Níveis de proteína, aminoácidos, energia e outros nutrientes nos primeiros 21 dias

Everton Krabbe

Embrapa Suinos e Aves

Contexto econômico

ICPFrango/Embrapa

Selecione o mês: Setembro

Selecione o ano: 2021

Em setembro, o ICPFrango foi de **+399,33**

M Em relação ao mês anterior a variação foi de **-2,01%**

A No ano, o ICPFrango acumulado é de **+18,54%**

12 Nos últimos 12 meses, a variação foi de **+32,27%**

Composição	Item de custo	Variação percentual dos itens de custo – Mês anterior	No ano	12 meses
75,59%	Nutrição	↓ -2,07%	↑ 15,38%	↑ 25,08%
13,01%	Pinto de um dia	↓ -0,18%	↑ 1,79%	↑ 2,51%
3,77%	Mão de obra	↑ 0,04%	↑ 0,62%	↑ 0,62%
1,95%	Depreciação	↓ -0,01%	↑ 0,28%	↑ 0,42%
1,62%	Transporte	↑ 0,07%	↓ -1,08%	↓ -0,37%
1,61%	Custo de capital	↓ -0,02%	↑ 0,25%	↑ 0,40%
1,52%	Energia elétrica | Cama | Calefação	↑ 0,16%	↑ 0,28%	↑ 0,21%
0,62%	Manutenção | Financeiro | Funrural	↓ -0,01%	↑ 0,08%	↑ 0,13%
0,17%	Diversos | Outros	0,00%	↑ 0,02%	↑ 0,03%
0,14%	Sanidade	0,00%	↓ -0,01%	↑ 0,07%

https://www.embrapa.br/suinos-e-aves/cias/custos/icpfrango

Evolução do Frango de Corte

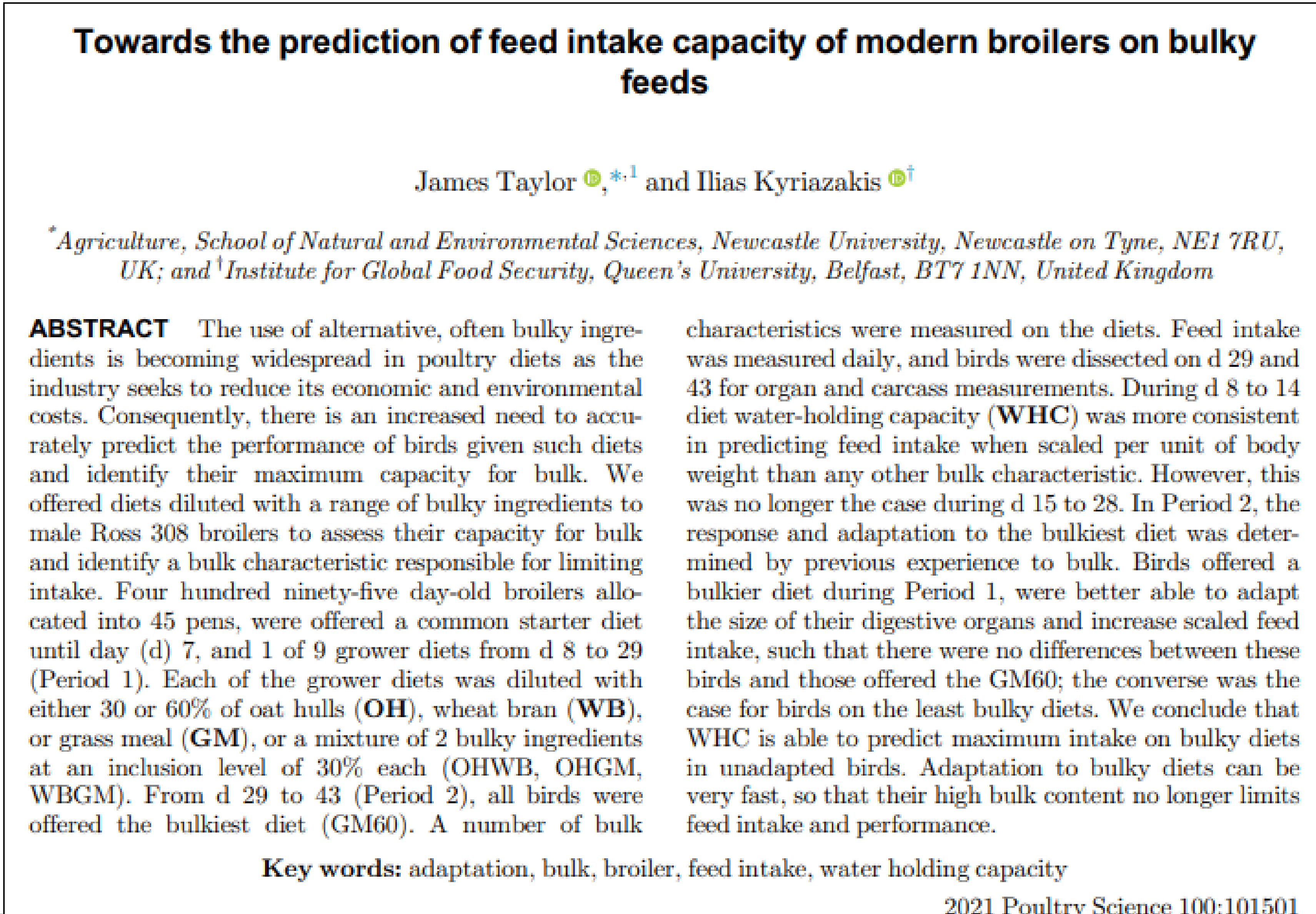
Advances in Poultry Nutrition Research-A Review
DOI: http://dx.doi.org/10.5772/intechopen.95990

Avian specie	Trait	Performance level				
		1960	2005	Δ (%)	2020	
Broiler chicken	Number of days until 2 kg	100	40	60	32	4%aa
	Kg feed per kg live weight	3.0	1.7	43	1.5	2,5%aa

Embrapa

Densidade nutricional

Densidade nutricional


Towards the prediction of feed intake capacity of modern broilers on bulky feeds

James Taylor [*,1] and Ilias Kyriazakis [†]

[*]*Agriculture, School of Natural and Environmental Sciences, Newcastle University, Newcastle on Tyne, NE1 7RU, UK; and* [†]*Institute for Global Food Security, Queen's University, Belfast, BT7 1NN, United Kingdom*

ABSTRACT The use of alternative, often bulky ingredients is becoming widespread in poultry diets as the industry seeks to reduce its economic and environmental costs. Consequently, there is an increased need to accurately predict the performance of birds given such diets and identify their maximum capacity for bulk. We offered diets diluted with a range of bulky ingredients to male Ross 308 broilers to assess their capacity for bulk and identify a bulk characteristic responsible for limiting intake. Four hundred ninety-five day-old broilers allocated into 45 pens, were offered a common starter diet until day (d) 7, and 1 of 9 grower diets from d 8 to 29 (Period 1). Each of the grower diets was diluted with either 30 or 60% of oat hulls (**OH**), wheat bran (**WB**), or grass meal (**GM**), or a mixture of 2 bulky ingredients at an inclusion level of 30% each (OHWB, OHGM, WBGM). From d 29 to 43 (Period 2), all birds were offered the bulkiest diet (GM60). A number of bulk characteristics were measured on the diets. Feed intake was measured daily, and birds were dissected on d 29 and 43 for organ and carcass measurements. During d 8 to 14 diet water-holding capacity (**WHC**) was more consistent in predicting feed intake when scaled per unit of body weight than any other bulk characteristic. However, this was no longer the case during d 15 to 28. In Period 2, the response and adaptation to the bulkiest diet was determined by previous experience to bulk. Birds offered a bulkier diet during Period 1, were better able to adapt the size of their digestive organs and increase scaled feed intake, such that there were no differences between these birds and those offered the GM60; the converse was the case for birds on the least bulky diets. We conclude that WHC is able to predict maximum intake on bulky diets in unadapted birds. Adaptation to bulky diets can be very fast, so that their high bulk content no longer limits feed intake and performance.

Key words: adaptation, bulk, broiler, feed intake, water holding capacity

2021 Poultry Science 100:101501

Table 1. Ingredient composition, calculated and analyzed chemical composition of the grower diets[a] offered from d 8 to d 28 of age to broiler chickens.

Ingredients (%)	OH30	OH60	WB30	WB60	GM30	GM60[g]	OHWB	OHGM	WBGM
Ground maize	7.00	4.00	7.00	4.00	7.00	4.00	4.00	4.00	4.00
Ground wheat	35.2	17.4	35.6	22.4	32.8	12.7	19.9	15.0	17.6
Soybean meal (48% CP)	16.3	10.7	15.1	4.9	17.4	12.9	7.81	11.8	8.91
Full fat soya	4.20	2.40	4.20	2.40	4.20	2.40	2.40	2.40	2.40
Oat hulls (OH)	30.0	60.0	-	-	-	-	30.0	30.0	-
Wheat bran (WB)	-	-	30.0	60.0	-	-	30.0	-	30.0
Grass meal (GM)	-	-	-	-	30.0	60.0	-	30.0	30.0
Limestone	1.09	0.71	1.20	0.95	1.28	1.08	0.83	0.90	1.02
Monocalcium phosphate	0.90	0.57	1.43	1.60	1.48	1.72	1.09	1.15	1.66
L-Lysine HCL	0.31	0.32	0.30	0.30	0.48	0.65	0.31	0.49	0.48
DL-Methionine	0.30	0.24	0.29	0.23	0.38	0.41	0.24	0.33	0.32
L-Threonine	0.16	0.17	0.13	0.10	0.26	0.36	0.14	0.27	0.23
Valine	0.06	0.13	0.00	0.00	0.15	0.30	0.06	0.21	0.15
Soya oil	2.31	1.32	2.31	1.32	2.31	1.32	1.32	1.32	1.32
Salt	0.18	0.10	0.18	0.10	0.18	0.10	0.10	0.10	0.10
Sodium bicarbonate	0.11	0.06	0.11	0.06	0.11	0.06	0.06	0.06	0.06
Vitamin and mineral premix [b]	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Titanium dioxide	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Ronozyme [c]	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Lignosulphonate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*
Chemical composition (%) [d]									
Metabolizable energy (kcal kg^{-1}) (calculated)	2,483	1,960	2,698	2,385	2,457	1,846	2,172	1,903	2,115
Crude protein (CP)	15.6	12.5	17.0	15.0	18.5	17.7	13.8	15.1	16.4
Lysine (calculated)	0.82	0.84	0.89	0.82	1.12	1.08	0.90	0.97	1.00
Crude fat (oil A) [e]	5.21	6.14	6.10	5.76	5.13	4.93	6.06	5.83	4.51
Total oil (oil B) [f]	5.64	6.84	6.13	7.02	5.67	5.42	6.54	6.40	5.09
Ash	4.60	5.20	7.90	8.10	9.50	11.50	7.00	7.80	7.10
Dry Matter	89.7	91.0	89.3	89.0	90.1	92.0	90.3	90.6	92.1
Calcium	0.72	0.63	0.79	0.71	0.88	0.86	0.61	0.69	0.71
Available phosphorus	0.50	0.42	0.49	0.49	0.62	0.59	0.45	0.51	0.56
DM digestibility	-	67.4	69.7	67.6	65.9	64.3	62.1	60.3	63.7
Crude fiber	6.70	12.2	6.40	9.30	12.3	16.7	10.7	14.6	13.4
Neutral detergent fiber	17.8	27.6	22.0	28.9	23.9	32.8	28.1	31.1	30.7
Acid detergent fiber	7.76	13.6	6.47	9.70	13.9	20.1	11.6	17.3	15.4
Acid detergent lignin	2.51	3.64	2.05	2.65	2.12	3.92	3.09	3.74	3.28
Diet density (g/ mL)	1.25	1.47	1.19	1.39	1.43	1.75	1.41	1.62	1.58
Water holding capacity (g/ g DM)	2.71	3.15	3.55	4.38	4.16	5.94	3.94	4.43	5.02

