



THE INSIDE CHIRP

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EFFECTS OF TEMPERATURE ON NEWLY HATCHED CHICKS

AVIAGEN MANAGEMENT ESSENTIALS



DID YOU KNOW THAT IF CHICKS ARE HELD TOO LONG AT HIGH TEMPERATURES, IT CAN AFFECT THEIR GROWTH

The newly hatched chick cannot control its body temperature very well

Air temperature, humidity, and airspeed interact and will all have an effect on the body temperature and the comfort of the young chick.

It is easy to see if chicks are uncomfortable from their behaviour – chicks that are too hot are noisy and pant (as shown in Figure 1) in order to lose heat.

Figure 1



Figure 2

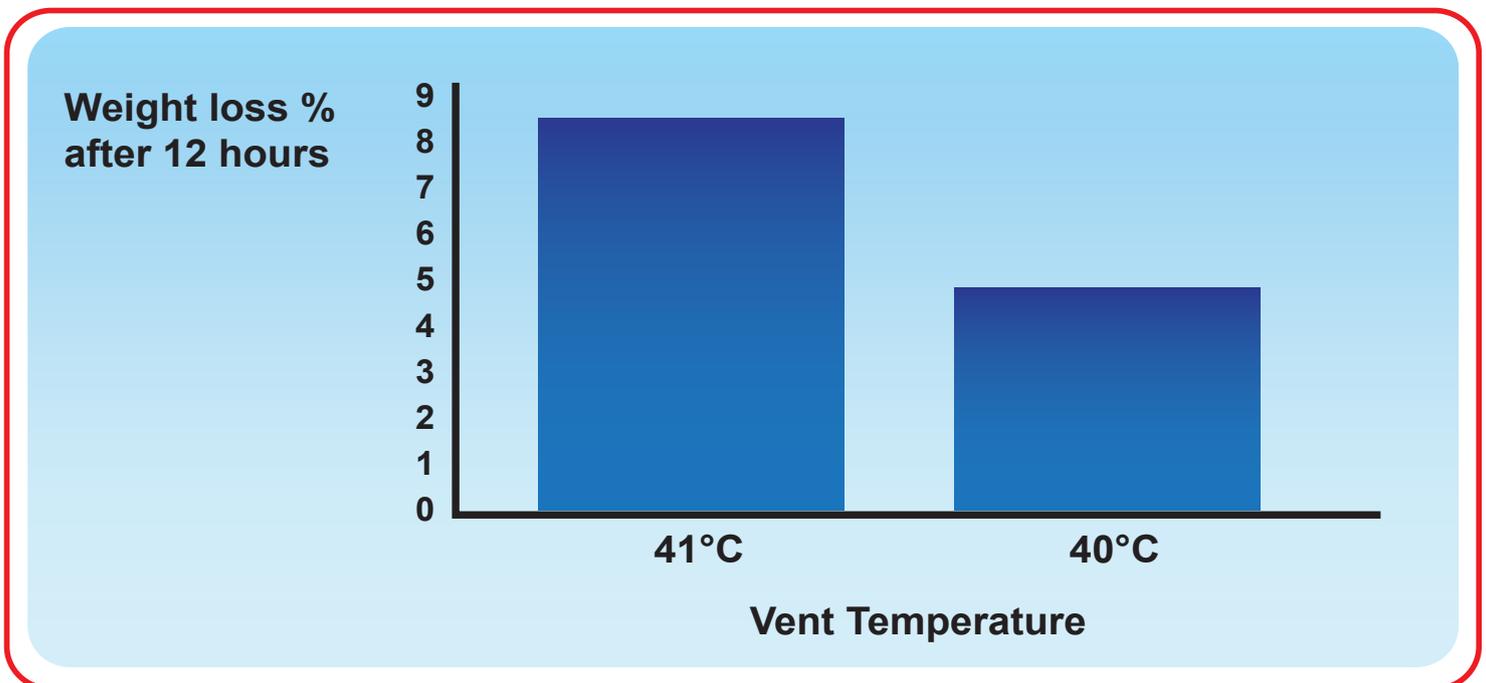


Chicks that are cold will huddle together to keep warm (see Figure 2) and their feet will feel cold.

In a recent trial, the Aviagen Hatchery Specialist team showed that chicks that were panting had a high vent temperature (averaging 41°C), while comfortable chicks had a vent temperature that averaged 40°C.

