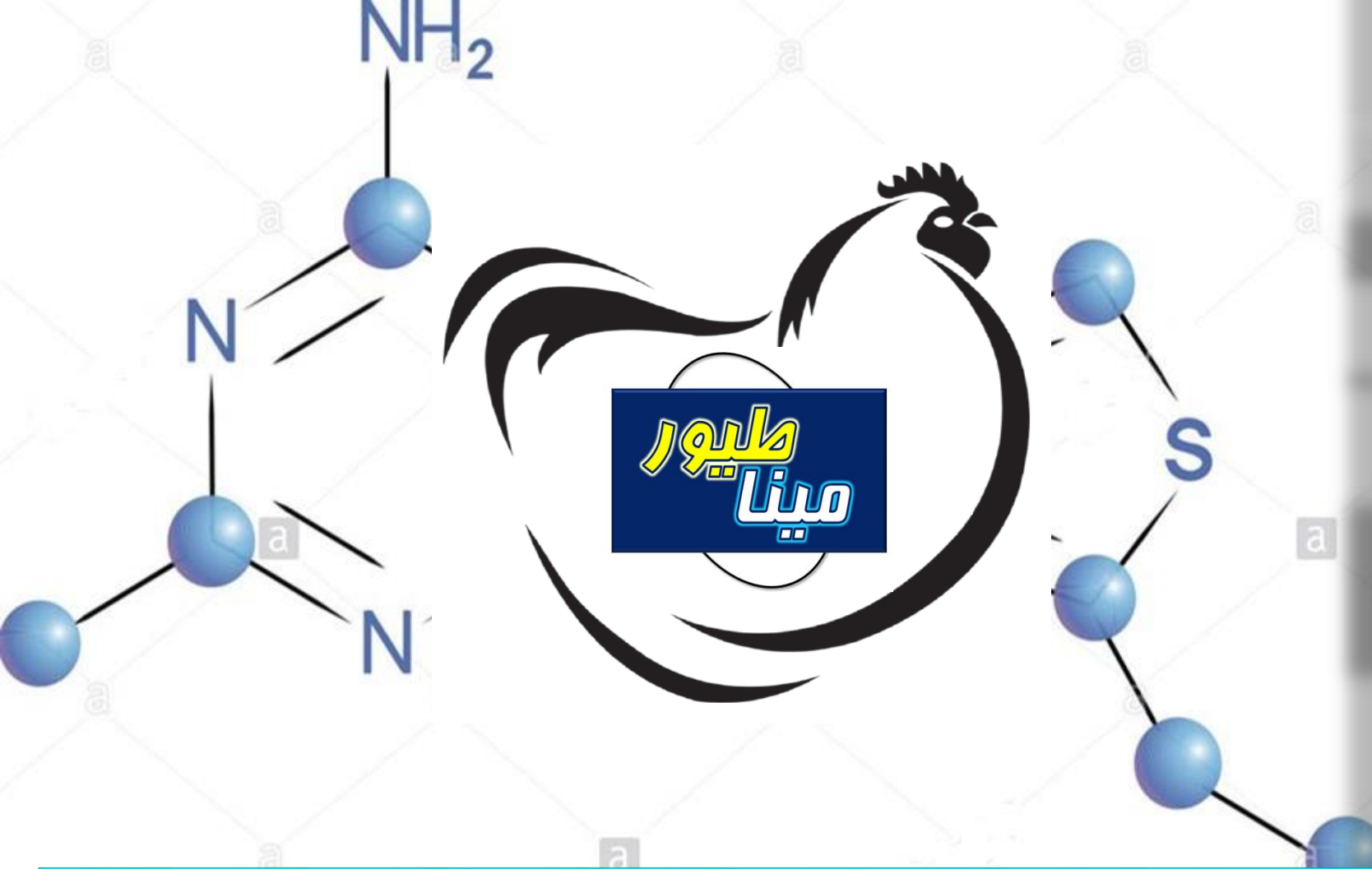


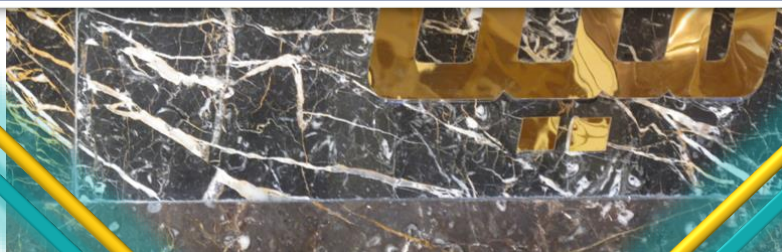


تولید کنندہ مکمل، پریمیکس، کنسانترہ و خوراک طیور

Since 1994



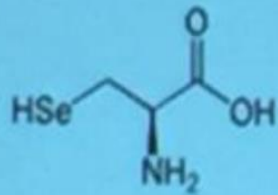
راهکارهای تغذیه سویه های نوین مرغهای مادر گوشتی



Jun 15, 2021



21th Amino Acid



Se as SeCys in
enzyme catalytic site

Selenocysteine: the 21st amino acid
(SeCys)

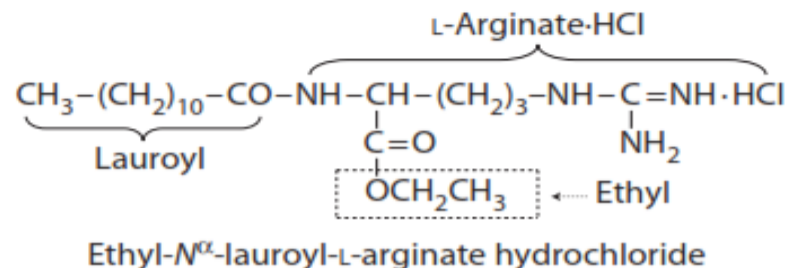




Some amino acids metabolites are useful feed additive to diets for Animals to improve intestinal health and the efficiency of nutrient utilization

Esterification and N^α -Dehydrogenation of α -AA

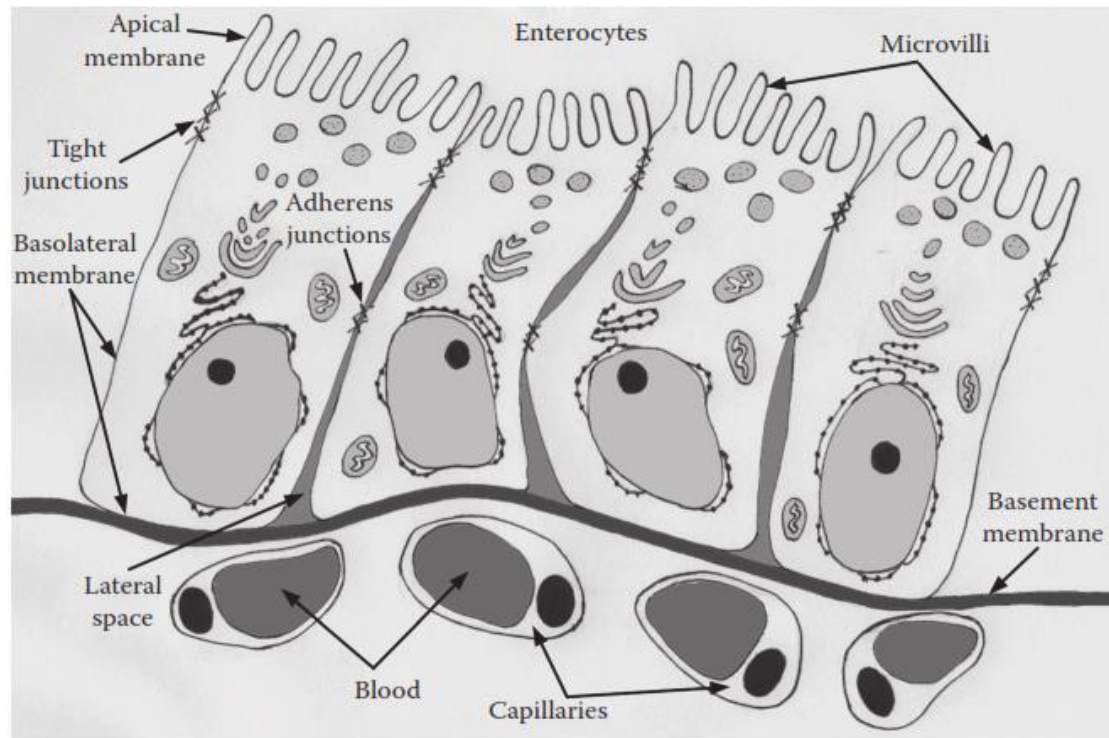
An example for esterification and N^α -dehydrogenation of an α -AA is the chemical synthesis of lauric arginate (ethyl- N^α -lauroyl-L-arginate hydrochloride) from L-arginine monohydrochloride, ethanol, and lauroyl chloride. This reaction is initiated by thionyl chloride (SOCl_2)-catalyzed esterification of the carboxyl group of L-arginine hydrochloride with ethanol in the presence of a base (NaOH) to form ethyl arginine dihydrochloride, followed by its condensation with lauroyl chloride to finally yield lauric arginate. This substance is a novel cationic surfactant that has a potent antimicrobial effect. Thus, lauric arginate (e.g., 200 ppm) is now used as a safe preservative in food and beverage industries. It may also be a useful feed additive to diets for animals (e.g., weanling pigs) to improve intestinal health and the efficiency of nutrient utilization.

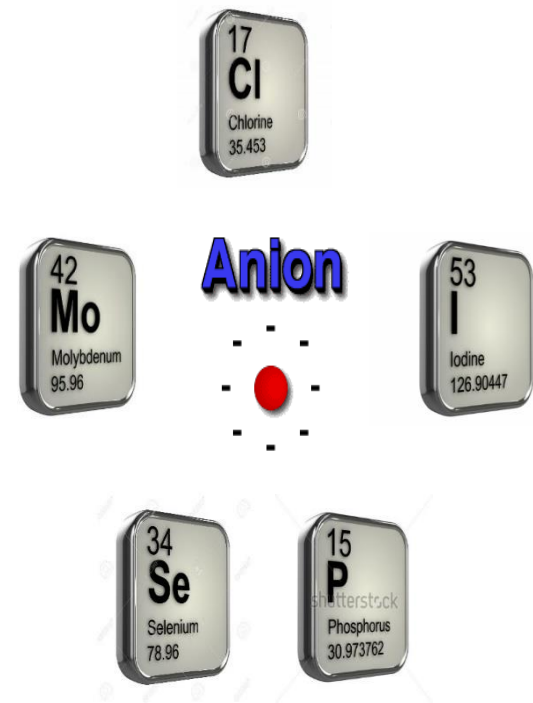
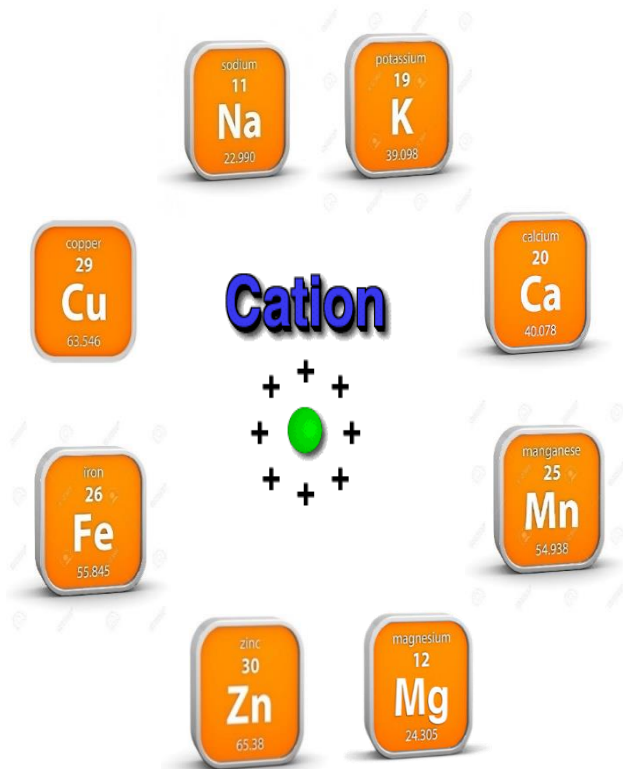




Amino Acids as a sole source of energy

The products of protein digestion are either utilized by microorganisms in the gastrointestinal tract or absorbed into enterocytes. Inside these cells, oxidation of AA is the major source of energy to support their high metabolic rates.

