Broiler Management
Manual
Fast Growth

Hubbard
YOUR CHOICE, OUR COMMITMENT

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1. KEY POINTS

- ✓ Pre-placement house preparation with efficient control of the feeders, drinkers, heaters, thermostats and sensors, floor temperature and ventilation.
- ✓ Optimum starter period with a 7 day bodyweight of at least 4.2 times the initial chick weight.
- ✓ Controlling growth rate between 7-14 days using a lighting programme for better frame development before adding muscle mass, depending on slaughter weight.
- ✓ Good ingredient quality, appropriate nutrient balance and optimized feed intake with good feed presentation.

2. STARTING PERIOD

The first week of life is key to ensure future performance. The bird's body weight increases 4.2 to 4.5 times over the first week, and an extra 10g of bodyweight at 7 days can increase the 40 days weight by 50-60g.

2.1. 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 body weight and uniformity, in order to adapt your management according to the results.

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

Figure 1: Activity

Figure 2: Nabel not sealed properly

Figure 1: Red Hock

Figure 2: Red Spot

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

2.2. Environmental factors

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

- Make sure the house and the floor is nice and warm (Appendix 1). The temperature zone for a baby chick is very tight (32-33°C). Below 32°C, the chick is not capable of maintaining its body temperature.
- Check and record the temperature, humidity, air speed, and observe the chick behavior (position, chirping, and attitude, feeding and drinking activity).

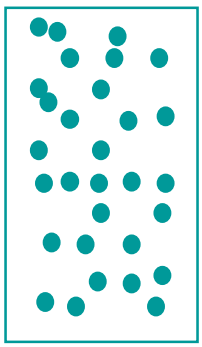

Figure 4: Good temperature

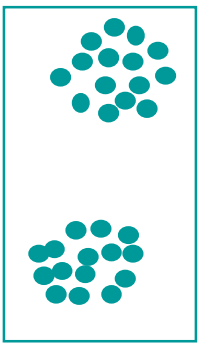

Figure 5: Too cold

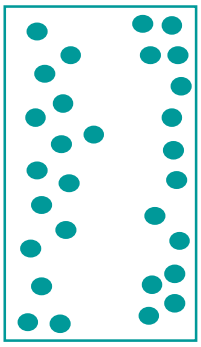

Figure 6: Too hot

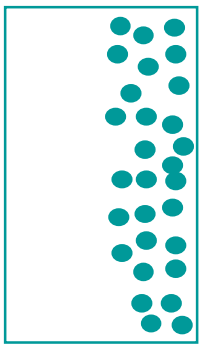

Figure 3: Draught

- The adjustment of the equipment is based on observation of the chick behavior.
- Chicks from young breeder hens are smaller and so require a higher temperature, about 1°C higher for the first week.
- If chicks have cold feet, increase the temperature to 34-35°C for at least 4-6 hours. Reassess feet temperature regularly until they come back to normal before decreasing the house temperature.

2.3. Feed and water

Early feeding stimulates the development of the chick's gastrointestinal system and promotes resorption of the yolk sac.

- 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 drinking source so that the chicks can also find water straight away (Appendix 2).
- 40 to 60 grams of crumb or mini-pellet feed on paper is recommended in 40 to 50% of the brooding area. This paper, if not biodegradable, should be removed on the third day.
- Supplementary feeders or egg trays (1 for 100 chicks) should be provided the first 7-10 days, as they are essential for a successful change to pan or chain feeders, before being removed when chicks are able to eat into feed pans from outside and cannot sleep inside them anymore.
- Renew the feed at regular intervals during the first 3-5 days according to chick size.

Figure 7: Feed on paper at start

Water is very important as birds can drink 1.6 to 2 times as much as they eat, depending on age and watering system.

- Refilling and cleaning drinkers (round and trough) should take place several times a day during the first week.
- Use supplementary drinkers for the first 24-72 hours in case of bell or trough drinkers, adjust the height of the drinking lines (nipples) and the water pressure every day.