[a]The diets included either 30 or 60% of one of the bulky ingredients Oat Hulls (OH), Wheat Bran (WB) and Grass Meal (GM). Three additional diets were formulated by mixing two of the 60% bulky foods at a time: diets OHWB, OHGM and WBGM, respectively.

[b]Provided per kilogram of diet: Vitamin A (vitamin A acetate), 13.5kIU; Vitamin D (cholecalciferol), 5.0 kIU; Vitamin E (dl-α tocopherol acetate), 100 mg

[c]Blend of amylase and beta-glucanase.

Densidade nutricional

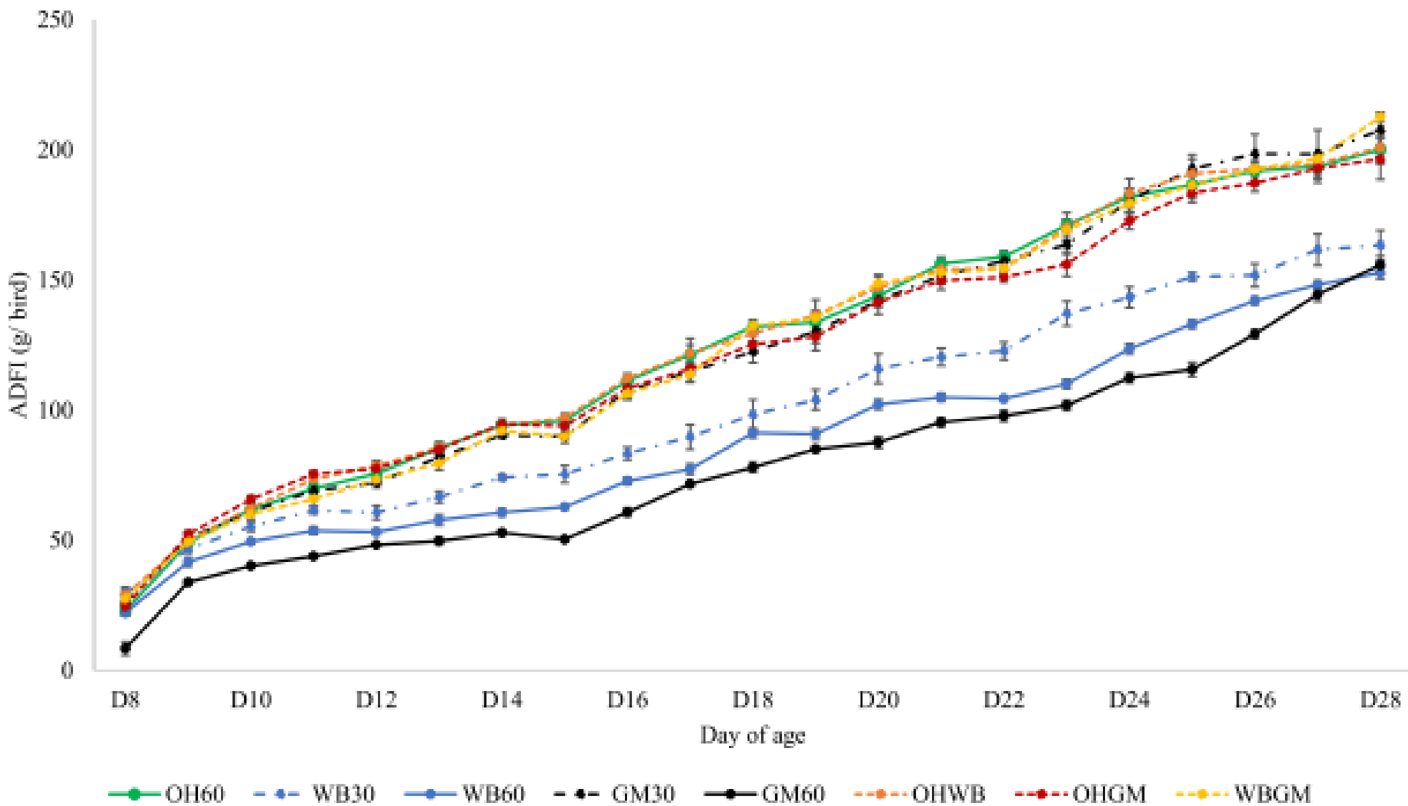
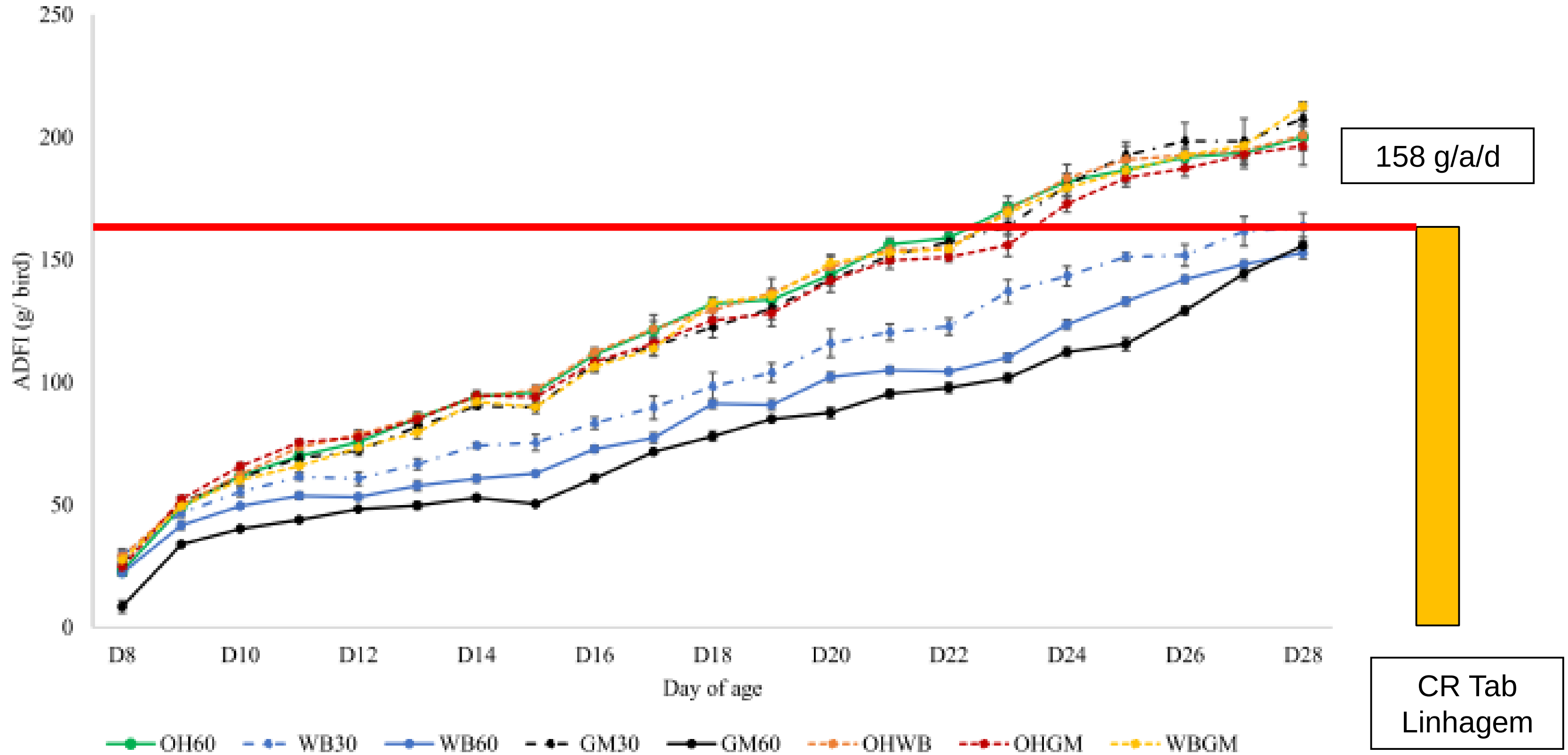


Figure 1. Average daily food intake (ADFI; g/ bird) of broiler chickens given access to foods containing Oat Hulls (OH at 60%), Wheat Bran (WB at either 30 or 60%), Grass Meal (GM at either 30 or 60%), or diets containing a mixture of two bulky ingredients at an inclusion level of 30% each (OHWB, OHGM, or WBGM), from d 8 to 28 of age. Each treatment was replicated in 5 pens containing 10 birds each.