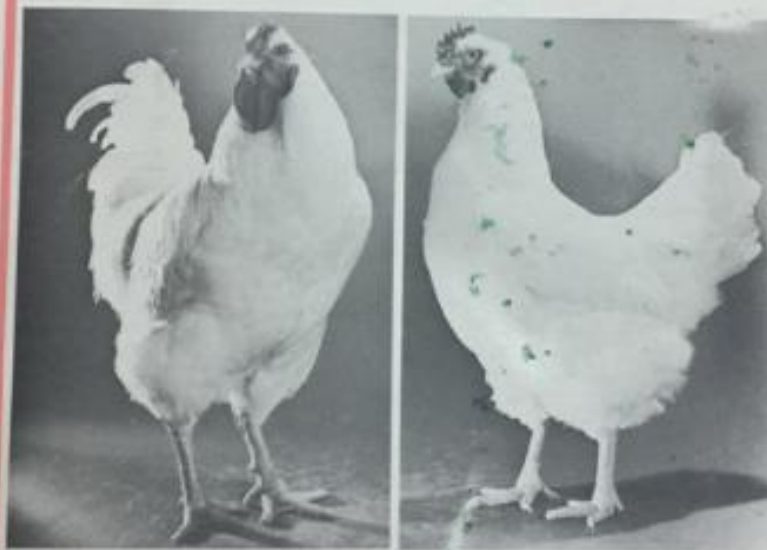






Management Program for Lohmann Broiler Parentstock

40 years ago



LOHMANN
CUXHAVEN



Performance data LOHMANN BROILER Parentstock

Livability % (♀♀)	
growing period	94 – 96
laying period	90 – 94
Total eggs / hen housed	
in 36 weeks of production	160 – 170
in 40 weeks of production	170 – 180
Hatching eggs / hen housed	
in 36 weeks of production	150 – 160
in 40 weeks of production	160 – 170
Average hatchability %	
in 36 weeks of production	84 – 85
in 40 weeks of production	83 – 84
Number of saleable chicks / H.H.	
in 36 weeks of production	128 – 136
in 40 weeks of production	135 – 143
Average feed consumption (including rearing period and males)	
gms/egg	315 – 330 (11.1 – 11.6 g/2)
gms/saleable chick	390 – 410 (13.8 – 14.5 g/2)
Average live weight (♀♀), kg	
at 26 weeks of age	2.50 – 2.80 (5.51 – 6.23 lbs)
at 66 weeks of age	3.10 – 3.30 (6.83 – 7.27 lbs)

135-143



Body Weights – Feeding – Egg Production

Laying Period (metric weights)

Week of age	Week of production	Average weight at end of week		Brooder mash	
		gms	gms	gms/bird/day	
26	1	2530 – 2730	3210 – 3460	135 – 145	
27	2	2610 – 2800	3310 – 3540	145 – 155	
28	3	2680 – 2860	3410 – 3620	155 – 162	75.2
29	4	2740 – 2920	3490 – 3700	158 – 166	61.8
30	5	2790 – 2960	3580 – 3780	159 – 169	64.0
31	6	2830 – 2990	3630 – 3850	160 – 169	64.6
32	7	2860 – 3020	3700 – 3920	159 – 169	64.2
33	8	2890 – 3050	3760 – 3980	158 – 168	63.3
34	9	2920 – 3070	3820 – 4050	157 – 167	61.8
35	10	2940 – 3090	3870 – 4110	157 – 167	60.3
36	11	2960 – 3110	3920 – 4160	156 – 166	78.1
37	12	2980 – 3130	3970 – 4210	155 – 165	77.8
38	13	2990 – 3140	4020 – 4260	155 – 165	76.7
39	14	3000 – 3150	4060 – 4310	154 – 164	75.5
40	15	3010 – 3160	4100 – 4360	154 – 164	74.3
41	16	3020 – 3170	4140 – 4410	153 – 163	73.1
42	17	3030 – 3180	4180 – 4450	152 – 162	71.9
43	18	3040 – 3190	4220 – 4490	151 – 161	70.7
44	19	3050 – 3200	4250 – 4530	151 – 161	69.5
45	20	3060 – 3210	4280 – 4570	150 – 160	68.3
46	21	3070 – 3220	4310 – 4600	149 – 159	67.2
47	22	3080 – 3230	4340 – 4630	148 – 158	66.0
48	23	3080 – 3230	4370 – 4660	147 – 157	64.8
49	24	3080 – 3230	4390 – 4690	147 – 157	63.7
50	25	3090 – 3240	4410 – 4720	146 – 156	62.5
51	26	3090 – 3240	4430 – 4750	145 – 155	61.4
52	27	3100 – 3250	4450 – 4770	145 – 155	60.4
53	28	3100 – 3250	4470 – 4790	144 – 154	59.2
54	29	3100 – 3250	4480 – 4810	143 – 153	58.0
55	30	3110 – 3260	4490 – 4830	143 – 153	57.0
56	31	3110 – 3260	4500 – 4850	143 – 153	55.9
57	32	3110 – 3260	4500 – 4860	142 – 152	54.9
58	33	3110 – 3260	4510 – 4870	142 – 152	53.8
59	34	3120 – 3270	4510 – 4880	142 – 152	52.8
60	35	3120 – 3270	4520 – 4890	141 – 151	51.7
61	36	3120 – 3270	4520 – 4900	141 – 151	50.6
62	37	3130 – 3280	4530 – 4910	141 – 151	49.5
63	38	3130 – 3280	4530 – 4910	140 – 150	48.5
64	39	3130 – 3280	4540 – 4920	140 – 150	47.4
65	40	3140 – 3290	4540 – 4920	140 – 150	46.4

169g

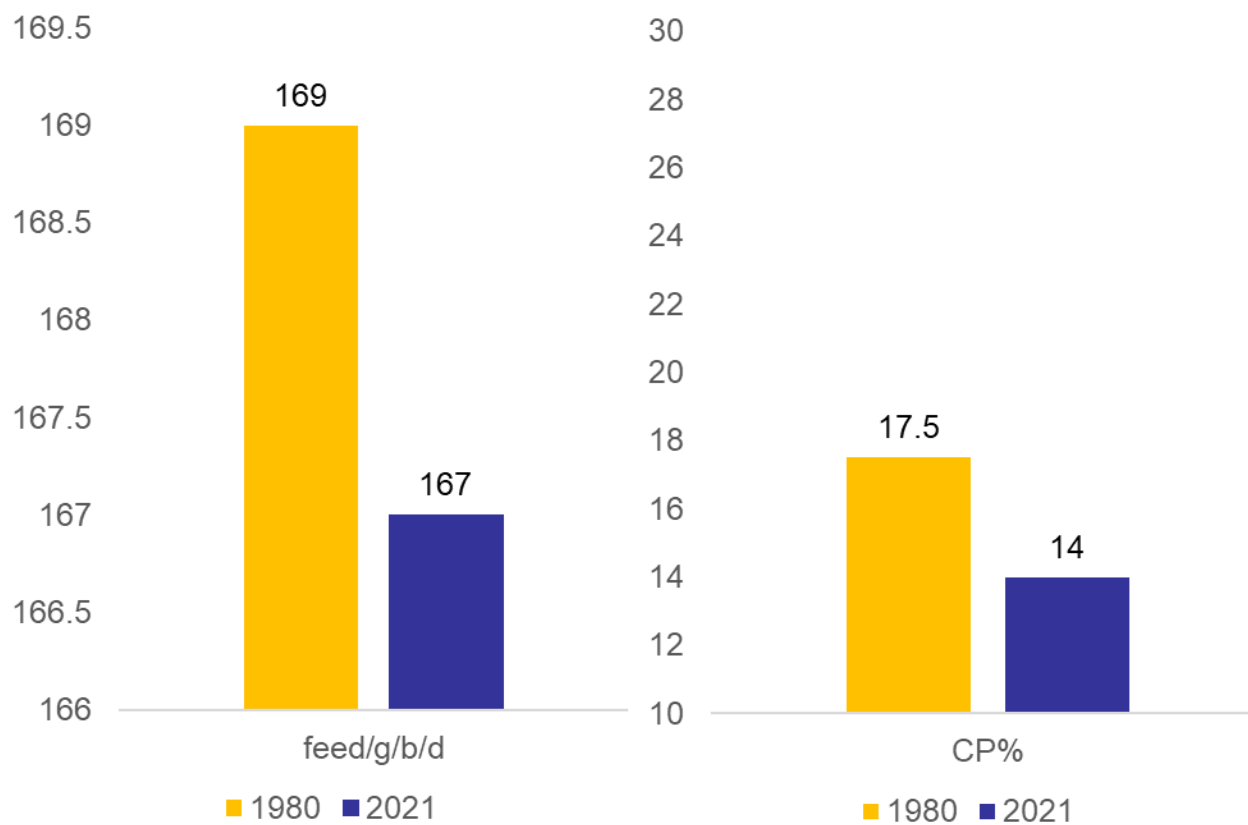


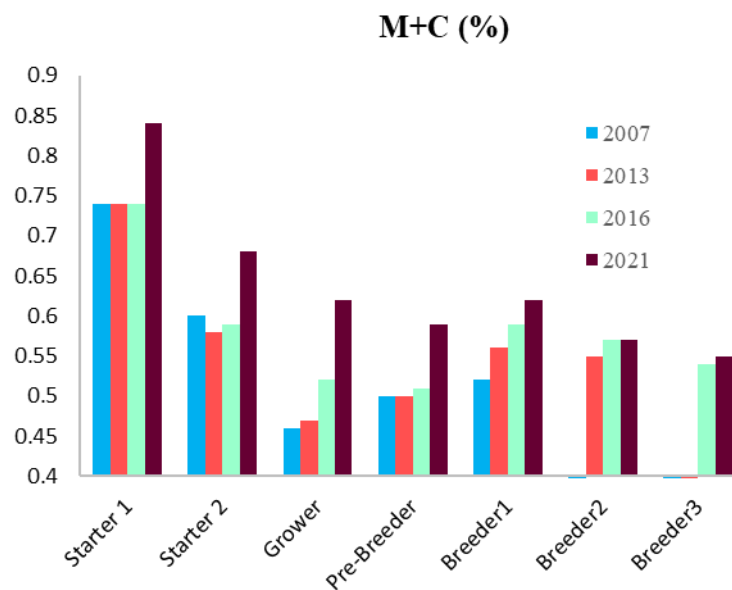
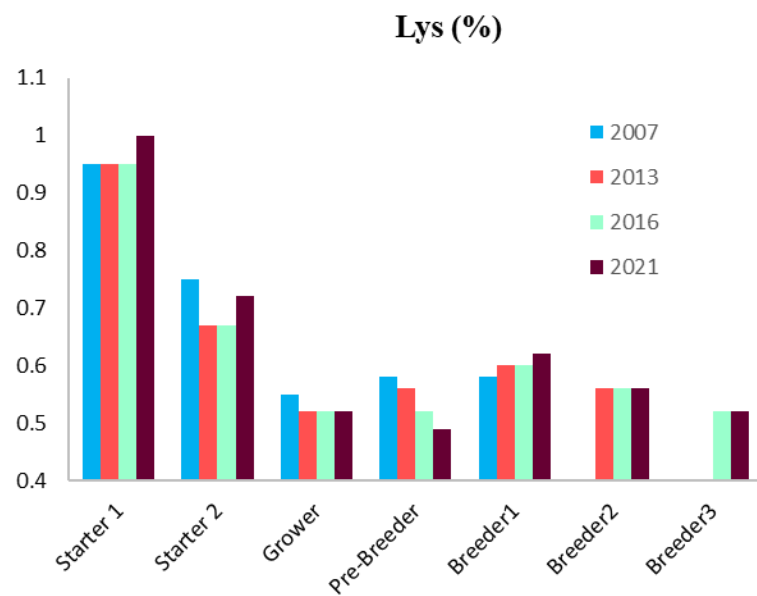
Nutrition

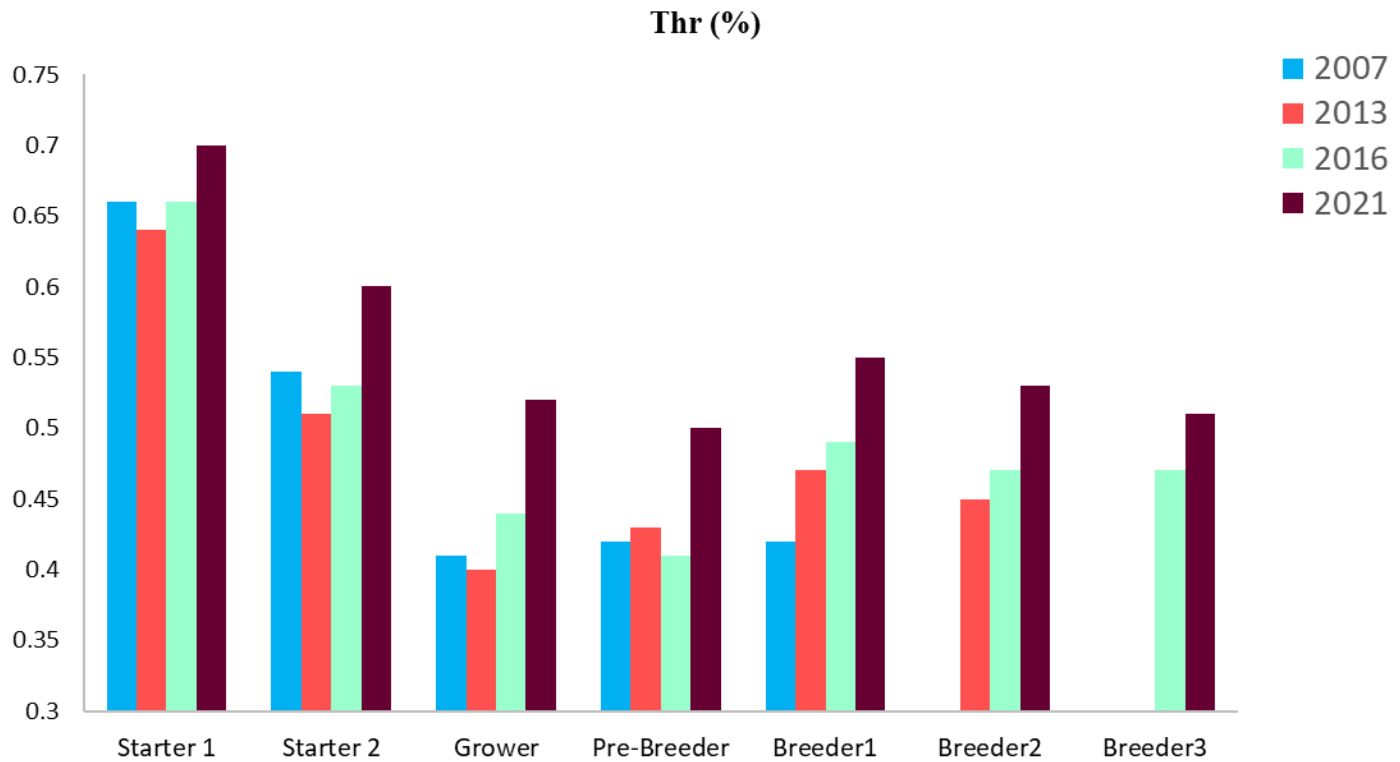
Recommended Nutrient Levels for Lohmann Broiler Parents

