

Effects of reduced energy and essential amino acid diets on plumage damage and skin injuries of male slow- (Auburn) and fast- (B.U.T. 6) growing turkey strains

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Background

Energy and amino acid reduction of 10% and up to 20% in rearing phase of turkeys does not negatively affect performance of male turkeys

Göppel et al., 2022, Thesing et al. 2023



Aim of the study

Investigate the effect of dietary energy and essential amino acid reduction on plumage damage and pecking injuries of two different genotypes (slow- and fast-growing)



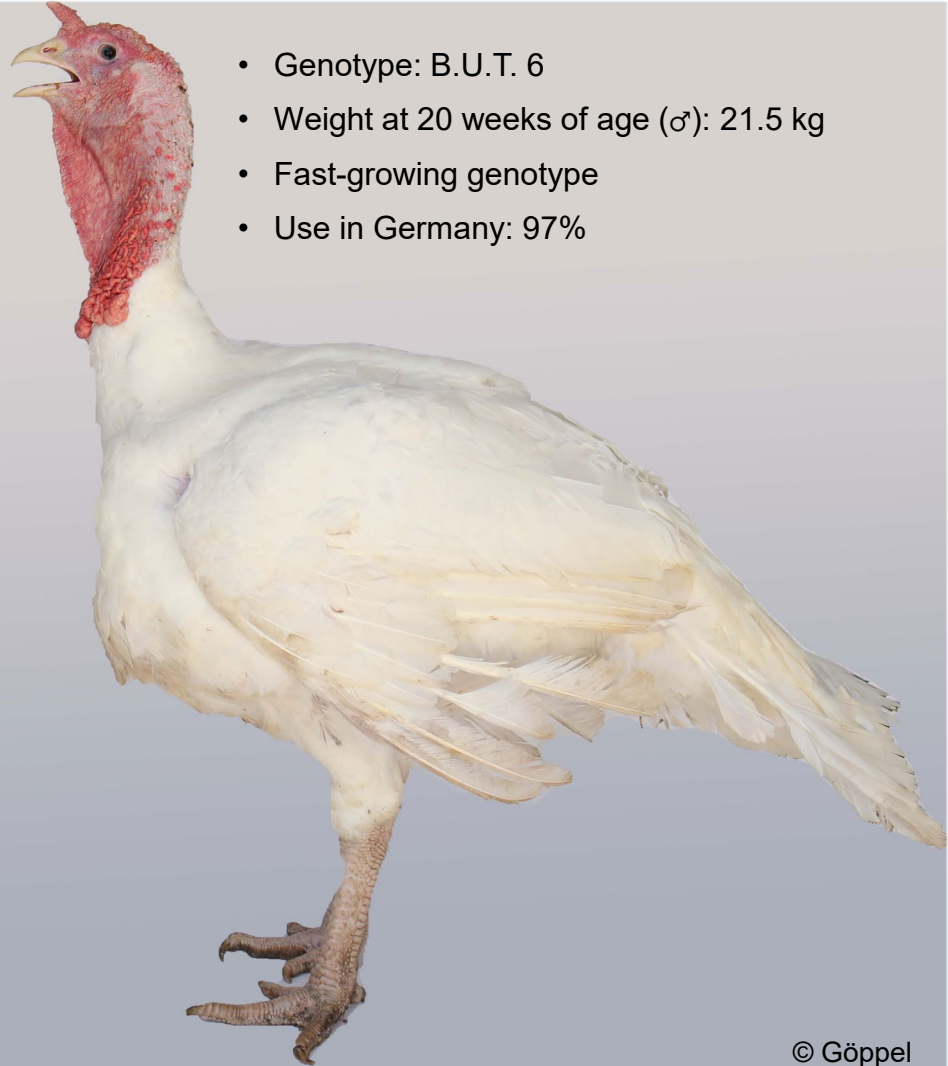
Animals. Material and Methods

- Two locations with 24 pens (15/10 animals/pen)
- In total, 240 animals
- Non-beaktrimmed males of two genotypes

- Genotype: Auburn
- Weight at 20 weeks of age (σ): 15.0 kg
- Slow-growing genotype



- Genotype: B.U.T. 6
- Weight at 20 weeks of age (σ): 21.5 kg
- Fast-growing genotype
- Use in Germany: 97%





