm long	
11 - 25	Crumble	=< 5 %	=< 50 %
	Mash	=< 20 %	=< 30 %
	Pellet	2.8-3.0 mm Ø and 5.0-6.0 mm long	
> 26	Mash	=< 15 %	=< 40 %
26 - 42	Pellet	3.0-3.5 mm Ø and 6.0-7.0 mm long	
> 42	Pellet	3.2-4.0 mm Ø and 7.0-8.0 mm long	



Fig. 19 – Chick starter crumble



Fig. 20 – Good pellet feed



Fig. 21 – Coarse mash feed

6.2. WITHDRAWAL PERIOD

- >> It is important to ensure there is sufficient time between the last pharmaceutical feed additive administration and time of processing to ensure the carcass is free of any possible residue of the additive at processing.
- >> Refer to local legislation or the product supplier to determine the withdrawal time required.

6.3. SUPPLEMENTAL WHOLE GRAIN FEEDING

- >> If supplemental whole grain is added to pelleted feed, make sure the dilution effect of the grain is taken into account when the compound feed is formulated to keep the nutrient intake at the recommended levels.
- >> The addition of whole grains such as whole wheat may start around 7 - 10 days. Start with an inclusion rate of 1 - 5 %, then increase this to a maximum of 10 % in the grower and 30 % in the finisher. This may be increased to a maximum of 40 % for heavy chicken weights. The inclusion rate that can be used will depend on the feed composition.
- >> Whole grain should be removed two days before catching to avoid carcass contamination at processing.
- >> Ensure the use of whole grain complies with local regulations for prevention of zoonoses, such as acid or heat treatment for Salmonella control if required.

6.4. ALTERNATIVES TO ANTIBIOTICS

>> Gut health has a fundamental influence on growth performance and the welfare of the chickens as it affects feed digestion, nutrient absorption, protein and energy utilisation, immunity and disease resistance, metabolism, and physiology. The focus needs to be on early establishment of immunity and intestinal integrity if chickens are to remain healthy and reach their maximum potential for growth and feed efficiency.

>> The key points include:

- Feeding highly digestible ingredients;
- Proper use of “natural” feed additives (enzymes, prebiotics, probiotics, herbs, spices and essential oils, acidifiers);
- Inclusion of moderate amounts of fiber in the diet (such as for example 2 - 3 % of oat hulls);
- Have a programme to monitor and maintain drinking water quality at all times. Despite the fact that chickens may have access to a free ranging area or be kept under lower stocking density than conventional broilers, having a clean and well managed primary source of water is critical to maintain gut health. Further details can be found in the Hubbard Technical Bulletin «**Water Quality for Breeders and Broilers**» (Fig. 22).



Fig. 22 – Hubbard Technical Bulletin available on www.hubbardbreeders.com

>> These techniques may alter the intestinal microflora profile by limiting the colonisation of unfavourable bacteria and promote the activity or growth of more favorable species.

6.5. FEED WITHDRAWAL BEFORE PROCESSING

- >> Depending on local regulations, a minimum of 8 hours of feed withdrawal is required in order to avoid carcass contamination at processing from faecal contamination and feed left in the crop.
- >> Water should remain available until catching.
- >> Lights should be dimmed to avoid birds from eating wasted food in the litter.
- >> It may be necessary to remove enrichments before catching the chickens to reduce the risk of injury and safety of the catching team.