8 and 24 hours after placement, at least 80% and 96% of chicks, respectively, should have a crop full of feed and water. If not, review feed placement, quality and water supply and the brooding conditions (temperature, light intensity, chick quality…).

Figure 8: Full, soft and rounded crop

2.4. Lighting

The HUBBARD recommended lighting programme:

Age (days)	Number of dark period	Hours of dark	Intensity (lux)
0-4	6	6 times 30 min = 3 hours	>50
5	1	4	40
6	1	4	30

- Short dark periods with a maximum light intensity the first 4 days are useful to stimulate chicks to eat and drink each time the light is on again, and prevent them from huddling and sleeping in some area (corners for example) for a long time.
- After 4 days a <one dark > period lighting programme may be implemented.
- Light intensity should be strong in the brooding area (>50 lux).
- In dark-out and semi-closed houses, light intensity should be gradually reduced to 30-20 lux between 7 and 12 days.

3. FURTHER GROWTH AND DEVELOPMENT

From the second week of life, further growth and development occurs in skeletal, organs and muscle mass. If birds grow too fast, they will have poor skeleton quality, high metabolic problems and lower resistance (more susceptible to disease). Slowing down growth during this time will help to prevent these problems.

3.1. Lighting

The HUBBARD recommended lighting programme depending on local regulations and standards:

Age (days)	Market bodyweight objective (kg)	Hours of dark	Intensity (lux)
7-14	<1.6	4	30 to 10-20
	1.6-2.4	6-8	
	>2.4	6-12	
15-21		4-10	Adapted to the behavior and regulation
22-28		4-6	
29-D-2		4	
D-2 to end		1	

- A single dark period applied every day is efficient to reduce mortality and leg problems and improve feed conversion.
- Dark periods are especially useful from 7 to 21 days to allow birds to grow a solid frame and thus reduce future leg disorders.
- The optimal duration depends on final bodyweight, genotype, feed form and composition and the sensitivity of the farm to metabolic problem.
- Because the feed pattern of broilers is to eat and drink before the dark period, it is important to switch off the light every day at the same time.
- Long dark periods are increasing the activity of the birds during daytime, favoring amongst other factors, the occurrence of skin scratches and tears. So, when skin injuries are already a concern, we recommend not to implement more than 4 hours of darkness after 21 days depending on local regulation or veterinary advice.

3.2. Growth control

2 main objectives: 1) to improve the skeletal quality thus preparing the broiler to support compensatory growth and obtain an improved feed conversion with less mortality, culls and downgrades, 2) to reduce the level of sudden and late mortality and problems of ascites.

- The lighting programme after 5 days of age may be further delayed by 1 to 3 days for chicks from young breeder hens.

Body weight	1.5 kg	2.8 kg
	CV	
Good	<10	<12
Average	11-14	12-16
Poor	>14	>16

- Once chicks can reach easily the bottom of the feeder (normally from 10-14 days of age), regular feeder emptying procedure should be implemented. Birds should 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 pans
- Feeders should be emptied every day from 20 days of age.
- Interrupt the feed supply before the light goes off and take advantage of the chick's hunger when light is on again to reduce the amount of fine particles before refilling the feeders with fresh feed.
- Weighing chicks on arrival and then every 7 days is a way to follow the growth.

3.3. Key points

Key points to record	Key points to do/check every day
Weight every 7 days	Temperature (mini and maxi)
Daily mortality and selection	Humidity (mini and maxi)
Amount of feed and water used	Litter quality
Minimum and maximum temperature	Dead and weak birds + culling
Vaccination and treatment given	Feeders and drinkers

4. VENTILATION

Ventilation management should meet 2 objectives:

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

Table about recommended range for ambient parameters and required renewing rate to keep them within the range.