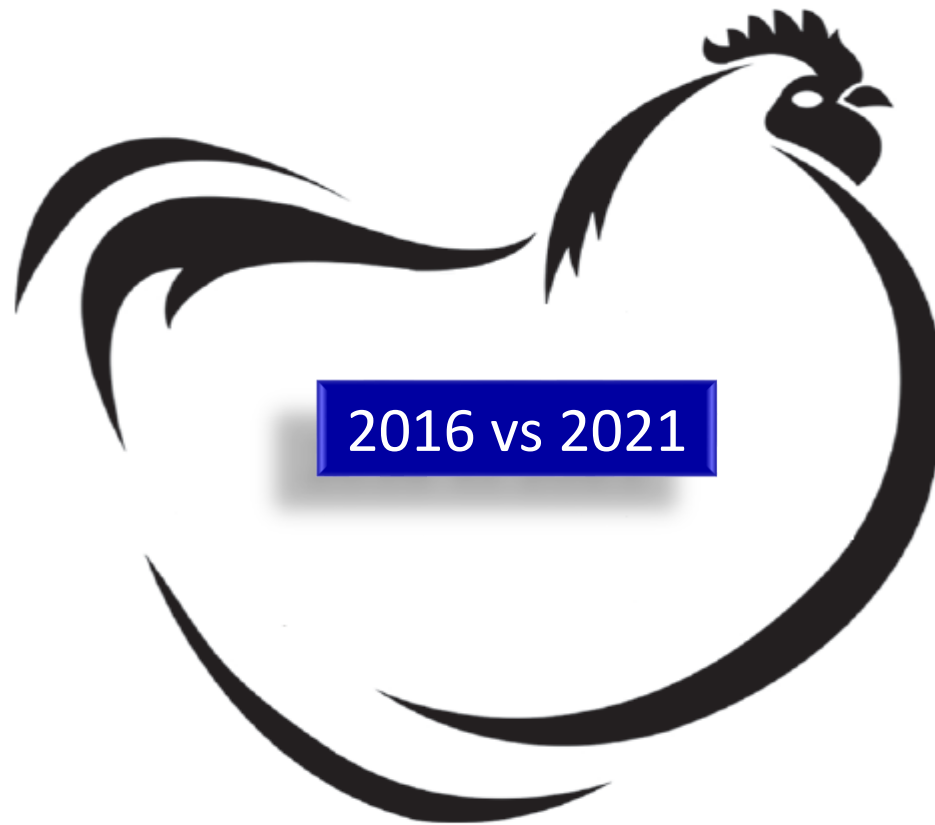
		Starter and Grower (1st to 6th week)		Developer (7th to 21st week)		Moderate Climate (av. 18° C) Layer (after 21st week)		Warm Climate (av. 24° C) Layer (after 21st week)	
Metabolizable Energy (N-corr.)	kcal/kg	2,750		2,700		2,700		2,700	
	kcal/lb	1,250		1,225		1,225		1,225	
	MJ/kg	11.5		11.3		11.3		11.3	
	MJ/lb	5.2		5.1		5.1		5.1	
	%	18.5		16.0		16.0		17.5	
Crude Protein	%	18.5		16.0		16.0		17.5	
Calcium	%	1.0		1.0		3.0		3.2	
Phosphorus, total	%	0.7		0.7		0.6		0.65	
Phosphorus, av.	%	0.45		0.45		0.35		0.38	
Sodium	%	0.14		0.14		0.14		0.15	
Methionine	%	0.36		0.32		0.33		0.36	
Methionine/Cystine	%	0.67		0.56		0.58		0.63	
Lysine	%	0.95		0.75		0.72		0.79	
Arginine	%	1.10		0.90		0.92		1.00	
Tryptophan	%	0.20		0.17		0.17		0.18	
Linoleic Acid	%	1.4		1.2		1.5		1.6	
Supplements per kg feed		kg	lb	kg	lb	kg	lb	kg	lb
Vitamin A	I. U.	12,000	5,443	15,000	6,804	15,000	6,804	16,500	7,484
Vitamin D ₃	I. U.	2,000	907	2,500	1,134	3,000	1,361	3,300	1,497
Vitamin E	mg	10	4.5	10	4.5	30	13.6	33	15.0
Vitamin K ₃	mg	3	1.4	3	1.4	3	1.4	4	1.8
Vitamin B ₁	mg	1	0.5	1	0.5	2	0.9	2	1.1
Vitamin B ₂	mg	4	1.8	5	2.3	8	3.6	10	4.5
Vitamin B ₆	mg	3	1.4	3	1.4	4	1.8	4	2.0
Vitamin B ₁₂	mcg	10	4.5	10	4.5	20	9.1	22	10.0
Pantothenic Acid	mg	8	3.6	8	3.6	18	8.2	20	9.1
Nicotinic Acid	mg	30	13.6	40	18.1	40	18.1	44	20.0
Folic Acid	mg	1	0.5	1	0.5	1	0.5	1	0.5
Biotin	mcg	50	22.7	50	22.7	100	45.4	110	49.9
Choline Chloride	mg	400	181.4	400	181.4	500	226.8	550	246.5
Ethoxyquine/BHT	mg	125	56.7	125	56.7	125	56.7	150	68.0
Antibiotic	mg	+	+	+	+	+	+	+	+
Coccidiostat		as required		as required		—		—	
Manganese (Mn)	mg	100	45.4	for all feeds					
Zinc (Zn)	mg	60	27.2						
Iron (Fe)	mg	25	11.3						
Copper (Cu)	mg	5	2.3						
Cobalt (Co)	mg	0.1	0.05						
Iodine (I)	mg	0.5	0.2						
Selenium (Se)	mg	0.2	0.1						

17.5











ROSS Parent Stock Nutrition Specification 2016 *vs* 2021



		2016		2021
		Starter 1		Starter 1
Age Fed	days	0-21 days		0-21 days
Energy per Kg	Kcal	2800		2800
	MJ	11.7		11.7
AMINO ACIDS		Total	Digest	Digestible
Lysine	%	1.06	0.95	1
Methionine + Cystine	%	0.84	0.74	0.84
Methionine	%	0.51	0.46	0.46
Threonine	%	0.75	0.66	0.7
Valine	%	0.8	0.71	0.81
IsoLeucine	%	0.7	0.62	0.7
Arginine	%	1.17	1.05	1.15
Tryptophan	%	0.19	0.16	0.18
Leucine	%	1.23	1.11	1.2
Histidine	%	-	-	0.43
Crude Protein (min)		19		19
MINERALS				
Calcium	%	1		1.05
Available Phosphorus	%	0.45		0.5
Sodium	%	0.18-0.23		0.18-0.23
Chloride	%	0.18-0.23		0.18-0.23
Potassium	%	0.40-0.90		0.60-0.90
ADDED TRACE MINERALS PER KG				
Copper	mg	16		16
Iodine	mg	1.25		2
Iron	mg	40		40
Manganese	mg	120		120
Selenium	mg	0.3		0.3
Zinc	mg	110		120
ADDED VITAMINS PER KG		Wheat based feed Maize based feed		
Vitamin A	IU	11000	10000	13000
Vitamin D3	IU	3500	3500	4000
Vitamin E	IU	100	100	100
Vitamin k (Menadione)	mg	3	3	6
Thiamin (B1)	mg	3	3	5
Riboflavin (B2)	mg	6	6	15
Nicotinic Acid	mg	30	35	50
Pantothenic Acid	mg	13	15	20
Pyridoxine (B6)	mg	4	3	5
Biotin	mg	0.2	0.15	0.3
Folic Acid	mg	1.5	1.5	3
Vitamin B12	mg	0.02	0.02	0.05
MINIMUM SPECIFICATION				
Choline per Kg	mg	1400		1400
Linoleic Acid	%	1		1.25

6/15/2021



		2016		2021
		Pre Breeder		Pre Breeder
Age Fed	days	106 days to 5% production		141 days to 5% production
Energy per Kg	Kcal	2700		2800
AMINO ACIDS		Total	Digest	Digestible
Lysine	%	0.58	0.52	0.48
Methionine + Cystine	%	0.58	0.51	0.58
Methionine	%	0.35	0.32	0.34
Threonine	%	0.47	0.41	0.49
Valine	%	0.51	0.45	0.56
IsoLeucine	%	0.47	0.41	0.43
Arginine	%	0.74	0.67	0.74
Tryptophan	%	0.15	0.13	0.15
Leucine	%	0.8	0.72	0.78
Histidine	%	-	-	0.2
Crude Protein (min)		14		14
MINERALS				
Calcium	%	1.2		1.2
Available Phosphorus	%	0.35		0.35
Sodium	%	0.18-0.23		0.18-0.23
Chloride	%	0.18-0.23		0.18-0.23
Potassium	%	0.60-0.90		0.60-0.90
ADDED TRACE MINERALS PER KG				
Copper	mg	16		16
Iodine	mg	1.25		2
Iron	mg	40		40
Manganese	mg	120		120
Selenium	mg	0.3		0.3
Zinc	mg	110		120
ADDED VITAMINS PER KG		Wheat based feed	Maize based feed	
Vitamin A	IU	11000	10000	13000
Vitamin D3	IU	3500	3500	4000
Vitamin E	IU	100	100	100
Vitamin k (Menadione)	mg	3	3	6
Thiamin (B1)	mg	3	3	5
Riboflavin (B2)	mg	6	6	15
Nicotinic Acid	mg	30	35	50
Pantothenic Acid	mg	13	15	20
Pyridoxine (B6)	mg	4	3	5
Biotin	mg	0.2	0.15	0.3
Folic Acid	mg	1.5	1.5	3
Vitamin B12	mg	0.02	0.02	0.05
MINIMUM SPECIFICATION				
Choline per Kg	mg	1400		1400
Linoleic Acid	%	1		1.25