Embrapa

Densidade nutricional



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Energia

Energia

Qualidade de pellet

EMAn	Dureza (Kgf)	Comp (mm)	Densid (Kg/m3)	%Finos	AngRepº	PDI%
2900	6,92 a	10,50 a	621,47	4,2	40,79	97,31
3000	5,06 b	10,02 a	624,52	7,14	41,63	95,57
3100	3,36 c	8,97 a	606,62	8,68	42,55	93,15
3200	3,36 c	8,84 a	604,17	11,49	42,75	91,72
3300	1,59 d	7,07 b	596,76	16,31	43,69	84,48
CV%	54,33	35,35	2,24	32,58	3,51	1,16
Prob	<0,0001	<0,0001	0,0002	<0,0001	0,001	<0,0001
EPM	0,18	0,21	24,34	0,72	0,25	0,66
Regressão	Y=42,40-0,0124EMAn	Y=33,96-0,008EMAn	Y=829,22-0,07EMAn	Y=-78,94+0,028EMAn	Y=20,81+0,0069EMAn	Y=183,88-0,0295EMAn
r2	0,38	0,11	0,34	0,64	0,32	0,84

Embrapa, 2021, no prelo

Energia

NÍVEL DE ENERGIA METABOLIZÁVEL APARENTE SOBRE O DESEMPENHO ZOOTÉCNICO DE FRANGOS DE CORTE

VS de Avila *[1], EL Krabbe[1], D Surek[2], CH Klein[2], LS Lopes[2], WA Marcon[3]

[1]*Pesquisador da Embrapa Suínos e Aves Concórdia, SC, Brasil*
[2]*Analista da Embrapa Suínos e Aves Concórdia, SC, Brasil*
[3]*Graduando em Agronomia pela FACC – Faculdade Concórdia*

Introdução

O milho é o principal ingrediente energético utilizado nas rações brasileiras para frango de corte. O frango de corte macho de desempenho superior necessita segundo Rostagno (1) cerca de 3.150 e 3.200 kcal/kg no período de 22 à 33 e 34 à 42 dias de idade, respectivamente. Para atender essa demanda energética óleos e gordura são incluídos nas formulações. O objetivo do trabalho foi avaliar o requerimento energia metabolizável aparente (EMA) de frangos de corte machos consumindo dieta peletizada/triturada de 21 a 42 dias com base nas variáveis de desempenho zootécnico.

Material e Métodos

O experimento foi conduzido na EMBRAPA Suíno e Aves para avaliar o efeito do aumento da energia metabolizável aparente (EMA) na dieta com a adição de níveis crescentes de óleo de soja. Foram utilizados 900 frangos de corte machos da linhagem Cobb, durante o período de 21 a 42 dias de idade. Uma dieta

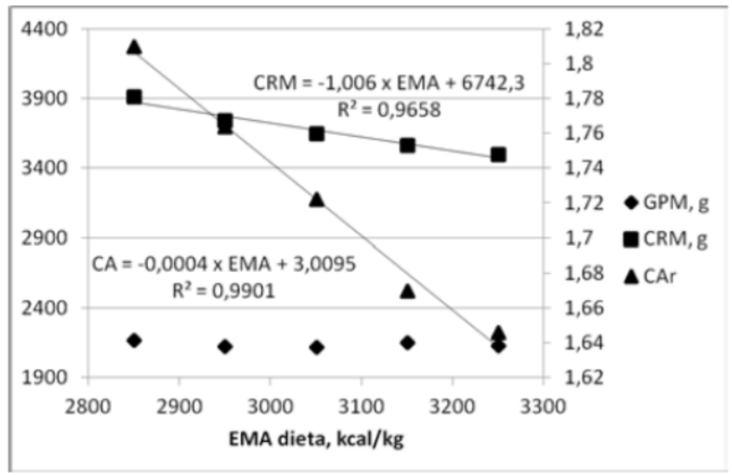

Figura 1 - Efeito do aumento da EMA sobre o ganho de peso médio (GPM), consumo de ração médio (CRM) e conversão alimentar (CA) de frangos dos 21 aos 42 dias de idade.

Energia

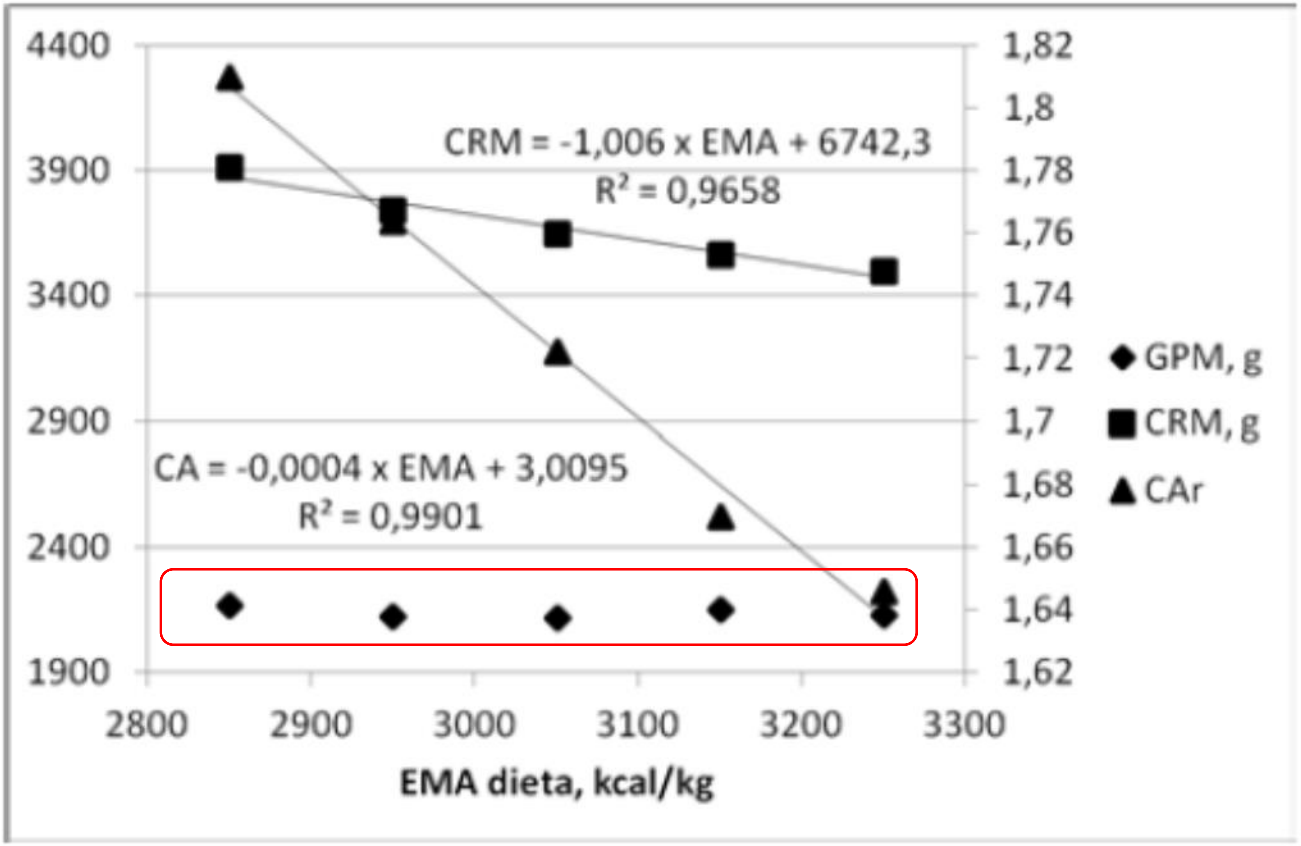

Figura 1 - Efeito do aumento da EMA sobre o ganho de peso médio (GPM), consumo de ração médio (CRM) e conversão alimentar (CA) de frangos dos 21 aos 42 dias de idade.

Energia

15ª Jornada de Iniciação Científica - JINC
21 de Outubro de 2021 - Concórdia, SC

EFICIÊNCIA ENERGÉTICA DE FRANGOS DE CORTE DE 1 A 21 DIAS DE IDADE

Caroline Bordignon da Rosa[1], Bárbara Vitória Marçal[2], Gabrielly Bonatto[3] e Everton Luis Kabbre[4]

[1] Graduando em Medicina Veterinária pelo Centro Universitário Campo Real, Campus Guarapuava
caroldarosa99@hotmail.com
[2]Graduando em Medicina Veterinária pela Universidade Federal de Santa Catarina, Campus Curitibanos
[3]Graduando em Medicina Veterinária pela Universidade Central de Educação FAI Faculdade, Campus Itapiranga
[4]Pesquisador da Embrapa Suínos e Aves

Palavras-chave: Ganho de peso, energia metabolizável, desempenho, conversão calórica.

Embrapa

Energia

Desempenho 21 d

EMAn	CR g		PM g		GPM g		CAr g:g	
2900	1339,0	a	1139,5	a	1093,4	a	1,233	a
3000	1301,6	a	1139,4	a	1093,4	a	1,196	b
3100	1256,2	b	1127,0	ab	1081,2	ab	1,163	c
3200	1208,1	c	1096,7	bc	1050,8	bc	1,158	cd
3300	1169,9	c	1070,9	c	1025,0	c	1,137	d
EPM	9,23		5,97		5,95		0,005	
CV, %	2,78		3,14		3,26		1,62	
Prob	<0,0001		<0,0001		<0,0001		<0,0001	

Embrapa, 2021, no prelo

Energia

Desempenho 42 d

EMAn	CR g		PM g		GPM g		CAr g:g	
2900	4923,7	a	3196,7	ab	3150,6	ab	1,567	a
3000	4861,3	ab	3263,0	ab	3217,3	ab	1,539	a
3100	4651,6	bc	3283,6	a	3237,8	a	1,445	b
3200	4428,8	cd	3259,9	ab	3213,9	ab	1,398	b
3300	4272,0	d	3158,6	b	3112,7	b	1,383	b
EPM	61,36		29,71		29,72		0,0208	
CV, %	4,59		3,18		3,23		4,91	
Prob	<0,0001		0,0252		0,0249		<0,0001	

Embrapa, 2021, no prelo

Embrapa

Energia

Custo alimentar

	1 a 21 d				1 a 42 d	
EMAn	**FeedCost R$/ave**		**FeedCost R$/KG PV**		**FeedCost R$/ave**	**FeedCost R$/KG PV**
2900	3,450	0,0	3,176	b	12,684	4,037
3000	3,470	0,0	3,192	b	12,981	4,117
3100	3,470	0,0	3,216	b	12,862	3,996
3200	3,450	0,0	3,311	a	12,662	3,678
3300	3,450	0,0	3,358	a	12,615	4,083
EPM	0,01		0,015		0,1733	0,155
CV, %	2,76		1,61		4,7	13,53
Prob	0,9409		<0,0001		0,5608	0,2988

Embrapa, 2021, no prelo

Energia

Rendimento de carcaça resfriada com pé e cabeça

EMAn	Mean	Homogeneous Groups
3200	85.694	A
3000	85.491	AB
2900	85.140	ABC
3100	84.589	BC
3300	84.343	C

Rendimento de peito

EMAn	Mean	Homogeneous Groups
3000	37.463	A
2900	37.058	AB
3100	36.892	ABC
3200	36.550	BC
3300	36.127	C

Embrapa, 2021, no prelo

Aminoácidos

in poultry.