Parameter	Range	Required ventilation in m3/kg/h	Factors affecting the optimum level and required ventilation
Temperature	34 to 18 °C	0.5 to 6 m3/kg/h	Age and feather cover
Humidity	40 to 70%	0.5 to more than 2 m3/kg/h	Inside and outside conditions
Air speed	0.1 to 3.5 m/sec	0.5 to 6 m3/kg/h	Age, feather cover and temperature
Ammonia (NH3)	< 15 ppm	0.5 to 4 m3/kg/h	New litter or not, litter humidity, litter treatment, litter temperature
Oxygen	>19.5%	0.1 m3/kg/h	Never a limiting factor
Carbon Monoxide	< 50 ppm		Maintenance of direct combustion heaters
Carbon dioxide	< 3 000 ppm (EU)	0.5-0.8 m3/kg/h	Direct combustion heaters, high heating needs, birds' metabolism
Particles		undefined	Low humidity, litter material, birds activity

Several ambient parameters are dependent on each other, so modifying one is affecting others. A good example is the relation between temperature, humidity and air speed on actual temperature felt by birds. During the first 3 weeks, each 0.1 m/sec above 0.3 m/sec is reducing the temperature felt by birds by 0.4 to 0.5°C. Also, very low humidity at start reduces significantly the temperature felt by chicks (up to 2-3°C).

Fighting against the effect of high temperature is a challenge in many places and especially in humid climates where the efficiency of evaporative cooling is less. In these areas, the capacity of the house to generate high air speed (up to 3.5 m/sec) is instrumental to alleviate the heat stress on fully feathered birds.

Beside average ambient parameters, the distribution of fresh air to all birds wherever they are located is the secret of a good ventilation. In regions, where the temperature is never falling below 20°C, permanent tunnel ventilation can succeed in reaching this objective. Nevertheless, in most of the producing areas, the outside temperature may drop below 10°C, requiring an even distribution of air inlets along the house.

Preventing air draughts at birds' level, when outside temperature is low, requires to be able to create a sufficient level of negative static pressure in order to introduce fresh air at high speed below the ceiling, so that it can be mixed with warm air before falling down on birds.

At the opposite, when temperature is higher than desired, fresh air is more efficient in cooling birds when it is directed on them. Anyway, evaporative water cooling becomes necessary beside air speed when temperature rises above 30-32°C after 4 weeks of age or 28-29°C after 5 weeks.

The management of ventilation relies more and more on controllers and sensors, which have the ability to make a better job than humans on a 24 hours basis, if they are well set and regularly calibrated. Temperature sensors should reflect the condition

experienced by birds and placed close to the floor at start, then raised progressively to prevent that the reading is affected by the presence or not of birds underneath or around the sensor.
Data loggers and diagnosis tools (smoke emitters, air speed meters, etc.…) are useful to understand how ventilation actually works in a given house and find adapted solutions.

5. NUTRITION AND FEEDING

Feed intake controls rate of growth. According to the characteristics of the breed being reared, stimulating or reducing their feed intake helps towards achieving the optimum performance. The main factors of stimulation are the feed presentation and the growing conditions.

5.1. Feed presentation

Intake is directly linked to the quality of the crumbs, pellets (hardness and durability) or mash (particle size and uniformity) placed in the chain or pan feeders.

- Provide birds with a uniform quality feed, which is adapted to their ability to eat and swallow, to reduce feeding time and energy used.
- Broiler growth and FCR will be better if the starter feed is given in sieved crumbles or mini-pellets followed by pellets of appropriate size (diameter and length) to processing.
- Poor feed presentation with high level of fines will have a negative impact on broiler intake. By instinct chicks pick up larger and more palatable particles of feed and because fine feed contains higher levels of additives, vitamins and trace minerals, it will generate an imbalance in the bird's intake.
- The change from crumbs to pellets is often difficult and can causes waste, above all if pellets are too big for the age of the bird and the size of their beak.