When the two groups were held in the hatchery for 12 hours, the over-heated chicks lost nearly twice as much weight. Samples taken at the hatchery showed that chicks that had been overheated had slight gut damage, so they could not absorb nutrients as well.

Grown on in a broiler trial, these chicks were 60g lighter at 35 days than chicks that had been held in comfortable conditions.



WHAT IS YOUR MECONIUM SCORE?

If chicks are held in the hatcher for too long, they do not grow as well in the broiler house.

A good way to tell if this is happening is to check how many of the eggs in a hatcher basket are stained with meconium (the dark green first droppings of the chick).

To find out what your meconium score is, pick out the 5 dirtiest eggs from each of 5 hatcher trays per flock. Select the eggs immediately after the chicks are removed from the hatcher. Score the eggs against the 5-point scale shown below.

If the dirtiest eggs are in groups 4 or 5, then the chicks are being left in the hatcher for too long. Delay the next set by 3 hours and make a note to check again when these eggs hatch in 3 weeks time. When you check them, if there are still eggs in groups 4 or 5 you will need to delay the next set by a further 3 hours. If all the eggs are clean, check that your total incubation time is not too short – this would be indicated by wet chicks in each hatcher basket and, if very short, live pipped embryos.

If your meconium scores vary from tray to tray, setter temperatures may be variable. Use the meconium scores to adjust setting times so that clean eggs predominate on every tray. Remember to check every hatch – flock age, egg age, and season can all affect the total incubation time



1

2

3

4

5

CLEAN

ALMOST
CLEAN

SLIGHT
MARKS

MARKED

DIRTY

INCUBATION TIME
TOO LONG **TOO SHORT**

- 5 or more dirty eggs per tray
- All chicks dry at time of chick take-off

- Clean egg shells in hatch debris
- Some chicks still wet
- Live pipped embryos



ROSS 308 BROILER PERFORMANCE OBJECTIVES 2022

INTRODUCTION

The Ross® 308 broiler is available in two types, a slow-feathering bird which produces sexable broilers (308) and one which produces all fast-feathering broilers (308 FF). The sexable-type produces fast-feathering female broilers and slow-feathering male broilers. This allows the broilers to be sexed in the hatchery by evaluating feather development differences.

This article contains the performance objectives for the 308 and the 308 FF broiler and is to be used with the Ross Broiler Management Handbook.

Performance

These objectives indicate the performance achievable under good management and environmental conditions and when feeding recommended nutrient levels.

Producers may find that local factors prevent such performance from being achieved. For example:

- The availability of raw materials may limit nutrient content and intake.
- Extreme climatic conditions will reduce performance.
- Economic considerations may limit choice of production systems.

Therefore, average performance may be lower than the figures presented here.

Carcass and carcass component yields will vary among processing plants depending on the type of equipment being used (e.g. carcass chilling technology, automated versus manual deboning, sampling procedures or cutting variation) and the exact carcass component being produced. The carcass and carcass component yield values provided herein are based on extensive data analysis from trials conducted by Aviagen®.

These values will differ from prior publications due to new and more extensive data analysis and genetic changes over time. When comparing these values to observations within an operation, keep in mind that how the carcass or carcass component is defined can significantly impact the quantitative value. For example, as % of live weight, carcass yield can differ >2% due to the presence/ absence of abdominal fat pad, water retention differences resulting from the method of carcass chilling, and cutting techniques used in the processing plant and feed withdrawal practices. Further, dietary amino acid and energy density can significantly affect carcass and carcass component yield values. Aviagen will continue to evaluate these values.

Every attempt has been made to ensure the accuracy and relevance of the information presented.

However, Aviagen accepts no liability for the consequences of using the information for the management of chickens. For further information on the management of Ross stock, please contact your local Ross representative.

Key Management Points

Cost effective production of chicken meat depends on achieving good bird performance; the following points are important for optimizing performance of the Ross 308 and Ross 308 FF broiler:

- Maximize chick quality by good management of hatching, storage and transport conditions.
- Design the brooding set-up to ensure easy access to water and feed at placement and to ease the transition between supplementary systems and the automated feeders and drinkers at 4-5 days.
- Feed a highly digestible, and nutritionally balanced Starter diet.
- Keep chicks in their thermal comfort zone by monitoring chick behavior, but beware of low relative humidities (less than 50% RH). Establish a minimum ventilation program from day one.
- Monitor crop fill, feeding and drinking behavior and 7-day live weight to allow continuous improvement of the brooding set-up.
- Keep birds in their thermal comfort zone throughout the growing period. Fast growing broilers produce large amounts of heat, particularly in the second half of the grow-out period. Keeping ambient temperatures less than 21°C from 21 days onwards may improve growth rates.
- Maintain high standards of biosecurity and cleanliness to keep disease challenge to a minimum.