Nutraceutical type and dose	Poultry species	Implication/Conclusion	References
Amino acids			
Trp, Ile, His, Val, Leu, Arg, Gly and Phe	Male broilers	Adding the essential amino acid mixtures to the low CP diets improved the performance but did not completely overcome the adverse effects of the low CP diets	Waldroup et al. 2005
Threonine (0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0 and 1.1%)	Ross 308 males	Gut functionality like microvilli height, epithelia thickness and crypt depth was improved with even higher levels of dietary standardized ileal digestible threonine level	Zaefarian et al. 2008
Arginine (2% L-arginine)	Broilers	Arginine increases specific immune response against Infectious Bursal Disease	Tayade et al. 2006
Threonine, valine and tryptophan	Laying Japanese quails	Reducing the CP level in a diet supplemented with crystalline amino acids is a valuable strategy for decreasing feeding cost and mitigating ammonia emission	Alagawany et al. 2014
Threonine and methionine	Broilers	Performance and immune system were improved at higher dietary threonine and methionine levels	Yaqoob and Ali 2018
Threonine (0.0 (control group), 0.25, 0.50, 0.75 and 1.00 g/kg diet)	Broilers	Adding threonine in the diet may promote the growth of immune organs, encourage the antibodies synthesis and mitigate the immune stress caused by Newcastle disease virus or *E. coli* challenge	Azzam El-Gogary 2015
Arginine (0%, 0.45%, 0.90%, 1.35%, and 1.80% Arg)	Broiler	The addition of arginine in the diet could improve the growth performance of broiler chickens at 42 days of age	Xu et al. 2018
Lysine and methionine	Male broiler	There are positive effects on meat yield and growth performance in response to supplemental amino acids in diets from 21 to 41 days of age	Zhai et al. 2016
L-Methionine (8 g/kg diet)	Rabbits	Reduced detrimental impacts of aflatoxinB1 on growth, immune and antioxidant status	Reda et al. 2020

Embrapa

		growth, immune and antioxidant status	
Three levels of Met + Cys (74%, 77% and 80%) of digestible lysine	Broiler chickens	DL-Met and L-Met are equally effective as a source of methionine for broilers	Rehman et al. 2019
Threonine (0, 300, 600 and 900 mg/ kg diet)	Broiler chickens	A significant improvement was observed in performance indices of birds fed diet enriched with threonine compared with the control	Al-Hayani 2017
Threonine, arginine, and glutamine	Broiler chickens	May help to minimize over-activation of the innate immune system, which is the most expensive in terms of energy and nutrients, as well as improve the intestinal microbiota	Bortoluzzi et al. 2018
Apparent and standardized ileal amino acid digestibility	Broiler chickens	Increasing dietary levels of highly digestible amino acids may help compensate for malabsorption through the stages of intestinal challenge	Adedokun et al. 2016; Rochell et al. 2016
Methionine (a control (0.49% methionine) or a deficient (0.28%)	Cobb500 broiler male parent	A methionine deficiency affects essential amino acids digestibility and cysteine, but not the methionine digestibility. The alterations in digestibility are reflected in the expression of mRNA of amino acid transporters across different tissues	Fagundes et al. 2020
Threonine (100, 110, and 120% of NRC recommendation)	Mixed sex broilers (Ross-308)	Use of threonine, above NRC requirements, resulted in a better growth rate, feed utilization and carcass quality, gut health, increased ileal digestibility of amino acids and protein, and immunity	Ahmed et al. 2020
Threonine (i.e., 100%, 110% and 120% of Ross recommendations)	Broiler chickens	An improvement in feed intake through the grower period and an improvement in body weight (BW)throughout the grower and overall period, whereas a better feed conversion ratio through the starter period in birds fed 10% extra threonine in comparison with the control diet	Zarrin-Kavyani et al.2018
Threonine (100% NRC specification, 100, 110, 120 and 130% threonine of Vencobb-400 strain specification)	Broiler chickens (Vencobb-400)	The immune organs weight was improved with threonine supplementation	Debnath et al. 2019
3.0 g threonine/kg feed	male chicks	The level of intestinal cytokines in lipopolysaccharide-challenged chickens was reduced by threonine addition	Chen et al. 2018b

Embrapa

Aminoácidos

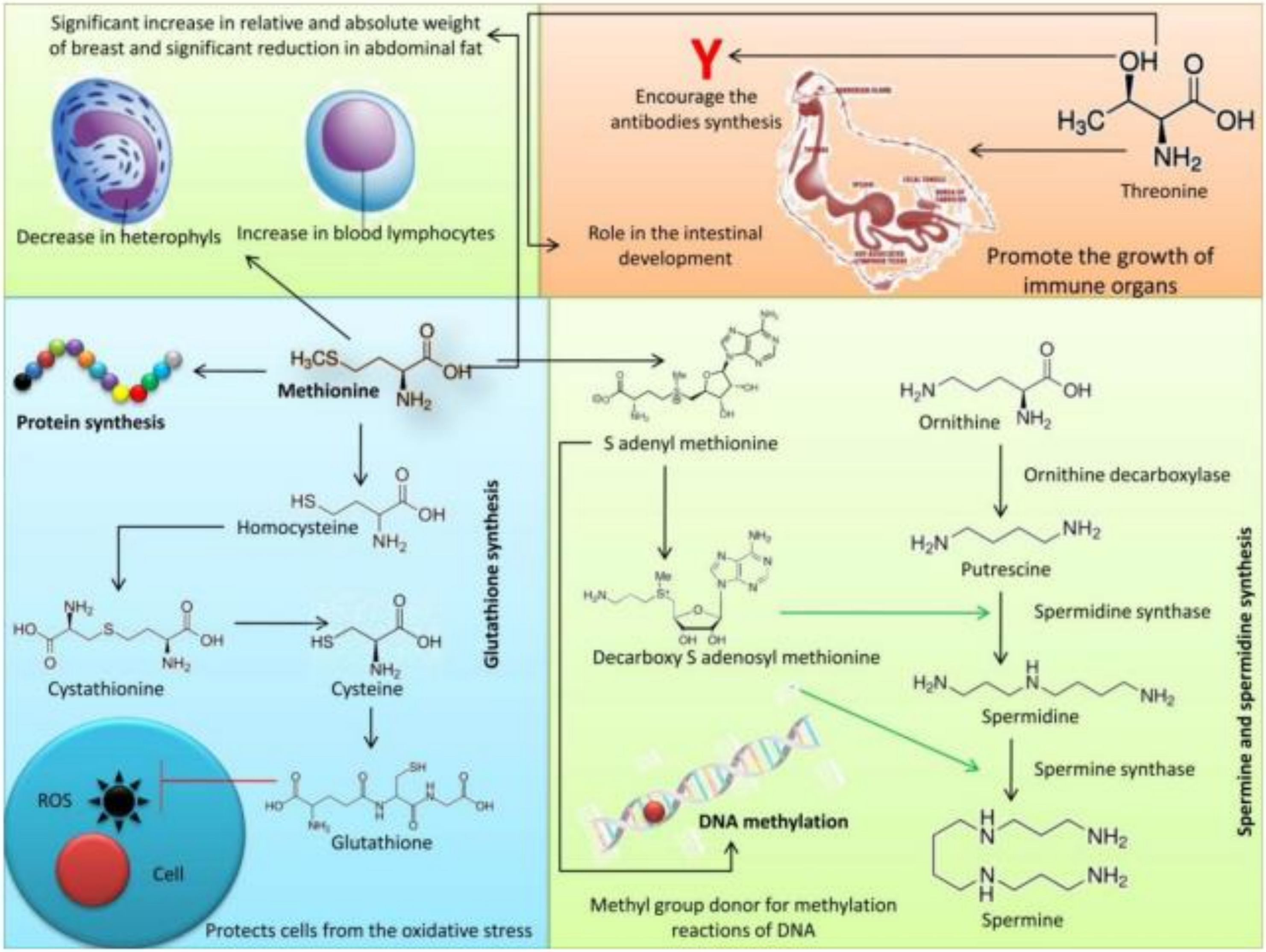

Figure 1. Effect of aminoacids – methionine and threonine on poultry health: (1) Methionine participates in synthesis of protein, (2) Methionine is a glutathione precursor, (3) Methionine is required for the polyamines (spermine and spermidine) synthesis that takes part in nucleus and cell division events, and (4) Methionine is the most important methyl group donor for methylation reactions of DNA and other molecules.