Animals. Material and Methods

- Two locations with 24 pens (12/20 animals/pen)
- In total, 240 animals
- Non-beaktrimmed males of two genotypes
- 3 feeding strategies with 4 replicates

Feeding strategies



Dietary energy content (MJ/kg)

	P1	P2	P3	P4	P5	P6
Group F1*	11.2	11.6	12.0	12.0	12.2	12.2
Gruppe F2	11.2	11.6	12.0	12.0	12.2	12.2
Gruppe F3	11.2	11.6	12.0	12.0	12.2	12.2

Feeding strategies



Amino acid concentration (% of recommendation)

	P1	P2	P3	P4	P5	P6
Group F1	80	90	90	90	90	80
Group F2	80	80	90	100*	90	80
Group F3	70	80	90	100	90	80

*100% = Recommendation of Aviagen (2015) for feeding program with reduced dietary energy content



Animals. Material and Methods

- Two locations á 24 pens (12/20 animals/pen)
- In total, 240 animals
- Non-beaktrimmed males of two genotypes
- 3 feeding strategies with 4 replicates
- Indoor housing until 8 weeks of age

Husbandry systems during fattening (weeks 9-20)



H1-

- Location 1
- Indoor housing
- Compound feed



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Husbandry systems during fattening

H1-

- Location 1
- Indoor housing
- Compound feed

H2+

- Location 2
- Indoor housing
- Compound feed PLUS silage feeding during fattening (weeks 13-20)
- Environmental enrichment (elevated platforms)



Husbandry systems during fattening (weeks 9-20)



H3-MS

- Location 2
- Indoor housing until week 8 and mobile housing system with free-range Compound feed PLUS free-range (weeks 13-20)
- Environmental enrichment (elevated platforms)

Data collection



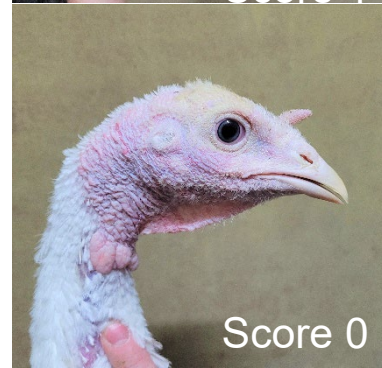
Scoring of integuments four-weekly

Criteria/Score		Definition
Pododermatitis		
0	intact footpad	intact. soft footpad no swelling and necrosis
1	low grade pododermatitis	superficial signs of wear. corneal papillae are separated and/or slight swelling of the footpad and/or small. punctiform necroses on the ball of the foot/toe
2	mild pododermatitis	swelling of the pad of the foot/toe. and necrosis of the pad of the foot $\leq 25\%$ and/or necrosis of the pad of the toe $> punctate$ (1 affected phalanx)
3	moderate pododermatitis	marked swelling of the pad of the foot/toe and necrosis of the pad of the foot necrosis of the pad of the foot $> 25\%$ and $\leq 50\%$ and/or necrosis on the pad of the toe $> punctate$ (2 affected phalanges)
4	high-grade pododermatitis	very severe swelling of the pad of the foot and/or necrosis on the pad of the foot $> 50\%$ necrosis of the pad of the toe $> punctate$ (≥ 3 affected phalanges)
Plumage soiling		
0	clean plumage	no soiling
1	slight soiling	discolouration of the plumage ≤ 8 cm
2	medium degree of soiling	coherent plumage discolourations > 8 cm and/or clear. coherent faecal litter adhesions ≤ 8 cm
3	high degree of soiling	clear. coherent faecal litter adhesions > 8 cm