ROSS 308/308 FF BROILER: PERFORMANCE OBJECTIVES

AS-HATCHED PERFORMANCE

Day	Weight (g) ¹	Daily Gain (g)	Av. Daily Gain (g)	Daily Intake (g)	Cum. Intake (g) ²	FCR ³
0	44					
1	62	18			12	0.196
2	81	19		16	28	0.352
3	102	21		20	48	0.476
4	125	23		24	72	0.577
5	151	26		27	100	0.658
6	181	29		31	131	0.724
7	213	32	24	35	166	0.780
8	249	36	26	39	206	0.826
9	288	39	27	44	249	0.865
10	330	42	29	48	297	0.900
11	376	46	30	52	349	0.930
12	425	49	32	57	406	0.957
13	477	52	33	62	468	0.982
14	533	56	35	67	535	1.005
15	592	59	37	72	608	1.026
16	655	62	38	77	685	1.047
17	720	66	40	83	768	1.066
18	789	69	41	88	856	1.086
19	860	72	43	94	950	1.105
20	935	74	45	100	1050	1.123
21	1012	77	46	105	1155	1.142
22	1092	80	48	111	1266	1.160
23	1174	82	49	117	1383	1.178
24	1258	85	51	122	1505	1.196
25	1345	87	52	128	1633	1.214
26	1434	89	53	134	1767	1.233
27	1524	91	55	139	1907	1.251
28	1616	92	56	145	2051	1.269
29	1710	94	57	150	2202	1.288
30	1805	95	59	156	2357	1.306
31	1901	96	60	161	2518	1.325
32	1999	97	61	166	2684	1.343
33	2097	98	62	171	2855	1.362
34	2196	99	63	176	3031	1.381
35	2296	100	64	180	3211	1.399
36	2396	100	65	185	3396	1.418
37	2496	100	66	189	3584	1.437
38	2597	101	67	193	3777	1.456
39	2697	101	68	197	3974	1.474
40	2798	100	69	201	4175	1.493
41	2898	100	70	204	4379	1.512
42	2998	100	70	207	4586	1.531
43	3097	100	71	211	4797	1.550
44	3197	99	72	213	5010	1.569
45	3295	98	72	216	5226	1.587
46	3393	98	73	219	5445	1.606
47	3490	97	73	221	5666	1.625
48	3586	96	74	223	5890	1.644
49	3681	95	74	225	6115	1.663
50	3776	94	75	227	6342	1.681
51	3869	93	75	229	6571	1.700
52	3961	92	75	230	6801	1.719
53	4052	91	76	231	7032	1.738
54	4142	90	76	233	7265	1.756
55	4230	89	76	233	7498	1.775
56	4318	87	76	234	7733	1.793

1 - On-farm body weight (i.e. feed present in intestinal tract).

2 - Feed consumption per living bird.

3 - FCR includes initial body weight at placement and does not account for mortality.

NOTE: In the table the values are rounded. This may result in small inaccuracies when using the objectives to calculate other performance statistics.