Embrapa

Aminoácidos

Trat	Des Sup	Arg Plus	Trip Plus	Val Plus	Arg/Trp/Val Plus	Des Reg
Dig Arg, %	**1,454**	**1,650**	1,454	1,454	**1,650**	**1,404**
Dig, Lys,%	1,364	1,364	1,364	1,364	1,364	1,300
Dig Met,%	0,692	0,692	0,692	0,692	0,692	0,669
Dig Met+Cis,%	1,000	1,000	1,000	1,000	1,000	0,970
Dig Thre,%	0,900	0,900	0,990	0,990	0,990	0,860
Dig Trip,%	**0,270**	0,270	**0,320**	0,270	**0,320**	**0,260**
Dig Leu,%	1,740	1,739	1,740	1,738	1,737	1,702
Dig Isol,%	0,900	0,900	0,900	0,900	0,900	0,870
Dig Phen, %	1,039	1,039	1,039	1,039	1,039	1,006
Dig Phen+Tyr, %	1,838	1,837	1,838	1,837	1,837	1,781
Dig Hist, %	0,550	0,550	0,550	0,550	0,550	0,535
Dig. Val, %	**1,030**	1,030	1,030	**1,190**	**1,190**	**1,000**
PB, %	23,14	23,56	23,19	23,17	23,58	22,42
EMAn, Kcal/kg	3.000	3.000	3.000	3.000	3.000	3.000

Embrapa

Aminoácidos

Desempenho 21 d

Trat	CR g	PM g	GPM g	CAr g:g
Des Sup	1342,0	1142,4	1093,1	1,228
Arg Plus 15%	1330,4	1118,8	1077,1	1,236
Trp Plus 15%	1320,7	1127,7	1078,5	1,232
Val Plus 15%	1320,8	1123,5	1074,7	1,236
Arg/Trp/Val Plus 15%	1324,1	1118,2	1069,0	1,24
Des Reg	1341,3	1126,7	1077,5	1,246
EPM	11,38	10,22	10,25	0,008
CV, %	2,48	3,42	3,45	2,06
Prob	0,5041	0,7528	0,8041	0,6841

Vitaminas

Vitaminas

VETERINARY QUARTERLY
2021, VOL. 41, NO. 1, 1–29
https://doi.org/10.1080/01652176.2020.1857887

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Nutritional significance of amino acids, vitamins and minerals as nutraceuticals in poultry production and health – a comprehensive review

Mahmoud Alagawany[a], Shaaban S. Elnesr[b], Mayada R. Farag[c], Ruchi Tiwari[d], Mohd. Iqbal Yatoo[e], Kumaragurubaran Karthik[f], Izabela Michalak[g] and Kuldeep Dhama[h]

[a]Faculty of Agriculture, Department of Poultry, Zagazig University, Zagazig, Egypt; [b]Faculty of Agriculture, Department of Poultry Production, Fayoum University, Fayoum, Egypt; [c]Faculty of Veterinary Medicine, Forensic Medicine and Toxicology Department, Zagazig University, Zagazig, Egypt; [d]Department of Veterinary Microbiology and Immunology, College of Veterinary Sciences, Deen Dayal Upadhayay Pashu Chikitsa Vigyan Vishwavidyalay Evum Go-Anusandhan Sansthan (DUVASU), Mathura, India; [e]Sher-E-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, India; [f]Central University Laboratory, Tamil Nadu Veterinary and Animal Sciences University, Chennai, India; [g]Faculty of Chemistry, Department of Advanced Material Technologies, Wrocław University of Science and Technology, Wrocław, Poland; [h]Division of Pathology, ICAR-Indian Veterinary Research Institute, Bareilly, India

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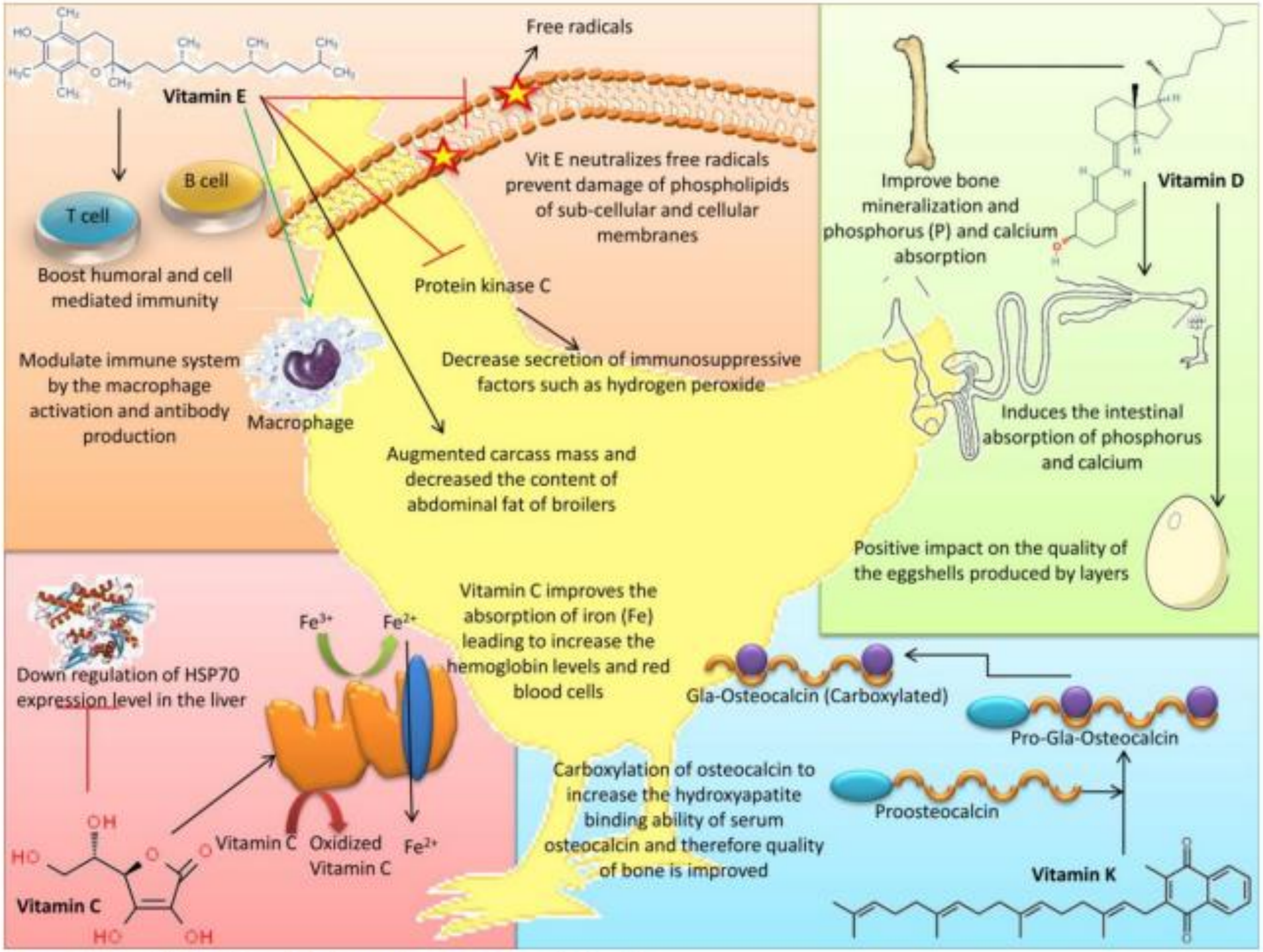

Figure 2. Beneficial effects of different vitamins on poultry health.

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Ca (3.0, 3.5, 4.0, and 4.5%) and 25OHD3 (0, 69, and 138 µg/kg feed)	Lohmann LSL-lite layers	Use high levels of calcium and 25OHD3 improved bone strength and decreased risks related to morbidity, leg weakness and mortalities	Kakhki et al. 2019

Vitamins			
Vitamin E	Broiler chickens	improvement of the immune response and antioxidants concentration in the liver	Karadas et al. 2016
2 g α-tocopherol acetate/kg feed	Broilers	Increase in carcass mass and decrease in the abdominal fat of broilers	Zaboli et al. 2013

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Nutraceutical type and dose	Poultry species	Implication/Conclusion	References
Vitamin E	Broiler chickens	A significant influence on the chicken meat quality by reducing juice drip and increasing WHC of meat	Zdanowska-Sasiadek et al. 2016
Vitamin A (16,000 IU/kg feed)	Hy-sex	Improvement of productivity performance parameters	Abd El-Hack et al. 2017a
Vitamin C (200 mg/kg feed)	Broiler chickens	Protection against the risk of high density by improved final BW, reduction of mortality and downregulation of HSP70expression level in the liver	Shewita et al. 2019
Vitamin C (200 mg/kg feed)	Commercial broilers	Improvement of the immunity of broilers	Lohakare et al. 2005
Vitamin A (0, 8,000 and16,000 IU/kg diet) and vitamin E (0, 250 and 500 mg/kg diet)	Bovans Brown laying hens	Both vitamins play a role in alleviating the harmful impacts of high ambient temperature. Use of 16,000 IU vitamin A with 500 mg vitamin E /kg diet is preferable for obtaining better production of birds exposed to heat stress	Abd El-Hack et al. 2019
Vitamin E (0, 250 mg/kg diet)	Growing Japanese quail	Useful in partly alleviating the adverse impacts of cadmium	Abou-Kassem et al. 2016
VitaminE	Laying hens	Prevents unsaturated lipid oxidation within cells, therefore protecting the cell membrane from oxidative damage induced by ROS	Mahrose et al.2012
Vitamin E (200 mg/kg feed)	Male chickens	Enhanced semen quality traits, including the spermatozoa count and motility, and reduced the dead spermatozoa, under heat stress conditions	Ebeid 2012
Vitamin E (100 mg/kg feed)	Poultry ganders	Improved ejaculate volumes, percentages of viable sperm and sperm concentrations and lowered percentages of spermatids	Jerysz and Lukaszewicz 2013
Control with additional 3,000 or 9,000 IU25-hydroxyvitamin D_3/kg feed, 3,000 or 9,000 IU vitamin D_3/kg feed, 3,000 or 9,000 IU vitamin D_2/kg feed	Lohmann white laying hens	Irrespective of forms, the apparent total tract digestibility of calcium was higher in diets enriched with vitamin D. The apparent total tract digestibility of phosphorus was higher in 3,000 IU/kg of vitamin D_2 compared to the other treatments. The utilization of calcium and phosphorus by laying birds can be enhanced by the addition of different sources of vitamin D in rations	Adhikari et al. 2020