		Screen Ø	
Age (days)	**Feed presentation**	**< 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	
11-20	Crumble	=< 5%	=< 50%
	Mash	=< 20%	=< 30%
	Pellet	2.8-3.0 mm Ø and 5.0 – 6.0 mm long	
>20	Mash	=< 15%	=< 40%
21-30	Pellet	3.0-3.5 mm Ø and 6.0 – 7.0 mm long	
>30	Pellet	3.2-4.0 mm Ø and 7.0 – 8.0 mm long	

Figure 9: Chick starter crumble

Figure 10: Good pellet feed

Figure 11: Coarse mash feed

5.2. Nutrients recommendations

Broiler nutrients recommendations: in g/kg per 1000 kcal (Mcal) of metabolisable energy.

	STARTER		GROWER		FINISHER 1				FINISHER 2 & WITHDRAWAL			
					Hot conditions and/or mash feed		Temperate climate and/or pellet feed		Hot conditions and/or mash feed		Temperate climate and/or pellet feed	
Age fed (days)	0 to 7/12		8/13 to 20/22		21/23 to 30/33				After 31/34			
Suggested kcal	2850 - 3000		2850 - 3100		2850 - 3200		2850 - 3200		2850 - 3250		2850 - 3250	
ME/kg MJ	11.92-12.55		11.92-12.97		11.92-13.39		11.92-13.39		11.92-13.60		11.92-13.60	
Min. amino-acids	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.			Tot.	Dig.
Lysine	4.69	4.23	4.16	3.70	3.97	3.54	3.82	3.40	3.58	3.15	3.41	3.00
Methionine	1.88	1.69	1.70	1.52	1.67	1.49	1.60	1.43	1.54	1.35	1.47	1.29
Methionine + Cystine	3.56	3.17	3.20	2.81	3.09	2.72	2.98	2.62	2.82	2.46	2.66	2.34
Valine	3.65	3.21	3.27	2.85	3.17	2.76	3.05	2.65	2.86	2.49	2.72	2.37
Isoleucine	3.12	2.75	2.81	2.44	2.72	2.37	2.62	2.28	2.46	2.14	2.34	2.04
Arginine	5.04	4.44	4.50	3.91	4.35	3.78	4.18	3.64	3.91	3.40	3.72	3.24
Tryptophan	0.79	0.68	0.69	0.59	0.70	0.60	0.67	0.58	0.62	0.54	0.59	0.51
Thréonine	3.16	2.75	2.81	2.44	2.72	2.37	2.62	2.28	2.46	2.14	2.34	2.04
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Crude protein (1)	75.0	77.0	66.0	68.0	62.0	64.0	60.0	62.0	56.5	58.50	54.5	56.50
Calcium	3.27	3.43	3.00	3.13	2.90	3.10	2.75	3.00	2.40	2.65	2.20	2.45
Av. Phosphorus	1.60	1.65	1.45	1.50	1.30	1.35	1.20	1.25	1.15	1.20	1.05	1.10
Sodium	0.52	0.75	0.50	0.65	0.50	0.60	0.48	0.57	0.50	0.60	0.48	0.57
Chloride	0.52	1.00	0.50	0.70	0.50	0.70	0.50	0.70	0.50	0.70	0.50	0.70

The progress made in raw material analyses and digestible amino acid evaluation should avoid unnecessary protein excess. Diets should be formulated based on minimum digestible amino acid levels.

From the above table, nutritionists can make whatever ration he/she is required to do. See two examples of diet specifications in Appendix 3.

5.3. Withdrawal feed

- A withdrawal feed is needed when pharmaceutical feed additives are used to avoid residual carcass contamination at processing.
- Refer to local legislation to determine the withdrawal time required.

5.4. Supplemental whole grain feeding:

- If supplemental whole grain is added, make sure the dilution is taken into account when the compound feed is formulated to keep the nurients at the recommended levels.
- The grains may be added after 7-10 days. Start with 1 to 5% inclusion rate, then a up to 10% in the grower and 30% in the finisher (up to 40% for heavy broilers). Inclusion rate will depend on the feed composition.
- Whole grain should be removed two days before catching to avoid carcass contamination at processing.