MALE PERFORMANCE

Day	Weight (g) ¹	Daily Gain (g)	Av. Daily Gain (g)	Daily Intake (g)	Cum. Intake (g) ²	FCR ³
0	44					
1	62	18			11	0.181
2	80	18		15	26	0.328
3	101	21		19	45	0.450
4	124	23		23	68	0.549
5	150	26		27	95	0.632
6	180	29		31	126	0.701
7	213	33	24	35	161	0.759
8	249	36	26	40	201	0.808
9	288	40	27	44	245	0.851
10	332	43	29	49	295	0.888
11	379	47	30	54	348	0.920
12	429	51	32	59	408	0.950
13	483	54	34	64	472	0.976
14	541	58	36	70	542	1.000
15	603	62	37	75	617	1.023
16	668	65	39	81	698	1.045
17	737	69	41	87	785	1.065
18	809	72	43	93	878	1.085
19	885	76	44	99	977	1.104
20	964	79	46	105	1082	1.122
21	1046	82	48	111	1193	1.141
22	1131	85	49	118	1310	1.159
23	1219	88	51	124	1434	1.177
24	1310	91	53	130	1564	1.195
25	1403	93	54	136	1701	1.212
26	1499	96	56	143	1843	1.230
27	1597	98	58	149	1992	1.248
28	1697	100	59	155	2147	1.266
29	1799	102	61	161	2308	1.283
30	1902	104	62	167	2475	1.301
31	2008	105	63	173	2648	1.319
32	2114	107	65	178	2826	1.337
33	2222	108	66	184	3010	1.355
34	2331	109	67	189	3200	1.373
35	2441	110	68	195	3394	1.390
36	2552	111	70	200	3594	1.408
37	2663	111	71	204	3798	1.426
38	2774	112	72	209	4007	1.444
39	2886	112	73	214	4221	1.462
40	2998	112	74	218	4439	1.481
41	3110	112	75	222	4661	1.499
42	3222	112	76	226	4886	1.517
43	3333	112	76	229	5116	1.535
44	3445	111	77	233	5348	1.553
45	3555	111	78	236	5584	1.571
46	3665	110	79	239	5823	1.589
47	3775	109	79	242	6065	1.607
48	3883	109	80	244	6309	1.625
49	3991	108	81	247	6556	1.643
50	4098	107	81	249	6805	1.661
51	4203	106	82	251	7055	1.679
52	4308	105	82	253	7308	1.696
53	4411	103	82	254	7562	1.714
54	4513	102	83	255	7817	1.732
55	4614	101	83	257	8074	1.750
56	4714	100	83	258	8332	1.768

1 - On-farm body weight (i.e. feed present in intestinal tract).

2 - Feed consumption per living bird.

3 - FCR includes initial body weight at placement and does not account for mortality.

NOTE: In the table the values are rounded. This may result in small inaccuracies when using the objectives to calculate other performance statistics.

FEMALE PERFORMANCE

Day	Weight (g) ¹	Daily Gain (g)	Av. Daily Gain (g)	Daily Intake (g)	Cum. Intake (g) ²	FCR ³
0	44					
1	63	19			13	0.211
2	81	19		17	31	0.375
3	103	21		21	52	0.503
4	126	24		25	76	0.604
5	152	26		28	104	0.684
6	182	29		32	136	0.748
7	214	32	24	35	171	0.800
8	249	35	26	39	210	0.843
9	287	38	27	43	253	0.880
10	328	41	28	47	299	0.911
11	373	44	30	51	350	0.939
12	421	48	31	55	405	0.964
13	471	51	33	60	465	0.987
14	525	54	34	64	529	1.009
15	581	57	36	69	598	1.029
16	641	59	37	74	672	1.049
17	703	62	39	79	751	1.068
18	768	65	40	84	835	1.087
19	836	67	42	89	924	1.105
20	906	70	43	94	1018	1.124
21	978	72	44	99	1117	1.142
22	1052	74	46	104	1221	1.161
23	1129	76	47	110	1331	1.179
24	1207	78	48	115	1446	1.198
25	1287	80	50	120	1566	1.217
26	1369	82	51	125	1691	1.235
27	1452	83	52	130	1821	1.254
28	1536	84	53	135	1956	1.273
29	1622	85	54	140	2095	1.292
30	1708	86	55	144	2240	1.311
31	1795	87	56	149	2389	1.331
32	1883	88	57	153	2542	1.350
33	1972	89	58	158	2700	1.369
34	2061	89	59	162	2862	1.389
35	2150	89	60	166	3028	1.408
36	2240	89	61	170	3197	1.428
37	2329	90	62	173	3371	1.447
38	2419	89	62	177	3547	1.467
39	2508	89	63	180	3728	1.486
40	2597	89	64	183	3911	1.506
41	2686	89	64	186	4097	1.526
42	2774	88	65	189	4286	1.545
43	2862	88	66	192	4478	1.565
44	2949	87	66	194	4672	1.585
45	3035	86	66	196	4869	1.604
46	3121	86	67	199	5067	1.624
47	3205	85	67	201	5268	1.643
48	3289	84	68	202	5470	1.663
49	3372	83	68	204	5674	1.683
50	3454	82	68	205	5879	1.702
51	3535	81	68	207	6086	1.722
52	3614	80	69	208	6294	1.741
53	3693	79	69	209	6503	1.761
54	3770	77	69	210	6712	1.780
55	3847	76	69	210	6923	1.800
56	3922	75	69	211	7133	1.819

1 - On-farm body weight (i.e. feed present in intestinal tract).