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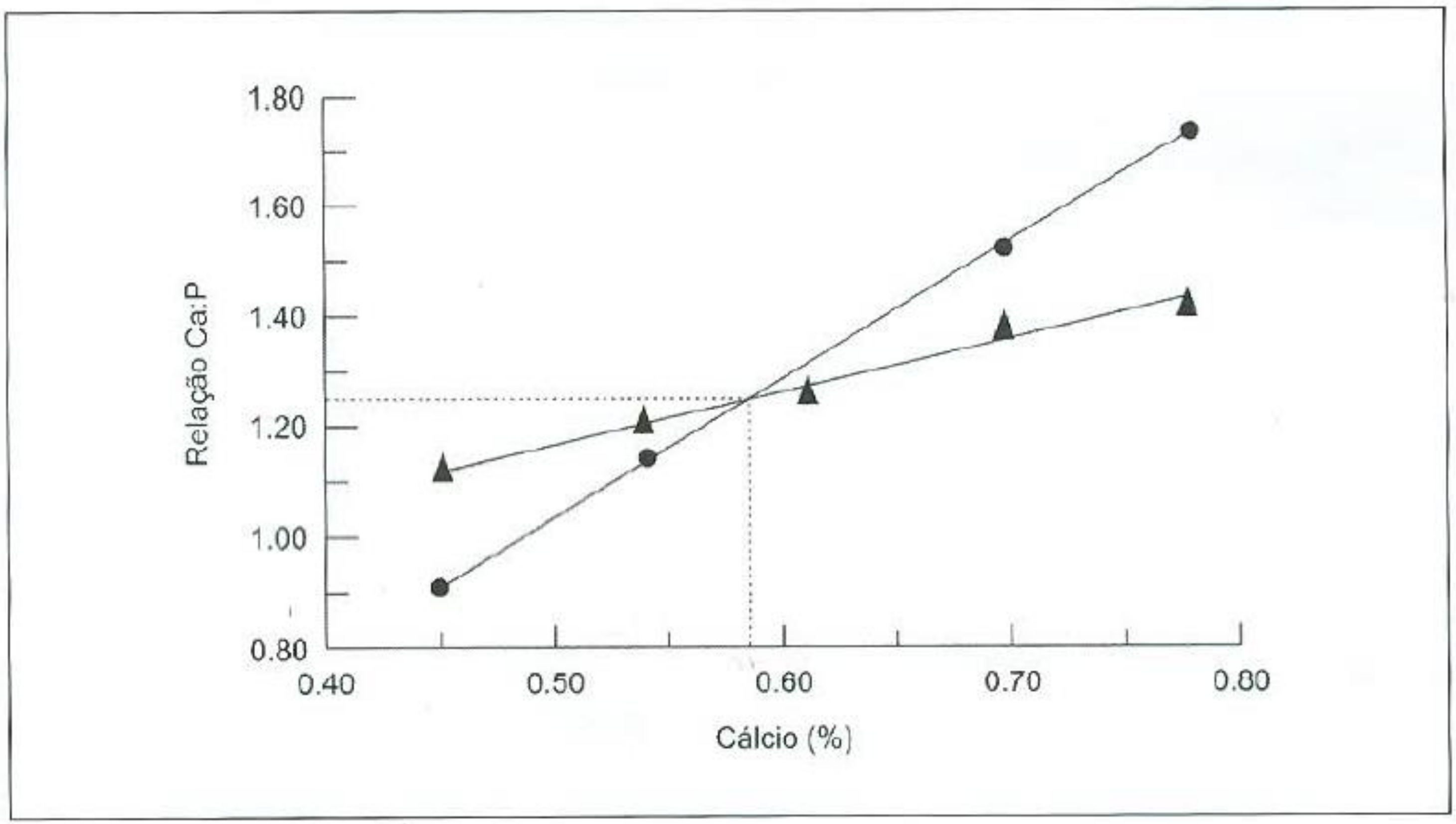
Relação Ca/P sobre absorção e retenção de cálcio (Ca) em frangos de corte com quatro semanas de idade, alimentados com dietas contendo 2,5g de fósforo disponível/kg de alimento e 2,0g de fósforo fítico/kg de alimento (● absorvido, ▲ retido).



Fonte: Adaptado de van der Klis&Versteegh, 1999.

Avaliação relação Ca-Pt e fitase em frangos de 21 a 42 d – Composição de Tibia

Tratamento	Força (Kgf)	Cz % MS	Ca % MS	P % MS	Rel Ca-P MS
1,45/1,34/1,27	30,06±1,92 b	39,26±0,60 de	14,43±0,22 cd	7,018±0,108 d	2,060±0,039
1,34/1,25/1,19	38,75±2,10 a	43,22±0,58 a	15,92±0,34 a	8,121±0,197 a	1,964±0,037
1,45/1,34/1,27	36,86±2,50 a	41,15±0,52 bc	14,78±0,33 bc	7,522±0,108 bc	1,966±0,042
1,45/1,34/1,27	40,69±1,27 a	42,10±0,69 ab	15,33±0,23 ab	7,745±0,167 ab	1,984±0,035
1,14/1,02/0,98	25,67±1,48 b	37,90±1,01 e	13,70±0,38 d	7,072±0,166 d	1,937±0,032
1,11/1,03/1,02	38,11±1,19 a	42,12±0,85 ab	15,33±0,33 ab	7,832±0,209 ab	1,961±0,025
1,14/1,02/0,98	29,18±1,46 b	39,99±0,37 cd	14,17±0,24 cd	7,189±0,095 cd	1,973±0,038
1,14/1,02/0,98	30,03±1,48 b	39,69±0,43 cde	14,35±0,22 cd	7,232±0,206 cd	1,995±0,051
Prob > F	<0,0001	<0,0001	<0,0001	<0,0001	0,1862
CV	21,927	6,396	7,611	8,313	6,039

Médias seguidas por letras distintas nas colunas diferem significativamente pelo teste *t-Student* ($p \leq 0,05$).

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Nutraceutical type and dose	Poultry species	Implication/Conclusion	References
Organic Se (0.3 mg/kg feed)	Male chickens	Enhanced semen quality traits, including the spermatozoa count and motility, and reduced the dead spermatozoa, under heat stress conditions	Ebeid 2012
Selenium (0.3 mg/kg feed)	Poultry ganders	Improved ejaculate volumes, percentages of viable sperm and sperm concentrations and lowered percentages of spermatids	Jerysz and Lukaszewicz 2013
0, 0.5, 1.0 or 2.0 mg Se (sodium selenite)/kg diet	Hy-Line roosters	The highest activity of GSH-Px and lowest content of MDA in blood and testis was recorded in the treatment of 0.5 mg/kg	Shi et al. 2014
Dietary Se deficiency (0.033 mg of Se/kg feed) in comparison with the control	Hy-line cockerels	Exerts harmful impacts on reproductive organs and the extrinsic and intrinsic pathways and the upstream regulators, like Bcl-2 and p53 are all involved in Se deficiency-induced testicular apoptosis	Huang et al. 2016
0.15 mg Se/kg feed from sodium selenite, Se-enriched yeast (Se-yeast) or SeMet	Broiler breeders	Apart from sodium selenite, Se-yeast or SeMet increased the activity of thioredoxinreductase-1 in the kidney and liver of breeders and their offspring, but not the activity of GSH-Px1	Yuan et al. 2012
Se 0.13 mg/kg feed with 0.4 mg Se in the form of sodium selenite (SS) or Se-yeast/kg feed for 9 months	Hy-Line Brown	Increased Se content of the e.g., g from 5.1 µg in the basal diet group to 14.4 and 22.7 µg, in SS or Se-yeast, respectively	Cobanová et al. 2011
Organic selenium (0.5 mg/kg diet)	Poultry breeders	A reduction in mortality with selenium supplementation; increase in e.g., g production, hatchability, and percentage of settable e.g., gs	Rajashree et al. 2014
Organic selenium (2 vitamin E levels (30 and 120 mg/kg feed) and two selenium sources (sodium selenite and zinc-L-selenomethionine).	Broiler breeder	Promoted heavier hatchling weight until e.g., g production peak (33 weeks), but did not influence hatchling quality	Urso et al. 2015
25 or 75 mg ZnO/kg diet	Laying hens (Hisex Brown)	Dietary zinc addition up to 75 mg/kg used as an effective supplement to improve antioxidant ability and zinc status in laying hens	Abd El-Hack et al. 2020b

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Copper sulfate (200 mg/kg feed)	Broiler	Useful influence on the growth rate	Hashish et al. 2010
150 mg copper sulfate/kg feed	Broiler chicks	Improved live BW gain that may be the result of the significant decline in the total pathogenic bacteria the gut	Xia et al. 2004
Copper(8.77 and 11.6 mg/kg feed)	Goslings	Improved growth and carcass yield from 28 to 70 days of age	Yang et al. 2018
12 mg Mn (inorganic or organic)/kg feed	Broiler	It was sufficient to provide optimum broiler performance	Mwangi et al. 2019
Zn-Met (25, 50, 75 or 100 mg Zn-Met/kg diet)	Hisex Brown laying hens	Increased Zn status and reduced blood triglyceride, LDL-cholesterol and resulted in improving antioxidant capacity	Abd El-Hack et al. 2018b
Chromium propionate with inclusion levels of 0, 200, 400, 800 and 1600 ppb.	Male ROSS-308 broilers	Better performance and weight gain may be achieved if chromium is added in broiler diets at the rate of 400 ppb	Arif et al. 2019
Selenium (0, 0.25, 0.50 mg/kg feed)	Bovans laying hens	Hemoglobin and lymphocytes were increased with increasing dietary Se level in layer reared under heat stress conditions	Abd El-Hack et al. 2017a
Selenium	Poultry males	Plays an important role in semen quality and is related to the high proportion of polyunsaturated fatty acids in avian semen and its susceptibility to lipid peroxidation	Surai et al. 1998a
Organic Se	Cockerel	Dietary supplementation of organic Se in the cockerel's diet increased (more than double) Se concentration in the semen; have a beneficial effect on the antioxidant defense in various tissues including sperm	Surai et al. 1998a,b
Selenium (0. 3 mg Se/kg feed)	Male chickens	Use of Se in the diet of male chickens increased the activity of GSH-Px in the liver, testes, spermatozoa and seminal plasma	Surai etal. 1998c
Organic Se (0.3 mg/kg feed)	Male chickens	Under high ambient temperature (33-36 °C in poultry farm), use of organic Se in the cockerel diets improved the GSH-Px activity and semen quality (motility and sperm count) and reduced the dead sperms count in a dose-dependent manner	Ebeid 2009

Embrapa

Different dietary trace mineral sources for broiler breeders and their progenies

C. S. S. Araújo,[*,1] R. G. Hermes,[†] L. C. Bittencourt,[†] C. C. Silva,[†] L. F. Araújo,[‡] C. A. Granghelli,[*] P. H. Pelissari,[*] F. A. Roque,[‡] and B. G. S. Leite[‡]

[*]*Departament of Animal Nutrition and Production, Universidade de São Paulo, 13635900 Pirassununga, Brazil;* [†]*Department of Animal Science, Universidade de São Paulo 13635900 Pirassununga, Brazil; and* [‡]*Department of Animal Science, Universidade de São Paulo, Pirassununga, Brazil*

ABSTRACT The objective of this study was to evaluate the effect of different trace mineral supplementation sources in the diet of broiler breeders on their performance and on their progenies. In total, 128 Cobb 500 broiler breeders were distributed according to a completely randomized experimental design in 2 experimental treatments. The control group was fed a diet supplemented with inorganic trace minerals (**ITM**), while the other group was fed a diet supplemented with reduced levels of trace minerals in the organic form. Eggs were collected when breeders were 35, 47, and 53 wk old. Their progeny (450 hatchlings) were divided according to trace mineral supplementation source from the maternal diet, creating 2 treatments with 16 replicates of 15 birds each. Organic trace mineral (**OTM**) supplementation improved broiler breeder performance, as shown by higher egg production and better eggshell quality of OTM-fed hens compared with those fed ITM. Egg fertility and hatchability were not influenced by the treatments. As to progeny performance, higher weight gain, and consequently, better feed conversion ratio, were obtained in the 41-day-old progenies of OTM-fed breeders, independently of hen age. Maternal diet trace mineral source did not affect broiler carcass, breast meat, or leg yields. The results of the present study show that supplementing broiler breeder diets with organic trace mineral sources enhances the performance of breeders and their progenies.