APPENDIX 1. TROUBLESHOOTING

Observations	Causes	Corrective actions	
Liveability first week < 99 %	Chick quality	Check with the hatchery	
	Non-starter	Check feed availability and quality and light	
	Dehydration	Check water availability and quality and light	
	Environment	Check house environment parameters	
	Disease	Post mortems on dead chicks / Vet advice	
High mortality rate in late growth	Metabolic diseases	Check house environment parameters, lighting programme (growth control), feed quality	
	Infectious diseases	Post mortems on dead chicks / Vet advice	
Poor growth the first week	Chick quality	Check with the hatchery	
	Environment	Check house environment parameters, lighting programme (day length)	
	Nutrition	Check pre-starter diet availability and quality	
	Water intake	Check water availability and quality adjustment of drinkers/nipples, n° birds per drinker, access	
	Disease	Post mortems on dead chicks / Vet advice	
Poor late growth	Environment	Ventilation settings	
	Nutrition	Check feed availability and quality	
	Water intake	Check water availability and quality and nipple flow rate	
	Disease	Post mortems on dead chicks / Vet advice	
Poor uniformity	Chick uniformity at placement	Check with the hatchery	
	Stocking density	Check stocking density is not too high	
	Feed intake	Check feeder access and feed quality	
	Water intake	Check drinker space and water quality	
	Environment	Check house environment parameters	
	Disease	Vet advice	
Poor feed conversion	Poor growth	See poor growth sections	
	Poor feed digestion	Post mortem for examining gut lesions	
	Poor feed intake	Check feed quality, feed form and feeders	
	Feed wastage		
Leg problems	Nutrition	Check calcium, phosphorus, vitamin D3, chloride levels in diets	
	Excess early growth	Slow down the growth with the lighting programme or feed restriction	
Poor feather cover	Environment	Check house temperature is not too high	
	Nutrition	Check the feed content in methionine and cysteine	
Poor litter quality	Environment	Use an alternative bedding source	
		Check stocking density is not too high	
		Check ventilation is sufficient and well distributed	
		Check if water spillage	
Nutrition	Check protein content in diets is not in excess		
	Check salt content in diets is not in excess		
Disease	Vet advice regarding infectious disease		
Carcass quality problems	Breast blisters Pustules	Check litter quality at late age	
		Check litter quality at early age	
		Reduce early growth	
	Bruises Skin tears Fractures	Check handling and management procedures	
		Fatness	Check nutritional balance of diets
			Check house temperature is not too high
Scratching	Decrease light intensity		
	Check access to feed and water		
		Check care takers behaviour (walking speed)	

APPENDIX 2. EXAMPLE APPROACH TO HELP DESIGN A LIGHTING PROGRAMME

>> Lighting programmes have proven to be very efficient in conventional broilers for improving health and welfare and for improving FCR.

>> It should not be overlooked that lighting programmes also play an important role to maximise the health and welfare of slow and intermediate growing chickens and should be optimised for the production system and breed.

>> A typical diurnal “one single daily light and one dark period” programme can be divided into 3 periods during the growing period:

- The ‘brooding’ during the 7 first days when chickens’ feed intake can be stimulated through an intermittent lighting programme where permitted for 5 days followed by 2 days with 4 hours darkness to prepare for the second week.
- The ‘growing’ phase of the lighting programme between 7 and 21 - 35 days when longer periods of dark can be used. The dark period can last up to 12 hours if housing or season allows it.
- The ‘maintenance’ phase, after 21 - 35 days when dark periods may have more impact on sexual maturity, behaviour and growth and keep the chickens follow a natural biological rhythm.

>> When previous flocks from the same breed have been grown on the farm, the experience gained can be very helpful to select and fine tune the most suitable lighting programme for the new flock.

>> As chickens tend to eat and drink more prior to the expected time the light goes off, especially when dark periods are long, it is recommended to switch off the light every day at the same time. Local regulations may require the use of a dawn /dusk dimming period which may calm the flock and reduce the stress or risk of injury.

>> During the summer or in countries with high temperatures, the growing phase can be used for a shorter period to consider the effect of high temperature on growth rate. In the final maintenance period, if feed intake is reduced due to very high temperature then if permitted a short period of supplemental light for 1 hour can be included in the middle of the dark period to stimulate the chickens to eat.

>> The following table shows some examples of lighting programmes for different breeds and growing periods. If local or scheme regulations require different lighting programmes, then these should always be respected. Consult your Hubbard Technical Manager to help you formulate the most suitable programme.

HOURS OF LIGHT (Natural and artificial)*	PREMIUM FEMALES JA57 - JA57Ki - P6N - REDBRO MINI - JA87 - REDBRO												
	Market Age (d)	Week of age											
SLOW GROWTH MALES S77 I66 S77N G66N S88 RIR	1	2	3	4	5	6	7	8	9	10	11	12	
	56												
	70	23 / cyclic											
	84												
INTERMEDIATE GROWTH MALES COLORYIELD REDBRO REDBRO NACKED NECK MASTER GREY TRICOLOR GREY BARRED NEW HAMPSHIRE	1	2	3	4	5	6	7	8	9	10	11	12	
	56		14-16	16	18								
	70	23 / cyclic	12-16	16	18								
	84			12-14			14	16	18			18-20	
CONVENTIONAL GROWTH MALES M77 M99	1	2	3	4	5	6	7	8	9	10	11	12	
	49		16-18	18									
	56	23 / cyclic	14-18	16-18	18								
	70			12-16		14-16	16	18			18-20		

* Natural light may exceed the recommended light.

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JA57 - JA57Ki - P6N - REDBRO MINI - JA87

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