2 - Feed consumption per living bird.

3 - FCR includes initial body weight at placement and does not account for mortality.

NOTE: In the table the values are rounded. This may result in small inaccuracies when using the objectives to calculate other performance statistics.

CARCASS YIELD

The following tables indicate how yields of the major portions change with increasing live weight in each sex. Two types of processing are described: eviscerated yield is broken down into breast meat, thigh and drumstick to represent a portioning operation and into breast meat and leg meat to represent a deboning operation.

Note: These figures represent dry yield. They do not include any moisture retained during chilling or processing. Carcass component yields will vary among processing plants depending on, for example, type of equipment used and the exact portion(s) being produced.

CARCASS YIELD - MALE

Live Weight kg	Portion					Debone		
	Eviscerated %	Breast %	Thigh %	Drumstick %	Wing %	Leg Meat %	Breast %	Total Meat %
1.6	69.79	21.54	12.86	9.95	7.68	15.19	21.54	36.73
1.8	70.65	22.57	13.13	9.91	7.64	15.67	22.57	38.25
2.0	71.34	23.39	13.33	9.88	7.61	16.07	23.39	39.46
2.2	71.91	24.07	13.50	9.86	7.58	16.38	24.07	40.45
2.4	72.38	24.63	13.65	9.84	7.55	16.65	24.63	41.28
2.6	72.78	25.10	13.77	9.82	7.54	16.88	25.10	41.98
2.8	73.13	25.51	13.87	9.80	7.52	17.07	25.51	42.58
3.0	73.42	25.86	13.96	9.79	7.50	17.24	25.86	43.10
3.2	73.68	26.17	14.04	9.78	7.49	17.38	26.17	43.55
3.4	73.91	26.44	14.11	9.77	7.48	17.51	26.44	43.95
3.6	74.11	26.68	14.17	9.76	7.47	17.63	26.68	44.31
3.8	74.30	26.90	14.22	9.75	7.46	17.73	26.90	44.63
4.0	74.46	27.09	14.27	9.74	7.45	17.82	27.09	44.91
4.2	74.61	27.27	14.32	9.74	7.45	17.91	27.27	45.17
4.4	74.74	27.43	14.36	9.73	7.44	17.98	27.43	45.41
4.6	74.87	27.57	14.39	9.73	7.43	18.05	27.57	45.63
4.8	74.98	27.71	14.43	9.72	7.43	18.12	27.71	45.82



EVISцерATED %:
Eviscerated carcass (without neck, abdominal fat and internal organs) as a percentage of live weight.



BREAST %:
Breast meat (without skin and bone) as a percentage of live weight



THIGH %:
Whole thigh (with skin and bone) as a percentage of live weight



DRUMSTICK %:
Whole drumstick (with skin and bone) as a percentage of live weight



WING %:
Whole wing, clean cut at the joint (with skin and bone) as a percentage of live weight

LEG %: Whole leg (without skin and bone) as a percentage of live weight.

TOTAL MEAT %: Whole leg and breast (without skin and bone) as a percentage of live weight

CARCASS YIELD - FEMALE

Live Weight kg	Portion					Debone		
	Eviscerated %	Breast %	Thigh %	Drumstick %	Wing %	Leg Meat %	Breast %	Total Meat %
1.6	70.07	22.97	13.04	9.51	7.66	15.77	22.97	38.74
1.8	71.02	24.18	13.20	9.43	7.61	15.92	24.18	40.10
2.0	71.78	25.15	13.32	9.36	7.57	16.03	25.15	41.19
2.2	72.40	25.95	13.42	9.31	7.54	16.13	25.95	42.08
2.4	72.92	26.61	13.51	9.26	7.52	16.21	26.61	42.82
2.6	73.36	27.17	13.58	9.23	7.49	16.28	27.17	43.45
2.8	73.73	27.65	13.64	9.19	7.48	16.34	27.65	43.99
3.0	74.06	28.06	13.69	9.17	7.46	16.39	28.06	44.45
3.2	74.34	28.43	13.74	9.14	7.45	16.44	28.43	44.86
3.4	74.59	28.75	13.78	9.12	7.43	16.48	28.75	45.22
3.6	74.82	29.03	13.82	9.10	7.42	16.51	29.03	45.54
3.8	75.02	29.29	13.85	9.08	7.41	16.54	29.29	45.83
4.0	75.20	29.52	13.88	9.07	7.40	16.57	29.52	46.09



EVisCERATED %:
Eviscerated carcass (without neck, abdominal fat and internal organs) as a percentage of live weight.