Key words: eggshell quality, fertility, hatchability, performance, organic trace mineral

2019 Poultry Science 98:4716–4721
http://dx.doi.org/10.3382/ps/pez182

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Carbo-amino-fosfo-quelado:

- 28% Cu;
- 10% Fe;
- 58% Mn;
- 54% Zn

Table 2. Performance and egg quality parameters of 34, 46, and 52 wk-old broiler breeders supplemented with different trace mineral sources.

Variable	ITM*	OTM*	*P*-value	SEM
34 wk				
Egg production, %	86.86	92.18	<0.0001	0.54
Egg weight, g	59.96	60.05	0.7015	0.11
Haugh units	83.97	84.51	0.7055	0.71
Eggshell thickness, mm	0.377	0.417	<0.0001	0.01
Eggshell breaking strength, kgf	4.10	4.25	0.0181	0.03
46 wk				
Egg production, %	79.17	81.08	0.0090	0.38
Egg weight, g	67.81	70.47	<0.0001	0.14
Haugh units	74.08	73.88	0.8863	0.70
Eggshell thickness, mm	0.378	0.420	<0.0001	0.01
Eggshell breaking strength, kgf	4.02	4.20	0.0091	0.03
52 wk				
Egg production, %	69.31	70.39	0.0346	0.26
Egg weight, g	69.38	70.16	0.0475	0.20
Haugh units	80.03	81.86	0.3397	0.96
Eggshell thickness, mm	0.360	0.409	<0.0001	0.01
Eggshell breaking strength, kgf	3.40	3.77	<0.0001	0.04

*Inorganic Trace Minerals (ITM); Organic Trace Minerals (OTM).

Table 4. Live performance (1 to 42 d of age) of the progeny of 35, 47, and 53-wk-old broiler breeders supplemented with different trace mineral sources.

	Body weight, kg	Feed intake, kg	Weight gain, kg	FCR g/g	FCRa* g/g	Livability%
			35-wk-old breeders			
ITM**	2.62	4.44	2.58	1.73	1.74	97.41
OTM	2.70	4.68	2.66	1.76	1.76	94.83
P-value	0.0158	<.0001	0.0149	0.1060	0.5102	0.1593
SEM	17.67	29.38	17.71	0.01	0.01	0.91
			47-wk-old breeders			
ITM	2.60	4.46	2.55	1.75	1.76	96.37
OTM	2.74	4.69	2.70	1.74	1.73	95.33
P-value	<.0001	<.0001	<.0001	0.7609	0.0289	0.5424
SEM	16.33	24.85	16.30	0.01	0.01	0.83
			53-wk-old breeders			
ITM	2.73	4.74	2.68	1.77	1.76	94.29
OTM	2.83	4.73	2.78	1.70	1.66	92.76
P-value	<.0001	0.4028	<.0001	<.0001	<.0001	0.4661
SEM	14.12	10.63	14.12	0.01	0.01	1.03

*FCRa = feed conversion ratio adjusted for 2.7 kg body weight.
**Inorganic Trace Minerals (ITM); Organic Trace Minerals (OTM).

Tendências

Tendências

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REVIEW
published: 28 June 2021
doi: 10.3389/fvets.2021.653152

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Influence of Feeding Omega-3 Polyunsaturated Fatty Acids to Broiler Breeders on Indices of Immunocompetence, Gastrointestinal, and Skeletal Development in Broiler Chickens

*Aizwarya Thanabalan and Elijah G. Kiarie**

Department of Animal Biosciences, University of Guelph, Guelph, ON, Canada

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Tendências

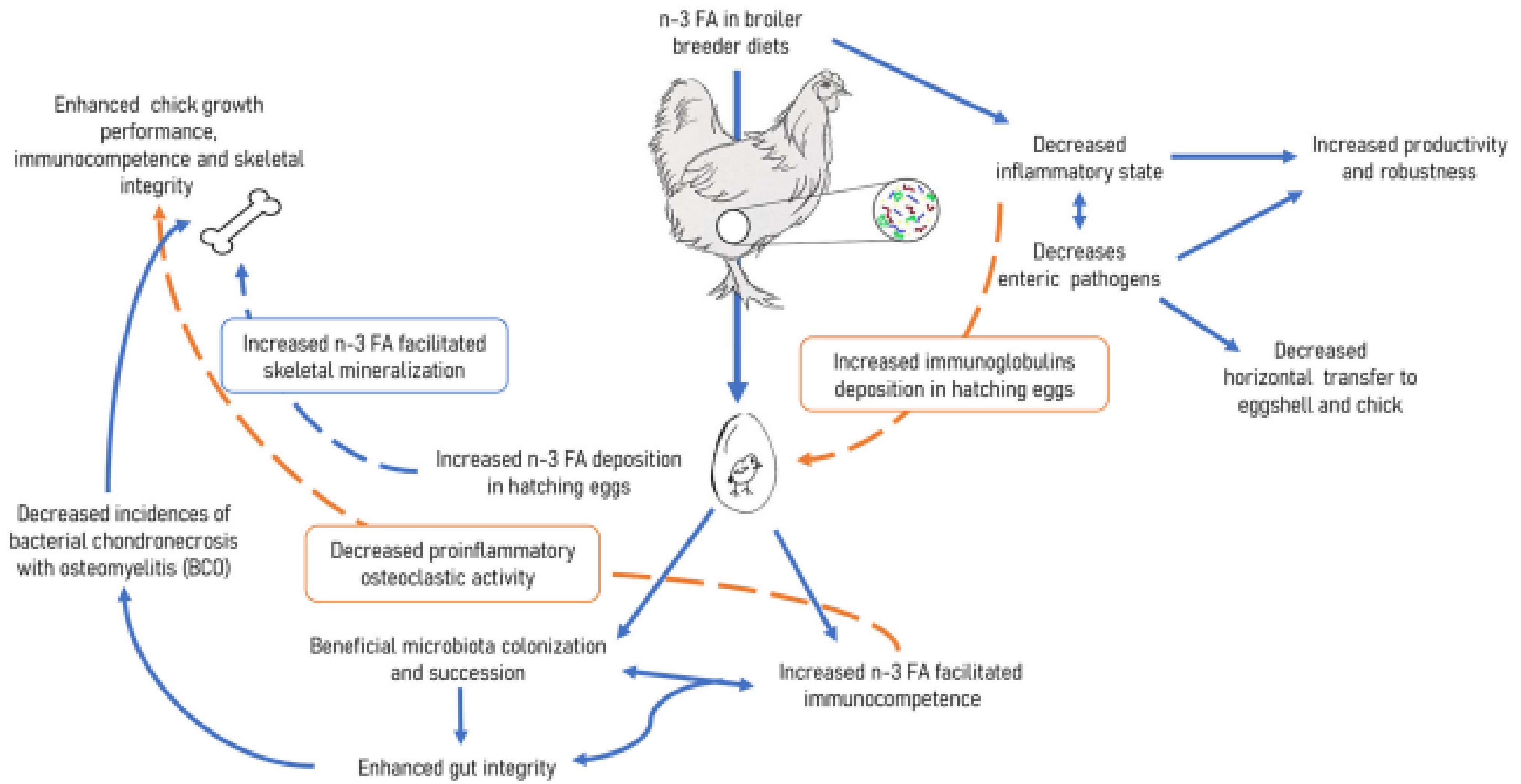

FIGURE 1 | Pathways for modulating immunocompetence, skeletal, and gastrointestinal attributes in broiler chickens hatched from broiler breeders fed omega-3 polyunsaturated fatty acids.

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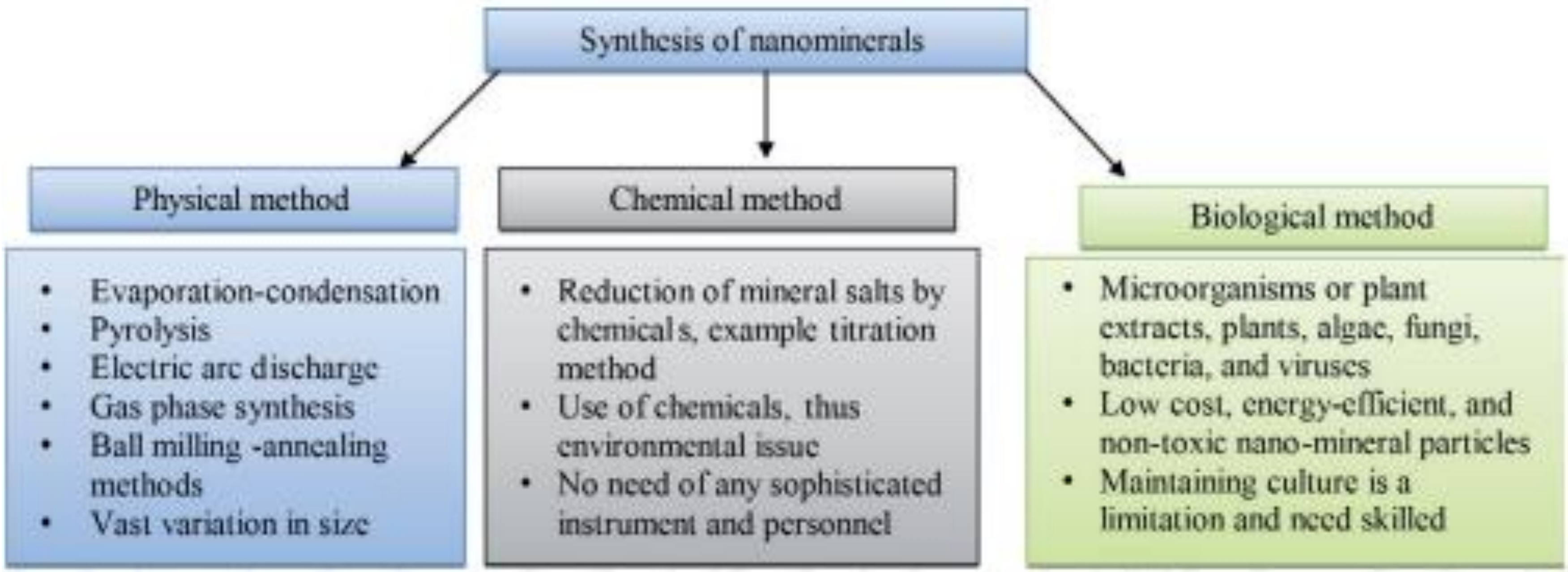