6/15/2021

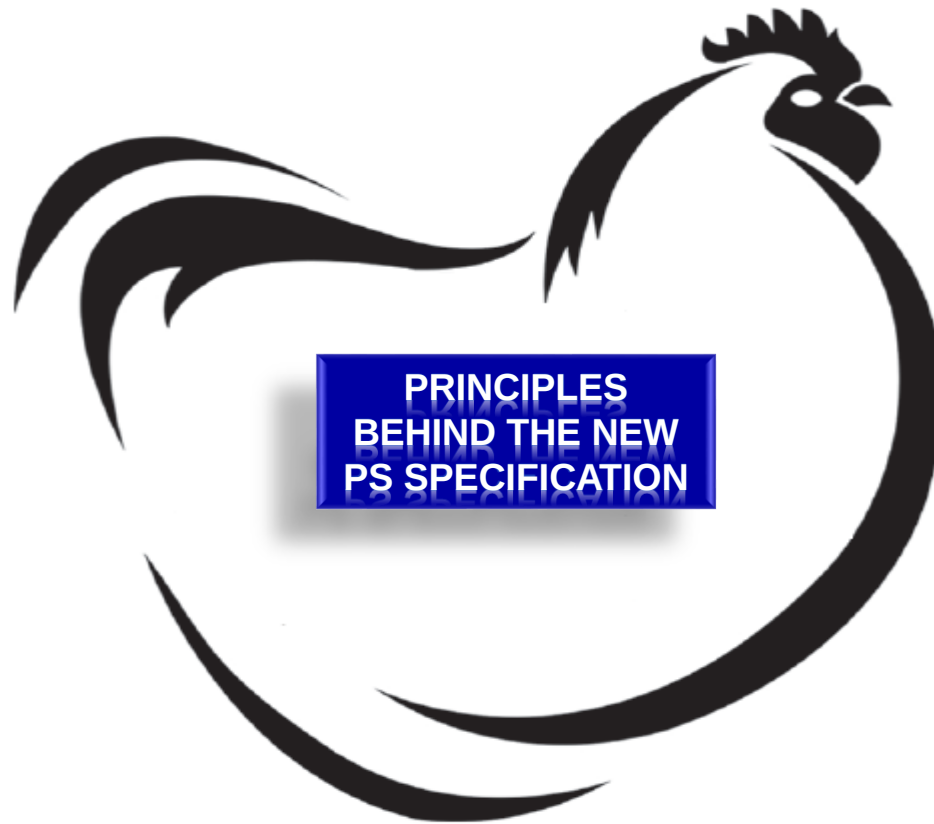


		2016		2021
		Breeder 1		Breeder 1
Age Fed	days	5 % production to 245 days		> 5 % production to 224 days
Energy per Kg	Kcal	2800		2800
	MJ	11.7		11.7
AMINO ACIDS		Total	Digest	Digestible
Lysine	%	0.67	0.6	0.62
Methionine + Cystine	%	0.67	0.59	0.62
Methionine	%	0.41	0.37	0.38
Threonine	%	0.55	0.49	0.55
Valine	%	0.63	0.56	0.64
IsoLeucine	%	0.56	0.5	0.52
Arginine	%	0.88	0.79	0.85
Tryptophan	%	0.16	0.14	0.15
Leucine	%	1.04	0.94	0.95
Histidine	%	-	-	0.3
Crude Protein (min)		15		15
MINERALS				
Calcium	%	3		3
Available Phosphorus	%	0.35		0.36
Sodium	%	0.18-0.23		0.18-0.23
Chloride	%	0.18-0.23		0.18-0.23
Potassium	%	0.60-0.90		0.70-0.90
ADDED TRACE MINERALS PER KG				
Copper	mg	10		16
Iodine	mg	2		3
Iron	mg	50		50
Manganese	mg	120		120
Selenium	mg	0.3		0.3
Zinc	mg	110		120
ADDED VITAMINS PER KG		Wheat based feed	Maize based feed	
Vitamin A	IU	12000	11000	15000
Vitamin D3	IU	3500	3500	5000
Vitamin E	IU	100	100	130
Vitamin k (Menadione)	mg	5	5	9
Thiamin (B1)	mg	3	3	6
Riboflavin (B2)	mg	12	12	20
Nicotinic Acid	mg	50	55	70
Pantothenic Acid	mg	13	15	25
Pyridoxine (B6)	mg	5	4	8
Biotin	mg	0.3	0.25	0.6
Folic Acid	mg	2	2	5
Vitamin B12	mg	0.03	0.03	0.07
MINIMUM SPECIFICATION				
Choline per Kg	mg	1200		1600
Linoleic Acid	%	1.25		2



نوع فرمول: دان مرغ مادر راس ۳۰۸ (کاتالوگ ۲۰۲۱) شماره فایل: ۳۴ تاریخ: ۱۴۰۰/۰۳/۱۶

مواد خوراکی	مرحله مورد استفاده							
	۱ تا ۳ هفته	۴ تا ۵ هفته	۶ تا ۱۵ هفته	۱۶ هفته تا ۵٪ تولید	۵٪ تولید تا ۴۰ هفته	۴۱ تا ۵۰ هفته	۵۱ هفته تا پایان	۲۵ هفته به بعد (خروس)
	Starter I	Starter II	Grower	Prebreeder	Breeder I	Breeder II	Breeder III	Male
ذرت (برزیل)	۶۰۱.۷	۳۴۶.۵	۵۱۹.۱	۶۱۸.۱	۴۴۸.۸	۴۱۴.۶	۴۸۷.۲	۵۴۲.۸
کنجاله سویا (۴۴٪)	۳۱۲.۵	۲۰۲.۴	۸۶	۹۵	۱۶۸.۹	۱۴۵.۵	۱۲۸.۱	۳۶.۴
گندم درجه یک	۳۳.۹	۲۴۶.۱	۱۵	۰	۱۵۹.۷	۲۲۰	۱۲۵	۱۸۶.۶
سیوس گندم	۰	۱۲۵.۴	۳۱۰.۴	۱۷۷.۸	۷۸.۹	۷۸.۵	۱۰۸.۱	۱۷۵
گلوتن ذرت	۰	۰	۰	۳۵.۷	۱۰	۰	۰	۱۰
روغن ذرت	۰	۳۳.۲	۲۶.۴	۲۰	۳۵.۶	۳۷.۸	۴۲.۹	۱۰
مونوکلسیم فسفات	۱۷.۵	۱۶.۲	۱۳.۹	۱۵.۹	۱۱.۷	۱۱.۱	۱۰.۲	۱۱.۶
صدف معدنی	۱۸.۵	۱۶.۱	۱۴.۸	۲۴	۷۲.۶	۷۸.۲	۸۳.۸	۱۲.۷
نمک	۳	۲.۹	۲.۴	۲.۹	۳.۱	۳	۳	۲.۸
جوش شیرین	۲.۲	۱.۹	۲.۲	۲.۱	۱.۸	۱.۸	۱.۹	۱.۷
کربنات پتاسیم	۰	۰	۰	۰	۰	۰	۰	۰
زنولیت	۰.۶	۰	۰	۰	۰	۰	۰	۰
مکمل معدنی ویتامینه پرورش	۵	۵	۵	۵	۰	۰	۰	۰
مکمل معدنی ویتامینه تولید	۰	۰	۰	۰	۵	۵	۵	۵
مینازایم	۱	۱	۱	۱	۱	۱	۱	۱
دی ال متیونین	۲.۹	۲.۱	۲.۴	۱.۵	۱.۸	۱.۷	۱.۷	۲.۱
آل لیزین	۰.۷	۰	۰	۰	۰	۰	۰	۰
آل آرژنین	۰	۰	۰	۰.۲	۰	۰.۴	۰.۶	۱.۲
آل والین	۰	۰.۳	۰.۴	۰	۰.۲	۰.۳	۰.۳	۰
آل ترئونین	۰.۵	۰.۹	۱	۰.۸	۰.۹	۱.۱	۱.۲	۱.۱
جمع	۱۰۰۰	۱۰۰۰	۱۰۰۰	۱۰۰۰	۱۰۰۰	۱۰۰۰	۱۰۰۰	۱۰۰۰
شکل فیزیکی	کرامیل	کرامیل	پلت	کرامیل	کرامیل	کرامیل	کرامیل	کرامیل
اندازه ذرات (میلی متر)	۱-۲	۲-۳	۳-۴	۳-۴	۳-۴	۳-۴	۳-۴	۳-۴
مواد مغذی (٪)								
انرژی قابل متابولیسم (کیلو کالری/کیلوگرم)	۲۸۰۰	۲۸۰۰	۲۶۰۰	۲۸۰۰	۲۸۰۰	۲۸۰۰	۲۸۰۰	۲۸۰۰
پروتئین خام	۱۹.۰	۱۷.۰	۱۳.۰	۱۴.۰	۱۵.۰	۱۴.۰	۱۳.۰	۱۲.۰
کلسیم	۱.۰۵	۰.۹۳	۰.۸۴	۱.۲۰	۳.۰۰	۳.۲۰	۳.۴۰	۰.۷۰
فسفر قابل دسترس	۰.۵۰	۰.۴۷	۰.۴۲	۰.۴۵	۰.۳۶	۰.۳۴	۰.۳۲	۰.۳۵
سدیم	۰.۲۰	۰.۲۰	۰.۱۸	۰.۲۰	۰.۲۰	۰.۲۰	۰.۲۰	۰.۱۹
کلر	۰.۲۳	۰.۲۳	۰.۲۱	۰.۲۳	۰.۲۳	۰.۲۳	۰.۲۳	۰.۲۳
پتاسیم	۰.۹۰	۰.۸۰	۰.۷۸	۰.۶۹	۰.۷۰	۰.۶۶	۰.۶۵	۰.۶۱
لینولئیک اسید	۱.۴۷	۳.۱۹	۳.۳۰	۲.۹۰	۳.۴۲	۳.۵۰	۳.۹۵	۲.۲۲
لیزین قابل هضم	۱.۰۰	۰.۷۲	۰.۴۸	۰.۴۹	۰.۶۲	۰.۵۶	۰.۵۲	۰.۳۵
متیونین قابل هضم	۰.۵۶	۰.۴۴	۰.۴۲	۰.۳۷	۰.۳۹	۰.۳۶	۰.۳۵	۰.۲۸
متیونین + سیستین قابل هضم	۰.۸۴	۰.۶۸	۰.۶۳	۰.۵۹	۰.۶۲	۰.۵۷	۰.۵۵	۰.۵۸
ترئونین قابل هضم	۰.۷۰	۰.۶۰	۰.۴۸	۰.۵۰	۰.۵۵	۰.۵۲	۰.۵۱	۰.۴۳
والین قابل هضم	۰.۸۳	۰.۷۲	۰.۵۶	۰.۵۷	۰.۶۴	۰.۶۰	۰.۵۶	۰.۴۶
تریپتوفان قابل هضم	۰.۲۰	۰.۱۸	۰.۱۴	۰.۱۳	۰.۱۵	۰.۱۴	۰.۱۳	۰.۱۱
آرژنین قابل هضم	۱.۲۲	۰.۹۹	۰.۷۳	۰.۷۵	۰.۸۶	۰.۸۲	۰.۷۹	۰.۶۸





2021 Parent Stock Nutrition Specifications

Global Nutrition Team



Outline

- Principles behind the New Specifications
- 2021 Parent Stock Specifications
 - Overview and 2016 vs 2021 comparison
 - Feeding phases & dilution
 - Amino Acids
 - Trace Minerals and Vitamins
 - Egg size and Hatchability support
- Our Message



How does Aviagen establish new PS Specifications?

- **Modelling** – Aviagen has developed sophisticated models to estimate energy and amino acid weekly requirements on a feed intake basis considering growth, maintenance, production and egg composition
- **Trials** – Information derived from modelling, in particular amino acid levels, are then tested in experimental flocks
- **Field experience** – Aviagen nutritionists working closely with key customers

Basic Principles

- Broiler performance improvements are largely a result of increased protein utilization efficiency
- Our products are **very Lysine efficient** at every generation on the breeding pyramid: this has to be managed on a breeder level if optimal results are to be achieved
- **KEY to Aviagen PS nutrition: Controlling Lysine intake to requirements and age**





Overview

	Feeding Programm	Ross 308
2016		
Feed allocation was calculated based on dietary energy of 2800 kcal/kg. However, any customer adopting the 4 stage program had to recalculate feed volume. Vitamin levels adjusted to EU Legislation	2 Stages	•
	3 Stages	•
	4 Stages diluted rearing diets	•
	Separate Male Diet	•
2021		
Feed allocation calculated based on a common dietary energy of 2800 kcal/kg across all feeding strategies. Vitamin levels adjusted to support chick quality	2 Stages	
	3 Stages	
	4 Stages	•
	5 Stages	•
Adjusted to 2800 kcal/kg.	Separate Male Diet	•





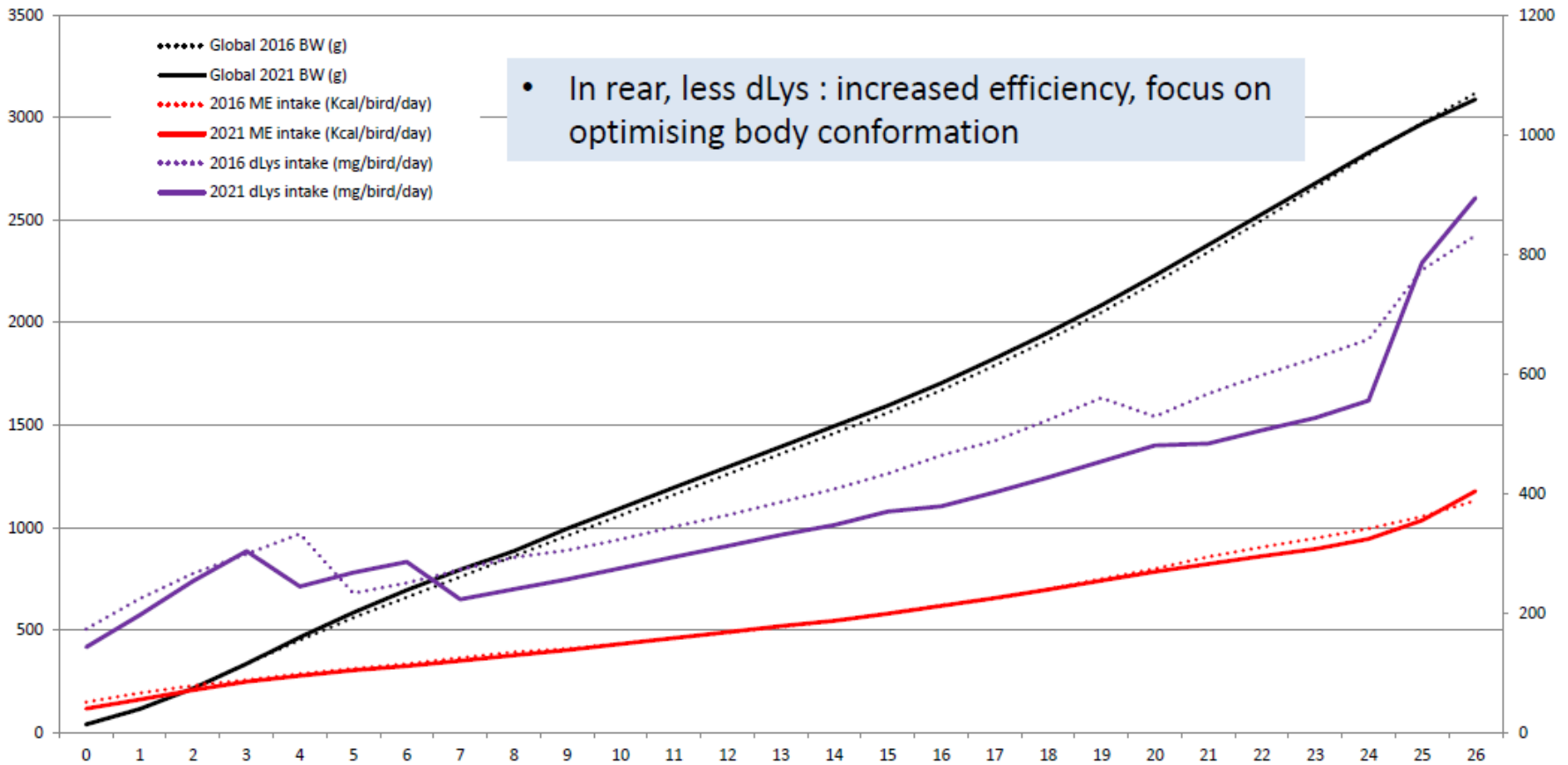
Nutrient allocation at peak*

*Slow feathering In-Season

NUTRIENT	NUTRIENT ALLOCATION AT PEAK
Energy (kcal/bird/day)	468
DIGESTIBLE AMINO ACIDS (mg/bird/day)	
Lysine	1036
Methionine	635
Methionine & Cystine	1036
Threonine	919
Valine	1070
Tryptophan	251
Arginine	1421
Leucine	1588
Isoleucine	869
Histidine	501
MINERALS (mg/bird/day)	
Calcium	5014
Available Phosphorus	602