BREAST %:
Breast meat (without skin and bone) as a percentage of live weight



THIGH %:
Whole thigh (with skin and bone) as a percentage of live weight



DRUMSTICK %:
Whole drumstick (with skin and bone) as a percentage of live weight



WING %:
Whole wing, clean cut at the joint (with skin and bone) as a percentage of live weight

LEG %: Whole leg (without skin and bone) as a percentage of live weight.

TOTAL MEAT %: Whole leg and breast (without skin and bone) as a percentage of live weight



ROSS BROILER NUTRITION SPECIFICATIONS

INTRODUCTION

This document contains the nutritional recommendations for Ross® broilers and is intended to be used in conjunction with the Ross Broiler Management Handbook.

Nutrition specifications for broilers are given in the following tables for a range of production and market situations across the world:

Target Live Weight Table 1 - As-hatched \leq 2.0 kg

Target Live Weight Table 2 - As-hatched 2.0 - 3.5 kg

Target Live Weight Table 3 - As-hatched $>$ 3.5 kg

The nutrient specifications included in this document aim to support the achievement of optimal biological performance in varying environments and market scenarios globally. Specific adjustments may be required depending on a range of factors, principally:

- Final product – live bird or portioned products – and meat product values.
- The supply and price of feed ingredients.
- Age and live weight at processing.
- Yield and carcass quality.
- Market requirements for skin color, shelf-life, etc.
- Use of sex-separate growing.

The most appropriate diets must be designed on a case-by-case basis with the objective of either minimizing costs for live bird production or maximizing margins over feed cost (MOFC) for portioned products. Optimizing the MOFC for portioned products, in most instances, can require an increased dietary amino acid density.

The energy values used in these specifications are based on assays for Metabolizable Energy published by the World's Poultry Science Association.

The digestible amino acid specifications were calculated according to the optimally balanced protein profile in Appendix 1. These values are based on Standardized Ileal Digestibility (SID) assays due to their accuracy in predicting performance outcomes in broiler diets formulated with a wide variety of raw materials. In addition, formulating on a digestible amino acid base avoids potential amino acid imbalances, improves nitrogen retention and reduces nitrogen excretion into the environment.

Total calcium and available phosphorus specifications were determined with corn/wheat-soybean-based diets to optimize both live performance and welfare characteristics. Limestone and monocalcium phosphate were the only supplemental sources of calcium and phosphorus used. As a reference, slow/ intermediate soluble limestone (300-350 microns geometric mean diameter [GMD]) has been adopted in Aviagen trials, providing 55-60% of solubility at 5 minutes according to published methods.

Available phosphorus specifications are based on the classical availability system whereby a reference inorganic phosphorus source is described as 100% available, and plant sources are described as 33% available.

When using limestone sources with different solubilities, alternative raw materials, different phosphates, or enzymes, changes in the calcium and available phosphorus contributions are expected. Therefore, requiring the development of accurate matrices for such nutrients.

For further information regarding these recommendations or more specialized situations and advice on local markets, please contact your Aviagen® nutritionist or any Aviagen representative.

In reference to the tables that follow, the below points and notes are applicable:

1. To achieve the listed amino acid levels, adopting the use of either feed-grade amino acids or more complex diets may be necessary.
2. Formulation should focus on achieving an adequate amino acid profile. These crude protein levels are not a requirement per se but instead are levels that can likely be achieved in corn/wheat and soybean meal-based diets and ensure a functional pool of non-essential amino acids.

NOTES:

These feed specifications should be used as a guide only. Adjustments may be necessary for local conditions, legislation and markets. A withdrawal feed should be fed to meet local requirements for medication withdrawal times and can be formulated to the same standards as the final feed listed above.