Essential Nanominerals and Other Nanomaterials in Poultry Nutrition and Production
DOI: http://dx.doi.org/10.5772/intechopen.96013

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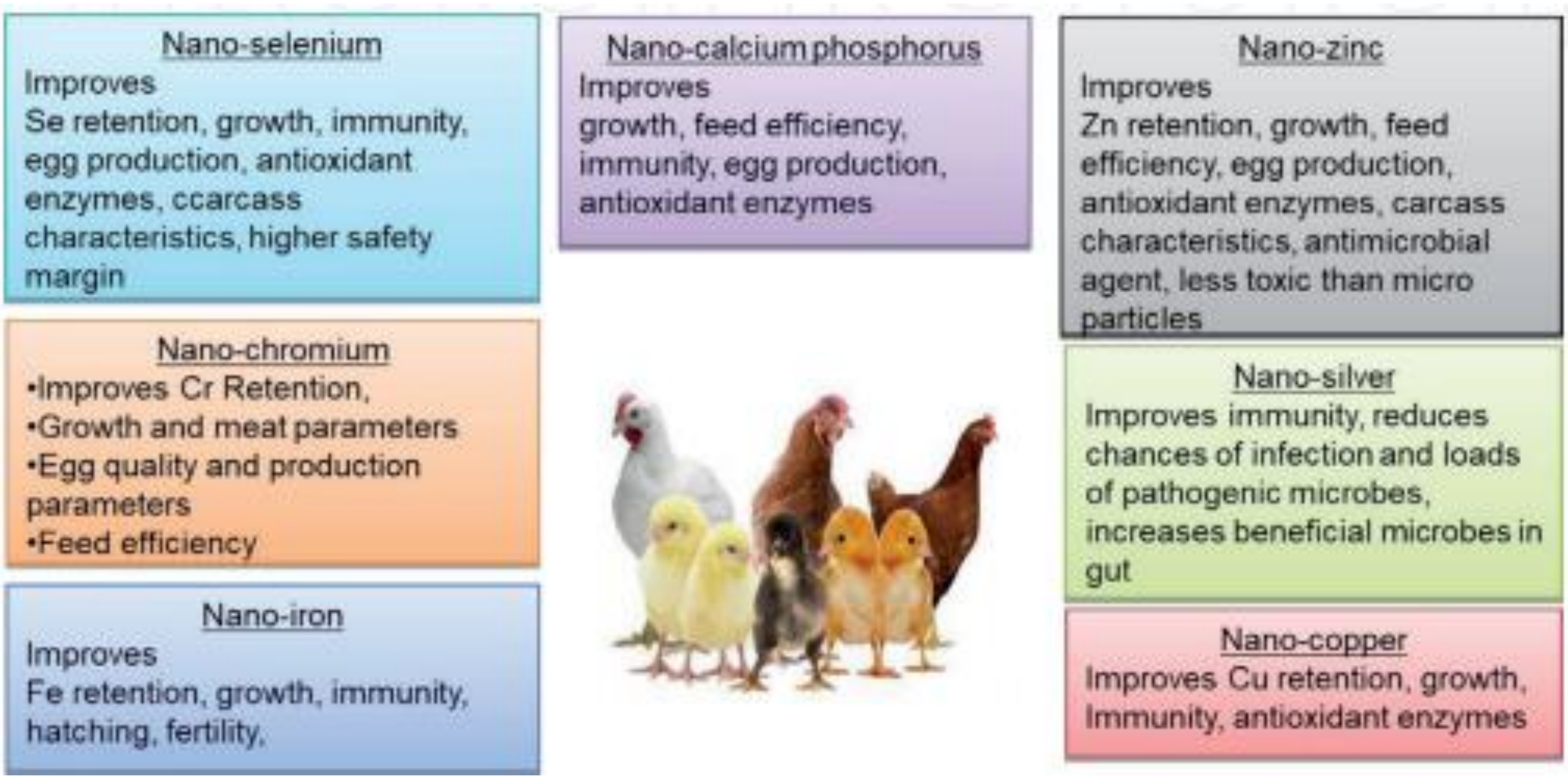

Essential Nanominerals and Other Nanomaterials in Poultry Nutrition and Production
DOI: http://dx.doi.org/10.5772/intechopen.96013

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doi:10.1017/S0043933918000259

Roles of dietary fibre and ingredient particle size in broiler nutrition

S.K. KHERAVII[1,2], N.K. MORGAN[1], R.A. SWICK[1], M. CHOCT[1] and S.-B. WU[1]*

[1]Animal Science, School of Environmental and Rural Science, University of New England, Armidale, NSW 2351, Australia; [2]Animal Production, Faculty of Agriculture and Forestry, University of Duhok, 42003, Kurdistan region, Iraq
*Corresponding author: shubiao.wu@une.edu.au

Increasing the structural components in the diet, namely through including coarse grain particles in diets and manipulating the dietary fibre composition, has been shown to improve gut health, feed utilisation and production efficiency. This is primarily because structural components physically stimulate activity in the fore gut. An example of this is dietary non-starch polysaccharides (NSP), namely insoluble NSP, which have been shown to instigate beneficial effects on gut health, litter quality and nutrient utilisation, by increasing crop and gizzard activity, stimulating digestive enzyme production and enhancing bacterial fermentation in the hind gut. However, there is a lack of consistency with regard to the direct effects of dietary fibre on chicken health and production. The aim of this review therefore is to explore the impact of feeding different sources of fibre and different size grain particles on gut health and microflora, nutrient utilisation, performance and litter quality in broilers.

Keywords: fibre; particle size; gizzard; performance; digestibility; gut microflora; litter

World's Poultry Science Journal, Vol. 74, June 2018

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Tendências

Dietary fibre and particle size in broiler nutrition: S.K. Kheravii et al.

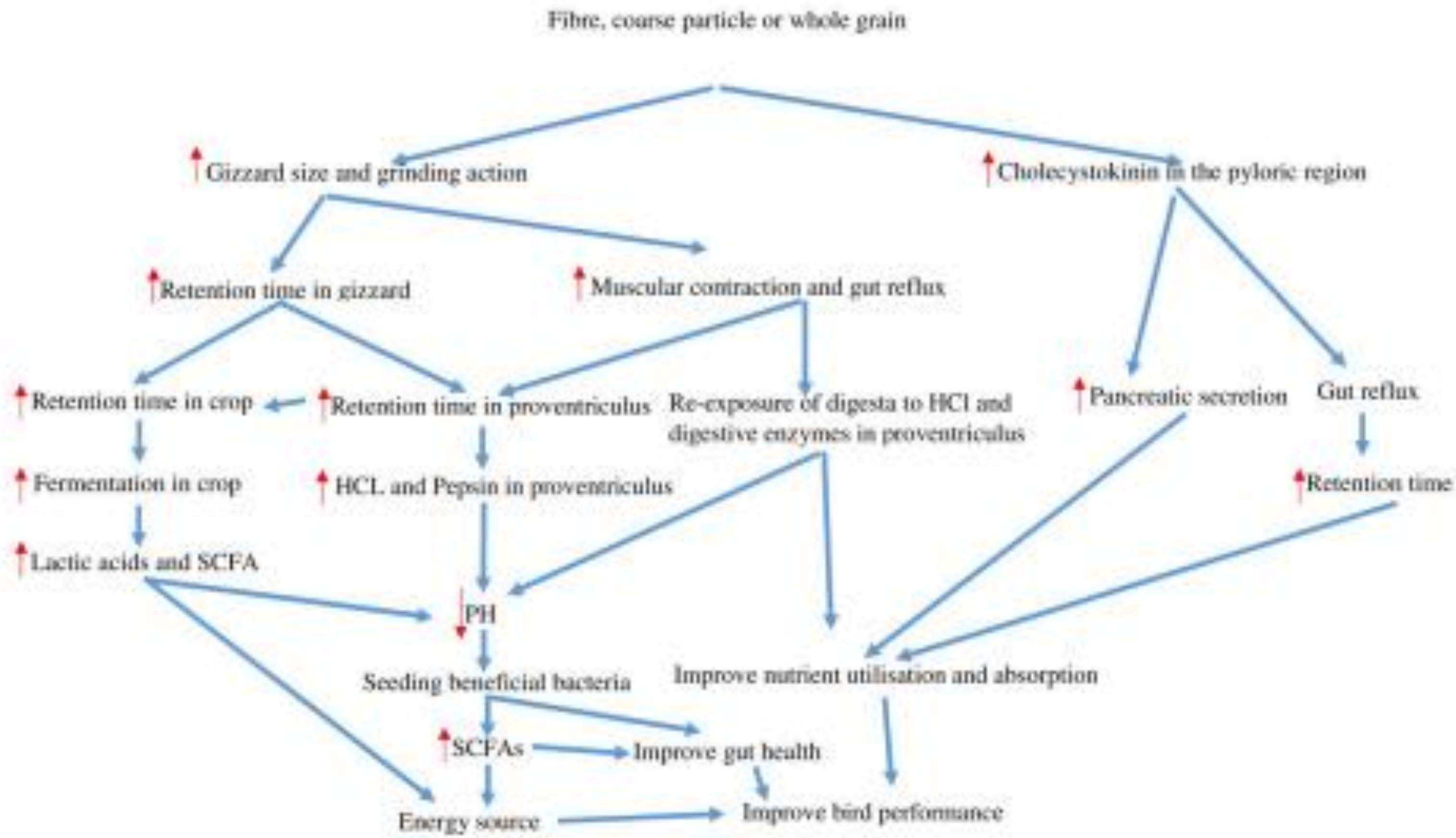

Figure 1 Possible mechanisms underlying improved nutrient digestibility, performance and gut health through manipulation of diet by structural components.

World's Poultry Science Journal, Vol. 74, June 2018

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everton.krabbe@embrapa.br

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