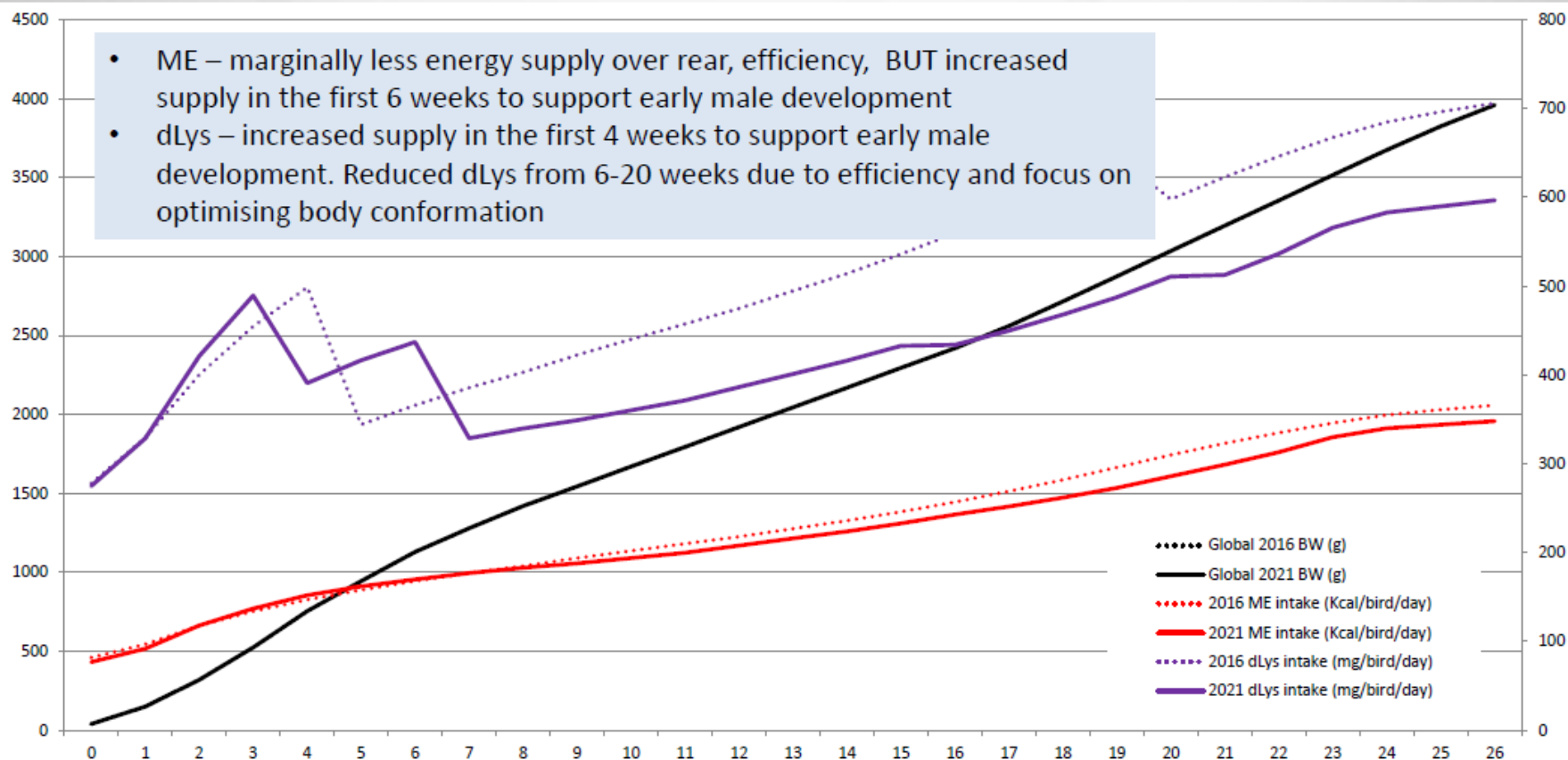
2016 vs 2021, Female 0 to 26 weeks





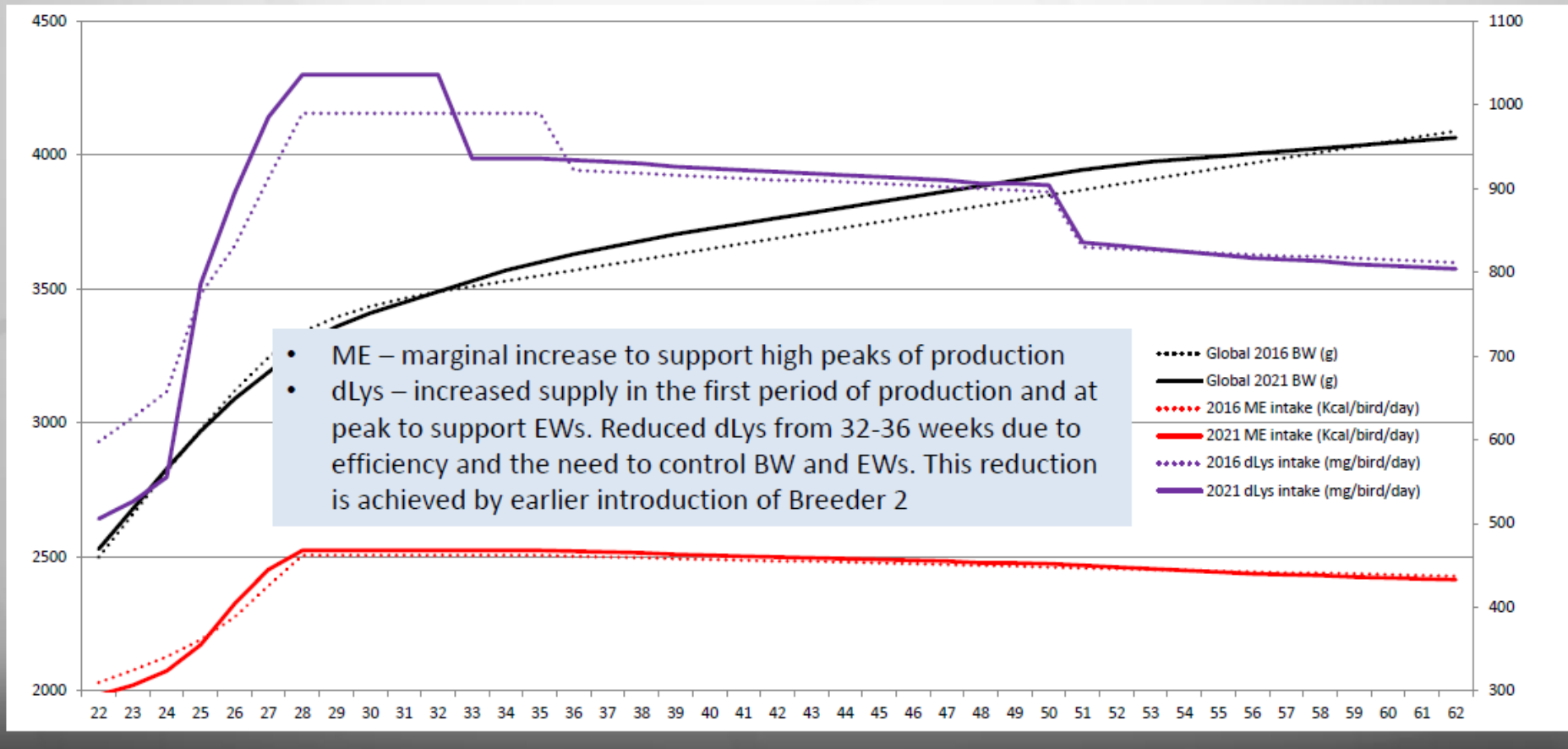
2016 vs 2021, Male 0 to 26 weeks

- ME – marginally less energy supply over rear, efficiency, BUT increased supply in the first 6 weeks to support early male development
- dLys – increased supply in the first 4 weeks to support early male development. Reduced dLys from 6-20 weeks due to efficiency and focus on optimising body conformation



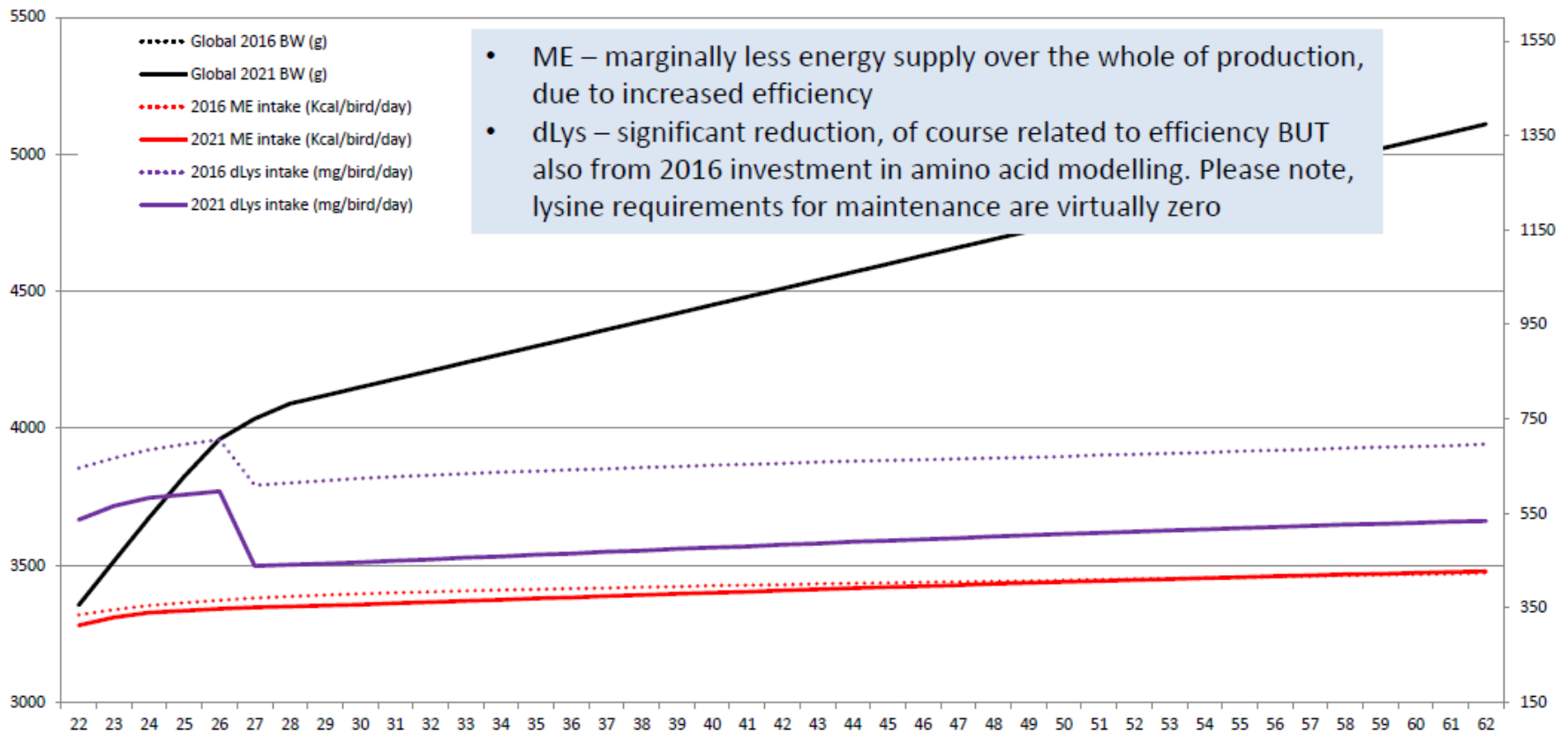


2016 vs 2021, Female >22 weeks





2016 vs 2021, Male >22 weeks





Global 4-stage & 5-stage Rearing Program

Ross 308

2016

		Starter 1	Starter 2	Grower	Pre-breeder	Breeder 1	Breeder 2	Breeder 3
Age Fed		0-21 day	22-35 days	36-105 days	106 days to 5% production	>5% production to 245 days	246-350 days	After-351 days
Energy per kg*	kcal	2800	2800	2800	2800	2800	2800	2800
DIGESTIBLE AMINO ACIDS								
Lysine (max)	%	0.95	0.6	0.52	0.5	0.62	0.56	0.52
Crude Protein (min)	%	19.0	17.0	14.0	14.0	14.0	14.0	13.0

Additional control of DLysine in grower: to control breast deposition favor fat reserves and uniformity

Introduction of Developer phase (15-20 weeks) to support feed volume, uniformity, feather development, and fat deposition. Additional control of Lysine

2021

		Starter 1	Starter 2	Grower	Developer	Pre-breeder	Breeder 1	Breeder 2	Breeder 3
Age Fed		0-21 day	22-42 days	43-105 days	106-140 days	106 days to 5% production	>5% production to 224 days	225-350 days	After-351 days
Energy per kg*	kcal	2800	2800	2800	2800	2800	2800	2800	2800
Lysine (max)	%	1.00	0.72	0.52	0.5	0.49	0.62	0.56	0.52
Crude Protein (min)	%	19.0	17.0	14.0	14.0	14.0	14.0	14.0	13.0

Higher AA density focusing on early development. Starter 2 Extended until 6 weeks. SUPPORTING MALE DEVELOPMENT TOO!