Table 1:

Nutrition Specifications for As-Hatched Broilers - Target Live Weight <2.0 kg

		Starter	Grower	Finisher
Age Fed	days	0 - 10	11 - 24	25 - market
Energy per kg	kcal	2975	3050	3100
	MJ	12.4	12.8	13.0
Energy per lb	kcal	1349	1383	1406
DIGESTIBLE AMINO ACIDS¹				
Lysine	%	1.32	1.18	1.08
Methionine + Cyst(e)ine	%	1.00	0.92	0.86
Methionine	%	0.55	0.51	0.48
Threonine	%	0.88	0.79	0.72
Valine	%	1.00	0.91	0.84
Isoleucine	%	0.88	0.80	0.75
Arginine	%	1.40	1.27	1.17
Tryptophan	%	0.21	0.19	0.17
Leucine	%	1.45	1.30	1.19
Crude Protein²	%	23.0	21.5	19.5
MINERALS				
Total Calcium	%	0.95	0.75	0.65
Available Phosphorus	%	0.50	0.42	0.36
Magnesium	%	0.05-0.30	0.05-0.30	0.05-0.30
Sodium	%	0.18-0.23	0.18-0.23	0.18-0.23
Chloride	%	0.18-0.23	0.18-0.23	0.18-0.23
Potassium	%	0.60-0.90	0.60-0.90	0.60-0.90
ADDED TRACE MINERALS PER KG				
Copper	mg	16	16	16
Iodine	mg	1.25	1.25	1.25
Iron	mg	20	20	20
Manganese	mg	120	120	120
Selenium	mg	0.30	0.30	0.30
Zinc	mg	120	120	120
ADDED VITAMINS PER KG				
Vitamin A	IU	13000	11000	10000
Vitamin D ₃	IU	5000	4500	4000
Vitamin E	IU	80	65	55
Vitamin K (Menadione)	mg	4.0	3.6	3.2
Thiamin (B ₁)	mg	5	4	3
Riboflavin (B ₂)	mg	9	8	7
Niacin	mg	70	65	50
Pantothenic Acid	mg	25	20	15
Pyridoxine (B ₆)	mg	5	4	3
Biotin	mg	0.35	0.28	0.22
Folic Acid	mg	2.5	2.0	1.8
Vitamin B ₁₂	mg	0.02	0.018	0.016
MINIMUM SPECIFICATION				
Choline per kg	mg	1700	1600	1500
Linoleic Acid	%	1.25	1.20	1.00

Table 2:

Nutrition Specifications for As-Hatched Broilers - Target Live Weight 2.0 - 3.5 kg

		Starter	Grower	Finisher 1	Finisher 2
Age Fed	days	0-10	11-24	25 -39	40-market
Energy per kg	kcal	2975	3050	3100	3125
	MJ	12.4	12.8	13.0	13.1
Energy per lb	kcal	1349	1383	1406	1417
DIGESTIBLE AMINO ACIDS¹					
Lysine	%	1.32	1.18	1.08	1.02
Methionine + Cyst(e)ine	%	1.00	0.92	0.86	0.82
Methionine	%	0.55	0.51	0.48	0.45
Threonine	%	0.88	0.79	0.72	0.68
Valine	%	1.00	0.91	0.84	0.80
Isoleucine	%	0.88	0.80	0.75	0.70
Arginine	%	1.40	1.27	1.17	1.12
Tryptophan	%	0.21	0.19	0.17	0.16
Leucine	%	1.45	1.30	1.19	1.12
Crude Protein²	%	23.0	21.5	19.5	18.0
MINERALS					
Total Calcium	%	0.95	0.75	0.65	0.60
Available Phosphorus	%	0.50	0.42	0.36	0.34
Magnesium	%	0.05-0.30	0.05-0.30	0.05-0.30	0.05-0.30
Sodium	%	0.18-0.23	0.18-0.23	0.18-0.23	0.18-0.23
Chloride	%	0.18-0.23	0.18-0.23	0.18-0.23	0.18-0.23
Potassium	%	0.60-0.90	0.60-0.90	0.60-0.90	0.60-0.90
ADDED TRACE MINERALS PER KG					
Copper	mg	16	16	16	16
Iodine	mg	1.25	1.25	1.25	1.25
Iron	mg	20	20	20	20
Manganese	mg	120	120	120	120
Selenium	mg	0.30	0.30	0.30	0.30
Zinc	mg	120	120	120	120
ADDED VITAMINS PER KG					
Vitamin A	IU	13000	11000	10000	10000
Vitamin D ₃	IU	5000	4500	4000	4000
Vitamin E	IU	80	65	55	55
Vitamin K (Menadione)	mg	4.0	3.6	3.2	3.2
Thiamin (B ₁)	mg	5	4	3	3
Riboflavin (B ₂)	mg	9	8	7	7
Niacin	mg	70	65	50	50
Pantothenic Acid	mg	25	20	15	15
Pyridoxine (B ₆)	mg	5	4	3	3
Biotin	mg	0.35	0.28	0.22	0.22
Folic Acid	mg	2.5	2.0	1.8	1.8
Vitamin B ₁₂	mg	0.02	0.018	0.016	0.016
MINIMUM SPECIFICATION					
Choline per kg	mg	1700	1600	1500	1450
Linoleic Acid	%	1.25	1.20	1.00	1.00