5.5. Fasting

- A minimum of 8 hours of fasting is required in order to avoid carcass contamination at processing from faecal ejection 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.

6. TROUBLESHOOTING

OBSERVATIONS	CAUSES	CORRECTIVE ACTIONS
Mortality first week >1%	Chick quality	Check with the hatchery
	Starvation	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
	Leg problems	See leg problem section
	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 (daylength)
	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
	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 behavior

APPENDIX 1: OPTIMAL CONTROLLED HOUSE ENVIRONMENT

Age (days)	Temperature (°C)			Relative humidity (%)	Air speed m/s	Ventilation
	Using brooders		Whole house heating			
	Under the brooder	Side of living area				
0-3	38	30	33 to 31	40-60	0.1 to 0.3	Minimum ventilation rate 1.5 to 0.8 m3/kg live weight/hour
3-7	35	29	32 to 30	40-65		
7-14	32	29-28	31 to 29	50-65		
14-21	29	28-27	29 to 27	50-65	0.3 to 2.0	
21-28		27-24	27 to 24	50-65		
28-35		24-22	24 to 22	50-70	0.5 to 3.0	
>35		22-18	22 to 18	50-70		

The floor temperature should be at least 29°C at placement.

APPENDIX 2: EQUIPMENT AND STOCKING DENSITY

Stocking density	**final weight (kg)**	**Indicative kg/m2 at market time**	
		Cold and temperate weather	**Hot weather**
	1.2	35	32
	1.4	36	33
	1.8	39	34
	2.2	41	35
	2.7	42	36
	3.2	42	37
	Follow the local regulations if different than above. Overstocking lowers the potential for optimum performance due to the reduced growth in the latter part of growing and poor uniformity, and the increase in FCR, mortality, culls and rejects.		
Water	round	1/100 birds	
	trough	2 cm/bird	
	nipples	1/10-15 birds	
	nipples: ensure that water pressure is constant through the complete length of the line. no residue or disinfectant in water, no clogged nipples. Flow rate capacity: > 40 ml/mn side action and > 60-80 ml/mn bottom action		
Feed	pans	1/60-70 birds	

APPENDIX 3: NUTRIENT RECOMMENDATIONS

Example of diet specifications for broilers with a slaughter weight of 1.8 to 2kg at 30-34 days:

		STARTER		GROWER		FINISHER 1		WITHDRAWAL	
Age fed	days	0 to 10		11 to 22		23 to 30		30 +	
ME	kcal/kg	3000		3050		3150		3200	
	MJ/kg	12.55		12.76		13.18		13.39	
		Crumbs or 2 mm pellet		Crumbs or 2.8 / 3.0 mm		3.0 to 3.5 mm pellet		3.2 to 4.0 mm pellet	
Min. amino acids		Tot.	Dig.	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.
Lysine	%	1.41	1.27	1.27	1.13	1.20	1.07	1.09	0.96
Methionine	%	0.56	0.51	0.52	0.46	0.51	0.45	0.47	0.41
Methionine + Cystine	%	1.07	0.95	0.97	0.86	0.94	0.82	0.85	0.75
Valine	%	1.09	0.96	1.00	0.87	0.96	0.84	0.87	0.76
Isoleucine	%	0.94	0.82	0.86	0.74	0.82	0.72	0.75	0.65
Arginine	%	1.51	1.33	1.37	1.19	1.32	1.15	1.19	1.04
Tryptophan	%	0.24	0.20	0.21	0.18	0.21	0.18	0.19	0.16
Thréonine	%	0.95	0.82	0.86	0.74	0.82	0.72	0.75	0.65
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Crude protein	%	22.5	23.0	20.0	20.5	19.0	19.5	17.5	18.0
Calcium	%	0.98	1.03	0.92	0.95	0.87	0.95	0.70	0.78
Available Phosphorus	%	0.48	0.50	0.44	0.46	0.38	0.39	0.34	0.35
Sodium	%	0.16	0.23	0.15	0.20	0.15	0.18	0.15	0.18
Chloride	%	0.16	0.30	0.15	0.21	0.16	0.22	0.16	0.22
Potassium	%	0.80	0.95	0.80	0.90	0.75	0.85	0.70	0.80
Crude fat	%	4.00	6.00	4.50	7.00	5.00	8.00	5.50	9.00
Linoleic acid	%	1.20	2.50	1.20	3.00	1.40	4.00	1.40	4.00