Plumage condition



Injuries



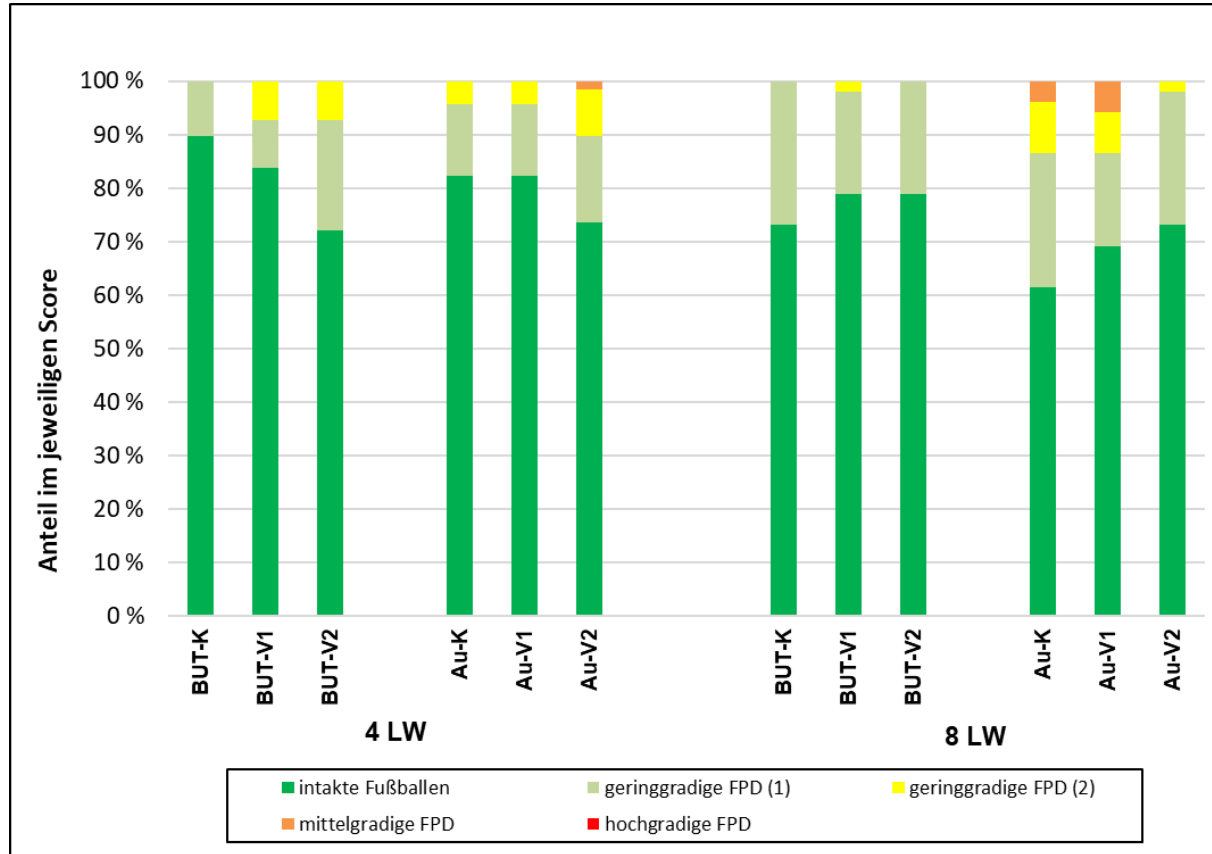
Footpad dermatitis during rearing



Trait	Score 1* (%)	Coefficients (SE)	Odds Ratio (95 % KI)	Individual p-Value	Total p-Value	Nagelkerke R ²
<i>Genotype</i>						
BUT	20.3	Reference	Basis			
Au	25.6	0.51 (0.28)	1.66 (0.43-6.41)		0.066	
<i>Feeding strategy</i>						
K	22.1	Reference	Basis			
V1	20.8	0.37 (0.07)	1.07 (0.52-2.22)	0.852	0.212	
V2	25.8	0.57 (0.36)	1.77 (0.88-3.58)	0.112		
<i>Husbandry system</i>						
HS 1	3.3	Reference	Basis			
HS 2	40.1	3.10 (0.49)	22.27 (8.58-57.77)		<0.001	0.35
<i>Age</i>						
4 LW	19.4	Reference	Basis			
8 LW	27.6	0.96 (0.21)	2.61 (1.73-3.94)		<0.001	
<i>Genotype*Feed</i>		-0.31 (0.51)	0.74 (0.27-1.98)		0.515	
<i>Genotype*Age</i>		0.66 (0.21)	1.23 (0.34-4.44)		0.754	
Constant		-4.31 (0.54)				