DLysine Increases to support early egg size. Feed change anticipated 32 weeks to avoid excessive BW gain.

Additional control of DLysine in Pre-breeder: to control breast deposition, favor fat reserves and uniformity.

Real Pre-Breeder phase focusing on better calcium reserves, breast development control, feathering maturity, fat deposition, and egg size



Key Concept

	Starter 1	Starter 2	Grower	Developer	Pre-breeder	Breeder 1	Breeder 2	Breeder 3
2016 ME/dLys	2947	4179	5000	-	5192	4667	5000	5385
2021 ME/dLys	2800	3889	5385	-	5714	4516	5000	5385
2021 ME/dLys	2800	3889	5385	5625	5833	4516	5000	5385

Mg of dLys / Kcal of Energy

Mg of dLys / Kcal of Energy

Essential Physiological Development (Organs, Skeleton etc.)
TO
Optimising conformation and Biological uniformity

Optimising Peak Production
(%, EW, Hatchability)
TO
Maintaining and controlling EW/BW



Amino Acid Profile in Rear

Focus on

- Digestible values NOT total; accuracy and cost effectiveness
- Important enrichment of amino acids other than dLysine, supporting:
 - Immune System
 - GIT function
 - Bone, Tendon, Skin Integrity
 - Feather development
 - Behavior & Welfare



Amino Acid Profile in Rear

Global 5 Stage Feeding Program Comparison in Rear

		2016	2021	2016	2021	2016	2021	2016	2021	2016	2021
		Starter 1	Starter 1	Starter 2	Starter 2	Grower	Grower	Developer	Developer	Pre Breeder	Pre Breeder
Age Fed	days	0-21 days	0-21 days	22-35 days	22-42 days	36-105 days	43-105 days	-	106-140 days	106 days to 5% production	141 days to 5% production
Energy per Kg	Kcal	2800	2800	2800	2800	2600	2800	-	2800	2700	2800
	MJ	11.7	11.7	11.7	11.7	10.9	11.7	-	11.7	11.3	11.7
Energy per lb	Kcal	1270	1271	1270	1271	1179	1271	-	1271	1225	1271
AMINO ACIDS		Digestible	Digestible	Digestible	Digestible	Digestible	Digestible	Digestible	Digestible	Digestible	Digestible
Lysine	%	0.95	1	0.67	0.72	0.52	0.52	0.54	0.5	0.52	0.48
Methionine + Cystine	%	0.74	0.84	0.59	0.68	0.52	0.62	0.53	0.6	0.51	0.58
Methionine	%	0.46	0.46	0.37	0.37	0.33	0.36	0.33	0.34	0.32	0.34
Threonine	%	0.66	0.7	0.53	0.6	0.44	0.52	0.43	0.5	0.41	0.49
Valine	%	0.71	0.81	0.63	0.72	0.44	0.6	0.47	0.58	0.45	0.56
IsoLeucine	%	0.62	0.7	0.55	0.58	0.4	0.47	0.13	0.45	0.41	0.43
Arginine	%	1.05	1.15	0.83	0.92	0.64	0.78	0.69	0.76	0.67	0.74
Tryptophan	%	0.16	0.18	0.15	0.18	0.12	0.15	0.75	0.15	0.13	0.15
Leucine	%	1.11	1.2	0.83	1.03	0.69	0.82	0.43	0.8	0.72	0.78
Histidine	%	-	0.43	-	0.32	-	0.26	-	0.23	-	0.2

+11
%

+16
%

+14
%

+13
%

+10
%



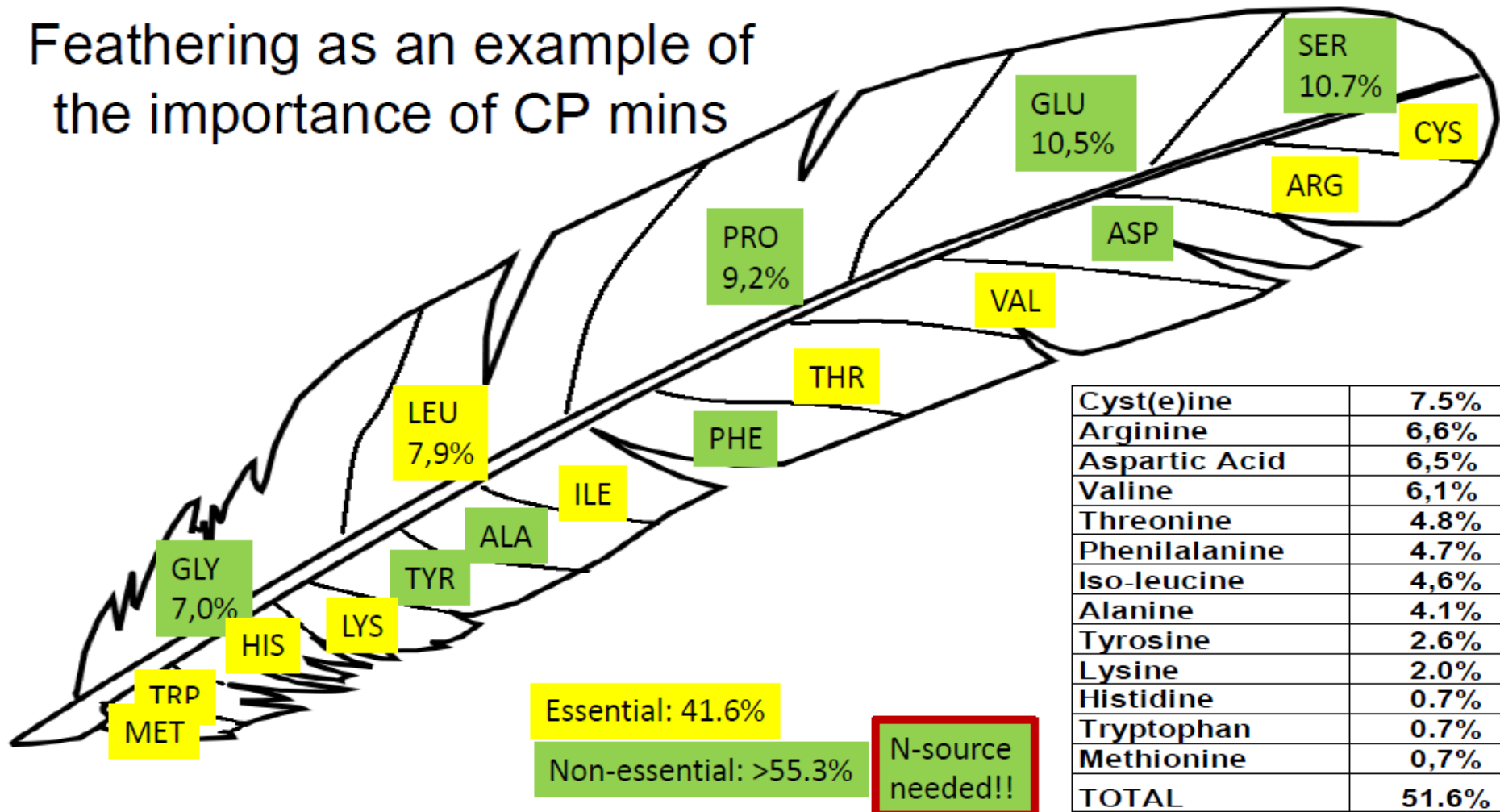


Should We Formulate on CP or Digestible Amino Acids?





Feathering as an example of the importance of CP mins

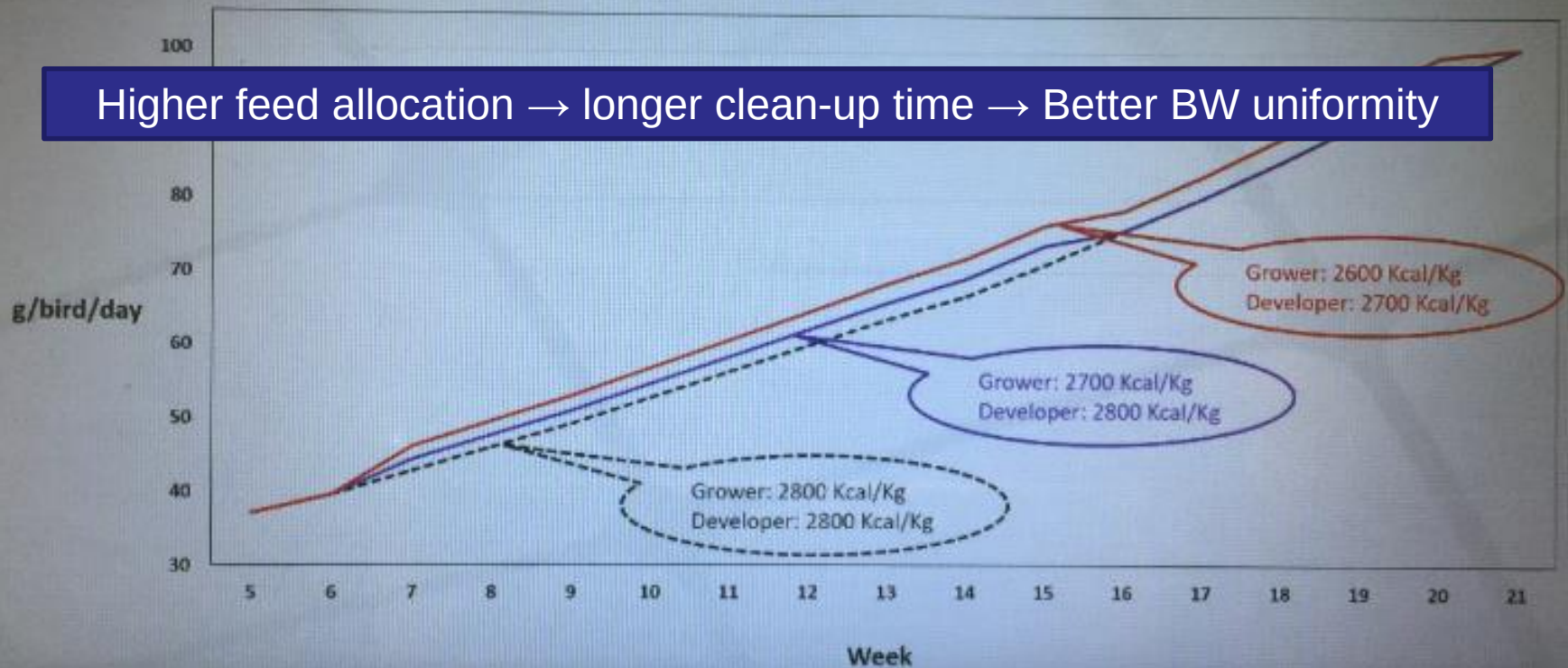


Stilborn et al. (1997). Journal Applied Poultry Research



Feed dilution and feed allocation

Higher feed allocation → longer clean-up time → Better BW uniformity



Aviagen



weeks	Energy Requirement ME/bird/day	Energy in Feed kcal/kg	Feed Allocation g/bird/day	Energy Requirement ME/bird/day	Energy in Feed kcal/kg	Feed Allocation g/bird/day	Energy Requirement ME/bird/day	Energy in Feed kcal/kg	Feed Allocation g/bird/day
0	40	2800	40	40	2800	14	40	2800	14
1	55	2800	20	55	2800	20	55	2800	20
2	71	2800	25	71	2800	25	71	2800	25
3	85	2800	30	85	2800	30	85	2800	30
4	95	2800	34	95	2800	34	95	2800	34
5	104	2800	37	104	2800	37	104	2800	37
6	111	2800	40	111	2800	40	111	2800	40
7	120	2800	44	120	2700	44	120	2700	44
8	129	2800	48	129	2700	48	129	2700	48
9	138	2800	51	138	2700	51	138	2600	53
10	148	2800	55	148	2700	55	148	2600	57
11	158	2800	59	158	2700	59	158	2600	61
12	168	2800	62	168	2700	62	168	2600	65
13	178	2800	66	178	2700	66	178	2600	68
14	187	2800	69	187	2700	69	187	2600	72
15	199	2800	74	199	2700	74	199	2600	77
16	212	2800	76	212	2800	76	212	2700	79
17	225	2800	80	225	2800	80	225	2700	83
18	239	2800	85	239	2800	85	239	2700	89
19	254	2800	91	254	2800	91	254	2700	94
20	269	2800	96	269	2800	96	269	2800	96
21	282	2800	101	282	2800	101	282	2800	101
22	295	2800	105	295	2800	105	295	2800	105
23	307	2800	110	307	2800	110	307	2800	110