Example of diet specifications for broilers with a slaughter weight of 2.5 to 3kg at 39-45 days:

		STARTER		GROWER		FINISHER 1		WITHDRAWAL	
Age fed	days	0 to 10		11 to 22		23 to 30		30 +	
ME	kcal/kg	2900		2950		3050		3100	
	MJ/kg	12.13		12.34		12.76		12.97	
		Crumbs or 2 mm pellet		Crumbs or 2.8 / 3.0 mm		3.0 to 3.5 mm pellet		3.2 to 4.0 mm pellet	
Min. amino acids		Tot.	Dig.	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.
Lysine	%	1.36	1.23	1.23	1.09	1.17	1.04	1.06	0.93
Methionine	%	0.54	0.49	0.50	0.45	0.49	0.44	0.45	0.40
Methionine + Cystine	%	1.03	0.92	0.94	0.83	0.91	0.80	0.82	0.73
Valine	%	1.06	0.93	0.97	0.84	0.93	0.81	0.84	0.73
Isoleucine	%	0.91	0.80	0.83	0.72	0.80	0.69	0.73	0.63
Arginine	%	1.46	1.29	1.33	1.15	1.28	1.11	1.15	1.00
Tryptophan	%	0.23	0.20	0.20	0.17	0.20	0.18	0.18	0.16
Thréonine	%	0.92	0.80	0.83	0.72	0.80	0.69	0.73	0.63
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Crude protein	%	22.0	22.5	19.5	20.0	18.5	19.0	17.0	17.5
Calcium	%	0.95	0.99	0.89	0.92	0.84	0.92	0.68	0.76
Available Phosphorus	%	0.46	0.48	0.43	0.44	0.37	0.38	0.33	0.34
Sodium	%	0.15	0.22	0.15	0.19	0.15	0.17	0.15	0.18
Chloride	%	0.15	0.29	0.15	0.21	0.15	0.21	0.16	0.22
Potassium	%	0.80	0.95	0.80	0.90	0.75	0.85	0.70	0.80
Crude fat	%	4.00	6.00	4.50	7.00	5.00	8.00	5.50	9.00
Linoleic acid	%	1.20	2.50	1.20	3.00	1.40	4.00	1.40	4.00

OTHER HUBBARD TECHNICAL DOCUMENTS

BREEDER MANUAL
INCUBATION GUIDE
NUTRITION GUIDE
OTHER SPECIFIC TECHNICAL DOCUMENTS

AMERICAS
HUBBARD LLC
1070 MAIN STREET
PIKEVILLE, TN 37367 – U.S.A.
TEL. +1 (423) 447-6224
FAX +1 (423) 447-6661
contact.americas@hubbardbreeders.com

E.M.E.A./BRAZIL
HUBBARD S.A.S.
Le Fœil – BP 169
22800 Quintin – FRANCE
TEL. +33-(0)2.96.79.63.70
FAX +33-(0)2.96.74.04.71
contact.emea@hubbardbreeders.com

ASIA
HUBBARD S.A.S.
Le Fœil – BP 169
22800 Quintin – FRANCE
TEL. +33-(0)2.96.79.63.70
FAX +33-(0)2.96.74.04.71
contact.asia@hubbardbreeders.com