Table 3:

Nutrition Specifications for As-Hatched Broilers - Target Live Weight > 3.5 kg

		Starter	Grower	Finisher 1	Finisher 2	Finisher 3
Age Fed	days	0-10	11-24	25 -39	40-51	52 -market
Energy per kg	kcal	2975	3050	3100	3125	3150
	MJ	12.4	12.8	13.0	13.1	13.2
Energy per lb	kcal	1349	1383	1406	1417	1429
DIGESTIBLE AMINO ACIDS¹						
Lysine	%	1.32	1.18	1.08	1.02	0.96
Methionine + Cyst(e)ine	%	1.00	0.92	0.86	0.82	0.77
Methionine	%	0.55	0.51	0.48	0.45	0.42
Threonine	%	0.88	0.79	0.72	0.68	0.64
Valine	%	1.00	0.91	0.84	0.80	0.77
Isoleucine	%	0.88	0.80	0.75	0.70	0.67
Arginine	%	1.40	1.27	1.17	1.12	1.08
Tryptophan	%	0.21	0.19	0.17	0.16	0.15
Leucine	%	1.45	1.30	1.19	1.12	1.06
Crude Protein²	%	23.0	21.5	19.5	18.0	17.0
MINERALS						
Total Calcium	%	0.95	0.75	0.65	0.60	0.55
Available Phosphorus	%	0.50	0.42	0.36	0.34	0.32
Magnesium	%	0.05-0.30	0.05-0.30	0.05-0.30	0.05-0.30	0.05-0.30
Sodium	%	0.18-0.23	0.18-0.23	0.18-0.23	0.18-0.23	0.18-0.23
Chloride	%	0.18-0.23	0.18-0.23	0.18-0.23	0.18-0.23	0.18-0.23
Potassium	%	0.60-0.90	0.60-0.90	0.60-0.90	0.60-0.90	0.60-0.90
ADDED TRACE MINERALS PER KG						
Copper	mg	16	16	16	16	16
Iodine	mg	1.25	1.25	1.25	1.25	1.25
Iron	mg	20	20	20	20	20
Manganese	mg	120	120	120	120	120
Selenium	mg	0.30	0.30	0.30	0.30	0.30
Zinc	mg	120	120	120	120	120
ADDED VITAMINS PER KG						
Vitamin A	IU	13000	11000	10000	10000	10000
Vitamin D ₃	IU	5000	4500	4000	4000	4000
Vitamin E	IU	80	65	55	55	55
Vitamin K (Menadione)	mg	4.0	3.6	3.2	3.2	3.2
Thiamin (B ₁)	mg	5	4	3	3	3
Riboflavin (B ₂)	mg	9	8	7	7	7
Niacin	mg	70	65	50	50	50
Pantothenic Acid	mg	25	20	15	15	15
Pyridoxine (B ₆)	mg	5	4	3	3	3
Biotin	mg	0.35	0.28	0.22	0.22	0.22
Folic Acid	mg	2.5	2.0	1.8	1.8	1.8
Vitamin B ₁₂	mg	0.02	0.018	0.016	0.016	0.016
MINIMUM SPECIFICATION						
Choline per kg	mg	1700	1600	1500	1450	1450
Linoleic Acid	%	1.25	1.20	1.00	1.00	1.00

Appendix 1:

Ratios for an optimally balanced protein profile

		AGE FED - DAYS				
		0-10	11-24	25-39	40-51	>52
Lysine	%	100	100	100	100	100
Methionine + Cyst(e)ine	%	76	78	80	80	80
Methionine	%	42	43	44	44	44
Threonine	%	67	67	67	67	67
Valine	%	76	77	78	78	80
Isoleucine	%	67	68	69	69	70
Arginine	%	106	108	108	110	112
Tryptophan	%	16	16	16	16	16
Leucine	%	110	110	110	110	110

NOTE: The information in the table is derived from Aviagen internal trials and published literature.



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