Energy Requirement /
energy in feed
 $(168 \times 1000) / 2800 = 60$

Energy Requirement /
energy in feed
 $(168 \times 1000) / 2600 = 65$

Lower Energy in Feed → Higher Feed Allocation



Higher feed allocation → Higher Nutrient



Nutrient Dilution

		Grower	Energy /nutrient ratio	Grower	Grower
Energy per kg	kcal	2800		2700	2600
Crude Protein (min)	%	14.0	200	13.5	13.0
Digestible lysine	%	0.52	5385	0.50	0.48
Digestible Methionine	%	0.36	7778	0.35	0.33
Calcium	%	0.90	3111	0.87	0.085
Copper	mg	16	175	15	14.85
Vitamin A	IU	1000	0.215	12500	12093

Energy ÷ Nutrient

$$2800 \div 0.52 = 5385$$

Energy ÷ Ratio

$$2700 \div 5385 = 0.5$$

Energy ÷ Ratio

$$2600 \div 5385 = 0.48$$



Message on Feed Dilution

- Specifications are given in terms of **nutrients per 2800 Kcal of energy**.
- **Nutrient values** must be **adjusted proportionally** to reflect the feeding of different energy levels. This is **especially** important when considering **digestible lysine**.
- **Feed allocation** provided in the performance objectives should be **adjusted proportionally** to any **change in the energy density**.
- **Feed volume** is an important **tool** that can be used to lengthen **feed clean-up times** and prevent **bodyweight uniformity** loss in rearing period even when multiple grading sessions are adopted.
- **Lower dietary energy** density Pullet Grower can be achieved by using a **combination** of lower energy **diluent** ingredients (e.g. wheat middlings, wheat bran, rice mill-feed, rice hulls, oat hulls, soya hulls, etc...).



3 Golden Rules

- Aviagen's advice for dLys should be considered as a **strict Maximum**, excess lysine excess BW
- Aviagen's advice for the other essential amino acids are **strict Minimums**, being under will predispose flock to sub optimal conditioning
- Aviagen's advice for CP is a **strongly advised minimum**, to ensure the non essential amino acids (performing very important functions in tissue, organs etc) are in adequate supply



Amino Acid Profile in Lay

Focus on

- Supporting egg output
- Early and Late Egg Size
- Egg Composition
- Hatchability & Chx Quality
- Feathering Status



Amino Acid Profile in Lay

Feeding Program Comparison in Lay

		2016	2021	2016	2021	2016	2021
		Breeder 1	Breeder 1	Breeder 2	Breeder 2	Breeder 3	Breeder 3
Age Fed	days	5 % production to 245 days	> 5 % production to 224 days	246 - 350 days	225 - 350 days	After 351 days	After 351 days
Energy per Kg	Kcal	2800	2800	2800	2800	2800	2800
	MJ	11.7	11.7	11.7	11.7	11.7	11.7
Energy per lb	Kcal	1270	1271	1270	1271	1270	1271
AMINO ACIDS		Digestible	Digestible	Digestible	Digestible	Digest	Digestible
Lysine	%	0.6	0.62	0.56	0.56	0.52	0.52
Methionine + Cystine	%	0.59	0.62	0.57	0.57	0.54	0.55
Methionine	%	0.37	0.38	0.36	0.35	0.35	0.34
Threonine	%	0.49	0.55	0.47	0.53	0.47	0.51
Valine	%	0.56	0.64	0.53	0.6	0.51	0.56
IsoLeucine	%	0.5	0.52	0.48	0.5	0.45	0.49
Arginine	%	0.79	0.85	0.77	0.82	0.72	0.79
Tryptophan	%	0.14	0.15	0.13	0.14	0.12	0.13
Leucine	%	0.94	0.95	0.9	0.9	0.86	0.86
Histidine	%	-	0.3	-	0.28	-	0.26

6/15/2021



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2016

		Starter 1	Starter 2	Grower	Pre-Breeder	Breeder 1	Breeder 2 ^a	Breeder 3 ^a
Age Fed	days	0-21 days	22-35 days	36-105 days	106 days to 5% production	5% production to 245 days	246-350 days	After 351 days
MINIMUM SPECIFICATION								
Choline					1200	1200		
Linoleic Acid					1.00	1.25		

Increase levels of choline in rear to support skeletal and feathering development. Linoleic Acid as an adjuvant of immunological responses.

Increase of choline and linoleic acid in lay to support feathering, egg size, hatchability and chick quality

		Starter 1	Starter 2	Grower	Developer	Pre-Breeder	Breeder
Age Fed	days	0-21 days	22-35 days	36-105 days	106-140 days	141 days to 5% production	>5% production to 224 days
MINIMUM SPECIFICATION							
Choline per kg	mg				1400		1600
Linoleic Acid	%				1.25		2.00

6/15/2021



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Trace Minerals

2016

ADDED TRACE MINERALS PER KG		Rearing Feeds	Laying Feeds
Copper	mg	16	10
Iodine	mg	1.25	2
Iron	mg	40	
Manganese	mg	120	
Selenium	mg	0.3	
Zinc	mg	110	

Increased levels of Iodine and Zinc to support general metabolism and feathering. Equalized levels of Copper

2021

ADDED TRACE MINERALS PER KG		Rearing Feeds	Laying Feeds
Copper	mg	16	16
Iodine	mg	2	3
Iron	mg	40	50
Manganese	mg	120	120
Selenium	mg	0.3	0.3
Zinc	mg	120	120



Vitamins

2016

ADDED VITAMINS PER KG		Wheat based feed	Maize based feed	Wheat based feed	Maize based feed
Vitamin A	IU	11000	10000	11000	10000
Vitamin D3	IU	3500	3500	3500	3500
Vitamin E	IU	100	100	100	100
Vitamin k (Menadione)	mg	3	3	3	3
Thiamin	mg	3	3	3	3
Riboflavin	mg	6	6	6	6
Nicotinic Acid	mg	30	35	30	35
Pantothenic Acid	mg	13	15	13	15
Pyridoxine	mg	4	3	4	3
Biotin	mg	0.2	0.15	0.2	0.15
Folic Acid	mg	1.5	1.5	1.5	1.5
Vitamin B12	mg	0.02	0.02	0.02	0.02

Increased vitamin levels to support embryo development, hatchability and chick quality
No longer is there distinction between Maize and Wheat feeds

2021

ADDED VITAMINS PER KG			
Vitamin A	IU	13000	15000
Vitamin D3	IU	4000	5000
Vitamin E	IU	100	130
Vitamin k (Menadione)	mg	6	9
Thiamin (B1)	mg	5	6
Riboflavin (B2)	mg	15	20
Nicotinic Acid	mg	50	70
Pantothenic Acid	mg	20	25
Pyridoxine (B6)	mg	5	8
Biotin	mg	0.3	0.6
Folic Acid	mg	3	5
Vitamin B12	mg	0.05	0.07

6/15/2021





2021 Nutrient Specifications

- 0 to 6 weeks; The best possible start
 - Increased amino acid, mineral and vitamin density to support early development
 - Male early development optimised, supporting leg health
 - Ensure optimal start for females including early feather development
- 7 to 20 weeks; Promote BW and biological uniformity
 - Reduced dLysine while also increasing the other EAAs and NEAAs (via CP minimums) supports
 - Optimal body composition, uniformity, feathering and flock behaviour
- 21 weeks to 5% production: Optimise sexual maturity and prepare flock for production
 - Further reduction in mg of dLysine / Kcal of energy, increased Ca,
 - Allow continued control of fleshing & BW during the final period of development
 - Opportunity to formulate on the same energy as the breeder 1, helps with stimulation





2021 Nutrient Specifications

- Production: Optimise number and quality of chx/hh
 - Enrichment of amino acids, vitamins, and minerals to support
 - Optimal production and persistency
 - Egg Quality
 - Composition, Size, and egg shell
 - Hatchability
 - Chick quality
 - Offspring performance
 - Continued feather support





***Our Specifications are Optimal for
Today, and for the Years To Come;
supporting the advancement of our
product's Performance and Welfare
Traits...***







	Old fashioned	New specifications	
	Breeder I		
Corn	670.7	398.9	375.3
Corn gluten	-	-	7.3
SBM	224	173.3	173
Wheat	-	274.7	329.2
Wheat bran	-	29.8	-
Corn oil	9.1	25.3	17.2
MCP	11.7	11.9	12
CaCO ₃	72.5	72.5	72.6
Common salt	3.3	3.1	3.1
NaHCO ₃	1.8	1.7	1.6
K ₂ CO ₃	-	0.6	1
Sup (Vit+Min)	5	5	5
DL-Met	1.6	1.9	1.7
L-Val	-	0.3	0.1
L-Thr	0.3	1	0.9



	Old fashioned	New specifications	
	Breeder I		
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Corn gluten	-	-	7.3
SBM	224	173.3	173
Wheat	-	274.7	329.2
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Corn oil	9.1	25.3	17.2
MCP	11.7	11.9	12
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Common salt	3.3	3.1	3.1
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K ₂ CO ₃	-	0.6	1
Sup (Vit+Min)	5	5	5
DL-Met	1.6	1.9	1.7
L-Val	-	0.3	0.1
L-Thr	0.3	1	0.9



	Old fashioned	New specifications	
	Breeder I		
Corn	670.7	398.9	375.3
Corn gluten	-	-	7.3
SBM	224	173.3	173
Wheat	-	274.7	329.2
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CaCO ₃	72.5	72.5	72.6
Common salt	3.3	3.1	3.1
NaHCO ₃	1.8	1.7	1.6
K ₂ CO ₃	-	0.6	1
Sup (Vit+Min)	5	5	5
DL-Met	1.6	1.9	1.7
L-Val	-	0.3	0.1
L-Thr	0.3	1	0.9

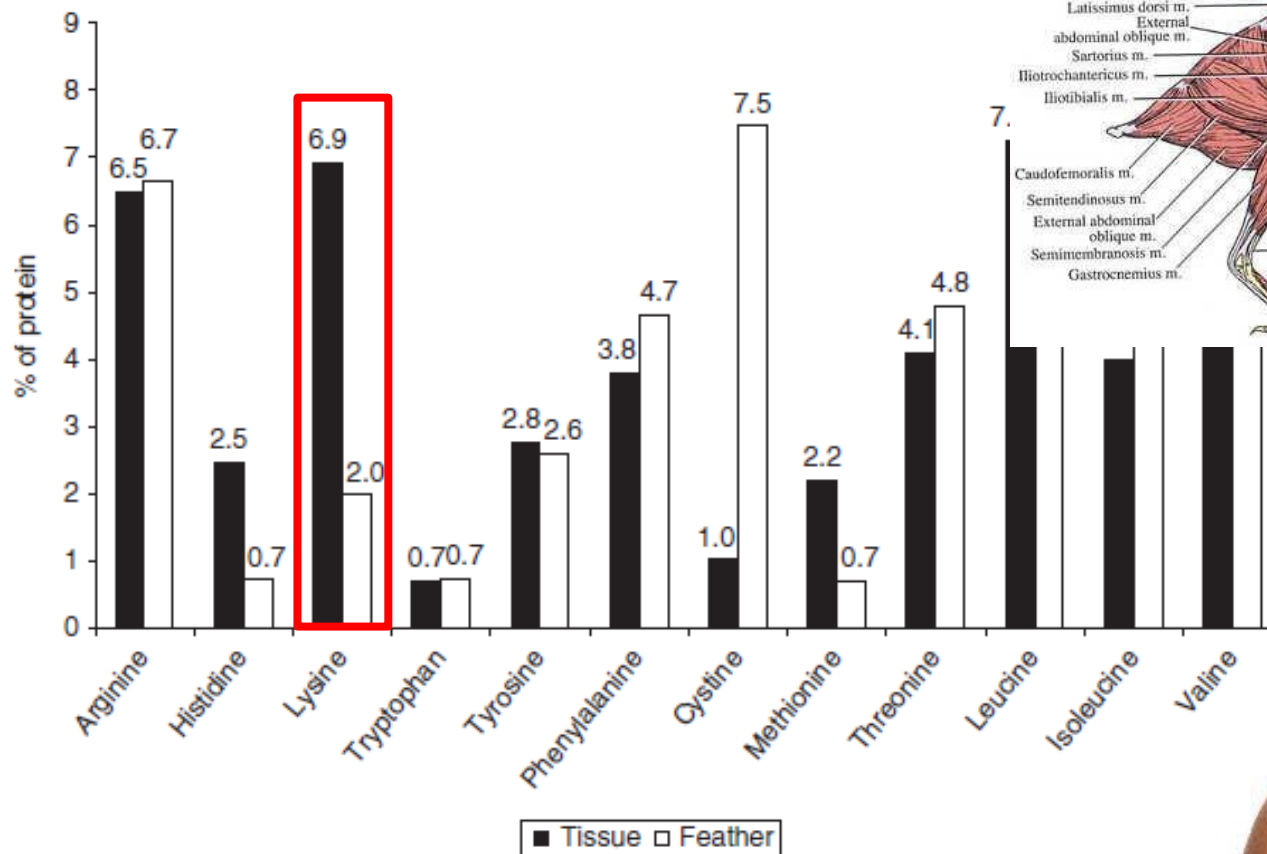


	Old fashioned	New specifications	
	Breeder I		
ME (Kcal)	2800	2800	2800
CP	15	15	15
Ca	3	3	3
Pa	0.36	0.36	0.36
Na	0.2	0.2	0.2
CL	0.23	0.23	0.23
K	0.74	0.7	0.7
Lin A.	2.11	2.6	2.11
D-Lys	0.72	0.62	0.62
D-Met	0.39	0.39	0.39
D-M+C	0.62	0.62	0.62
D-Thr	0.55	0.55	0.55
D-Trp	0.15	0.15	0.15
D-Arg	0.94	0.58	0.58
D-Val	0.66	0.64	0.64
D-Leu	1.30	1.12	1.18
D-His	0.40	0.36	0.40
D-Ileu	0.59	0.52	0.54

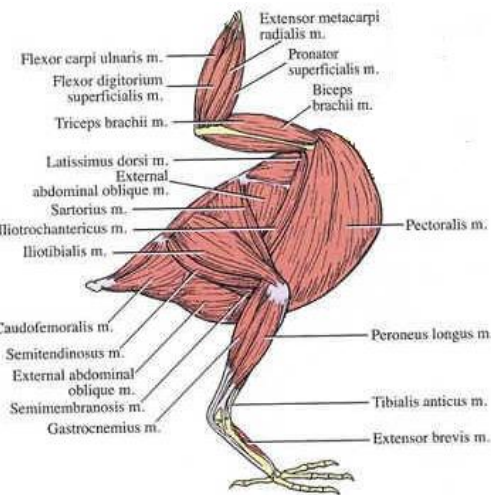
Req
0.6

Req
0.62

Req
0.62

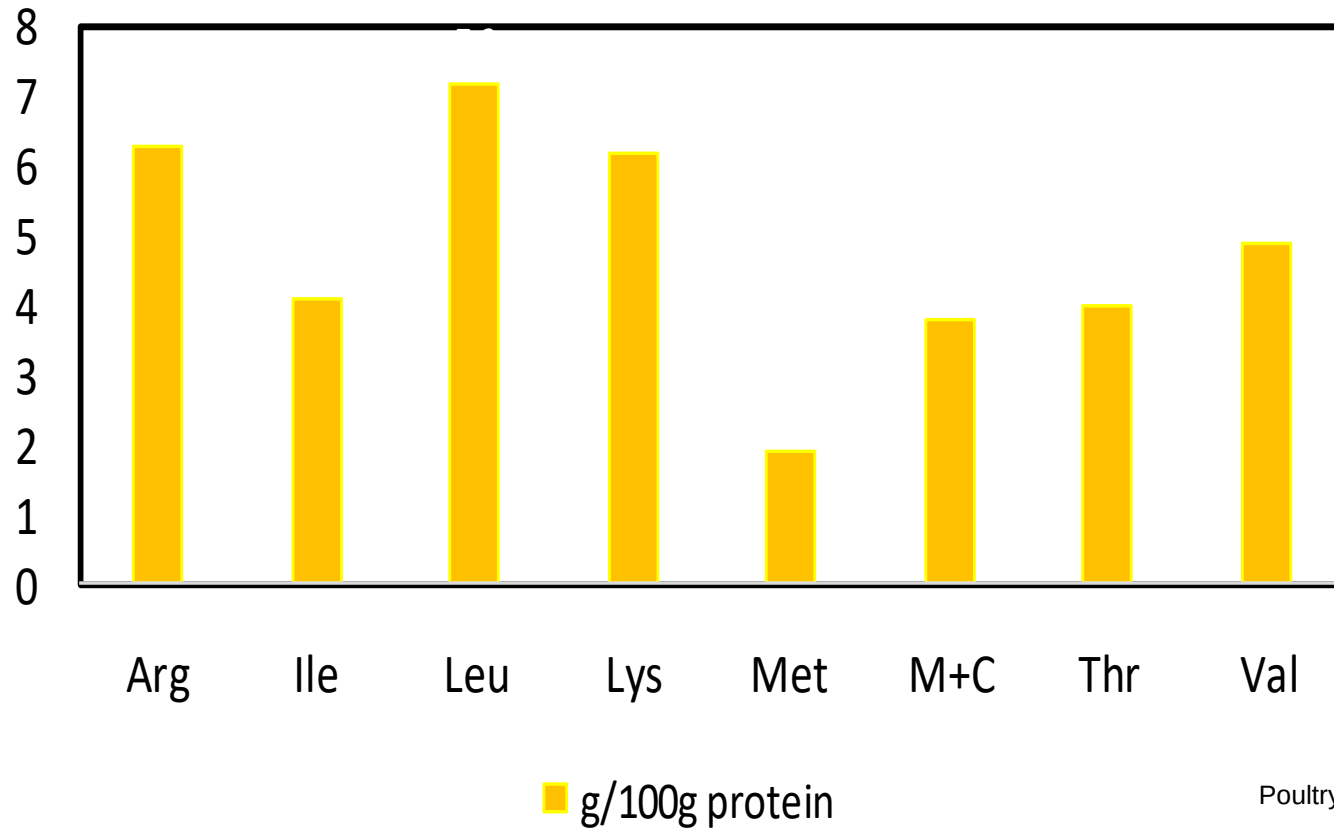


Comparison of amino acids composition of tissues and feathers in growing broilers (adapted from Stilborn *et al.*, 1997, 2010).





Whole body amino acid composition of broiler breeder

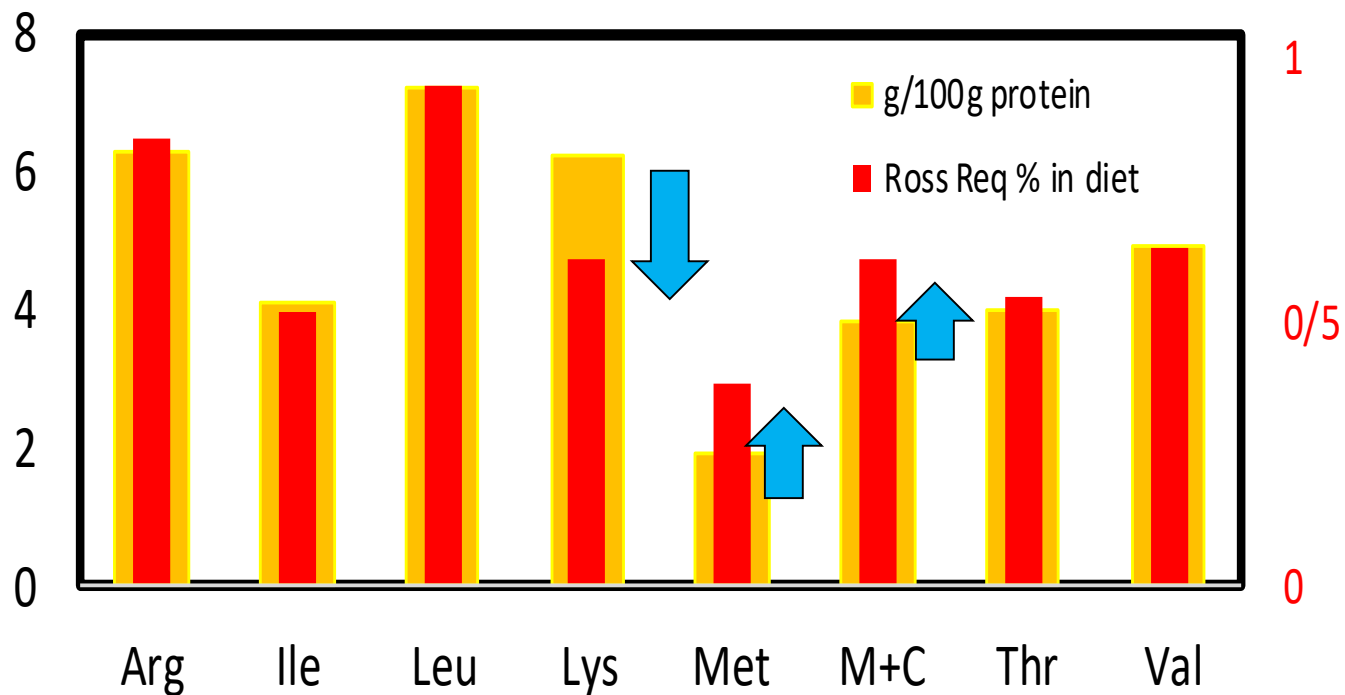


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Whole body amino acid composition of broiler breeder

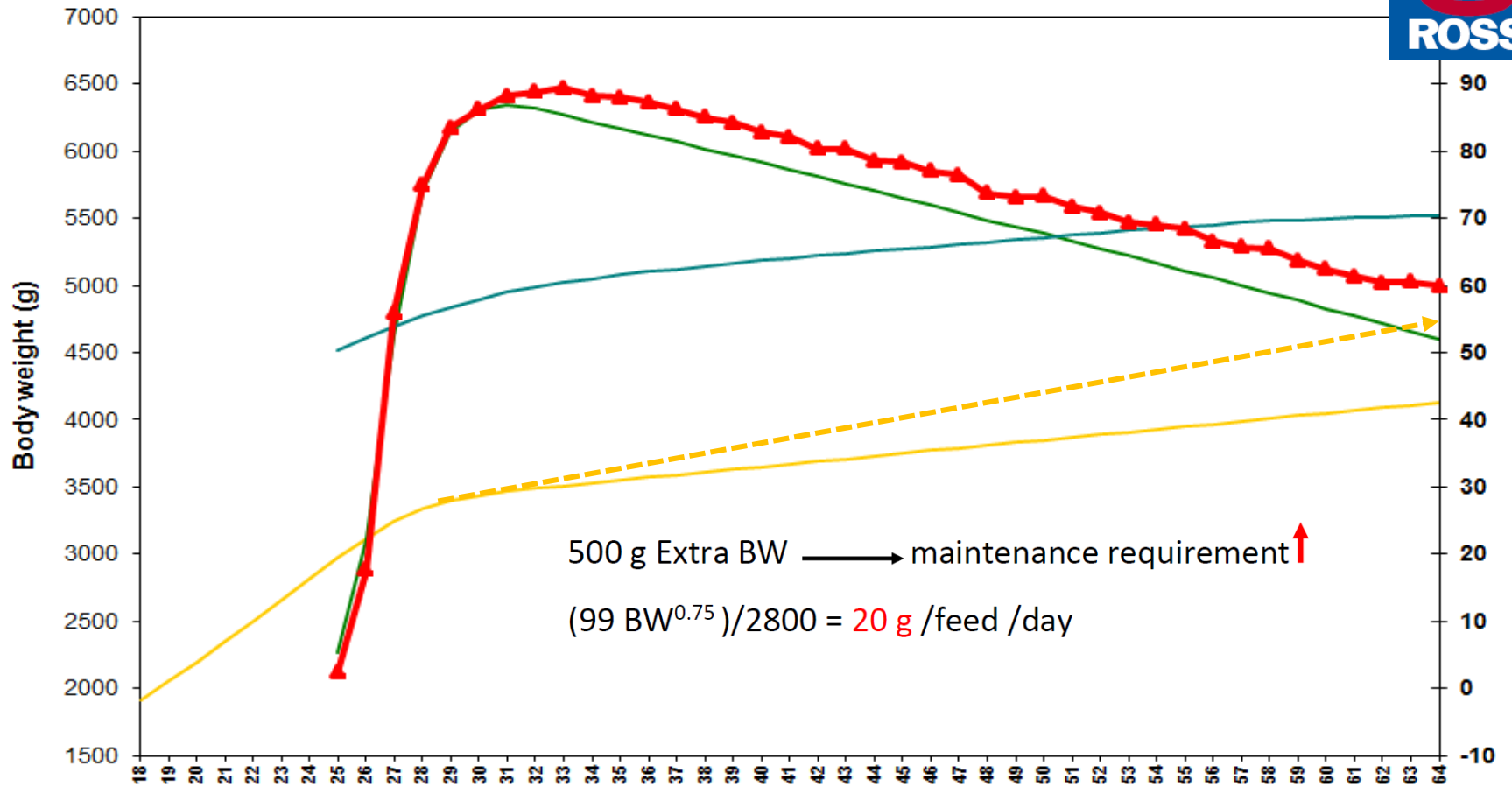
Compare to Ross 308 (2021) requirement







Ross 308 Parent Stock - Laying Programme 18 - 64 Weeks





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