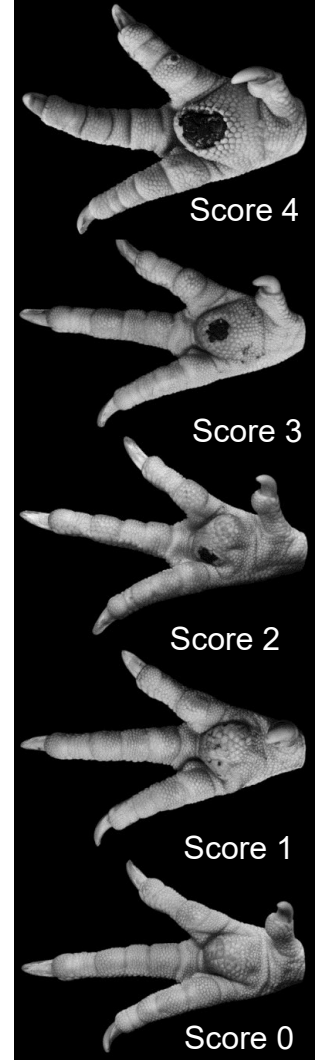
*Score 1 = includes all alterations (score 1. 2. 3 and 4)

Footpad dermatitis during rearing



Significant effect of Husbandry and Age ($p < 0.05$)

Hocking et al. (2008)

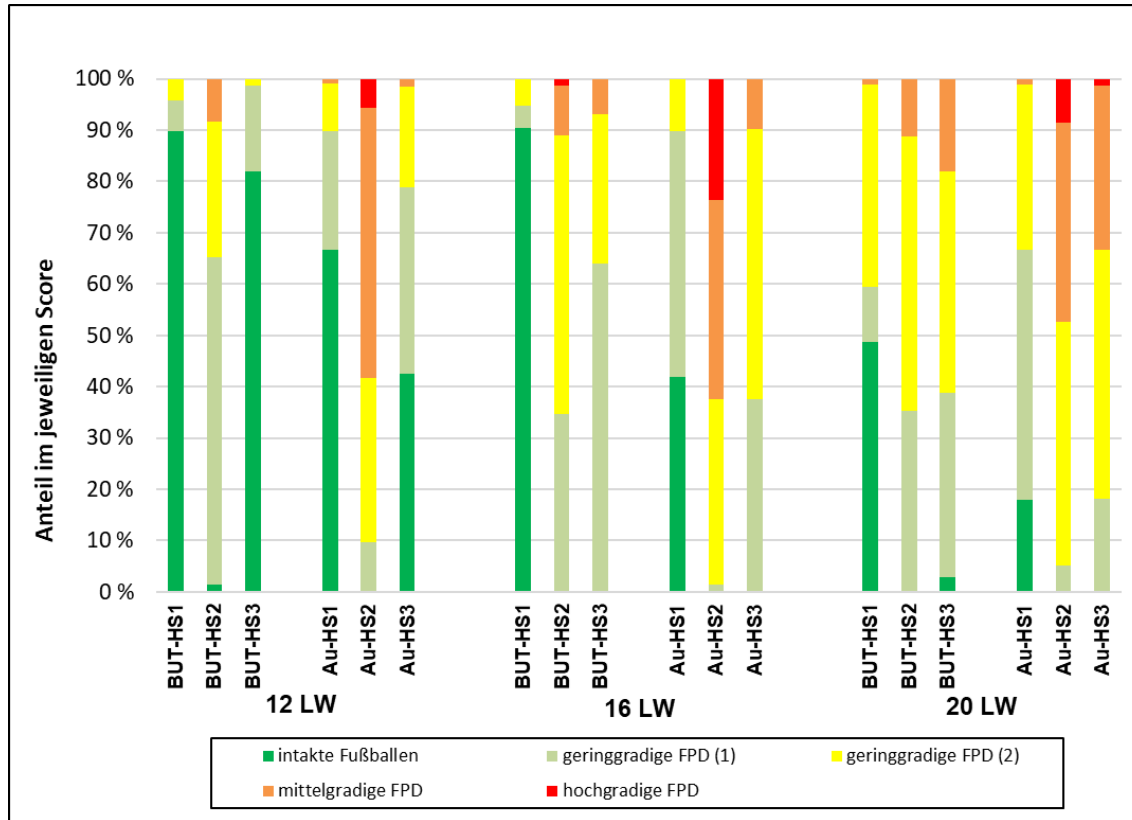


Footpad dermatitis during fattening



Trait	Score 1 (%)	Coefficients (SE)	Odds Ratio (95 % KI)	Individual <i>p</i> -Value	Total <i>p</i> -Wert	Nagelkerke R ²
<i>Genotype</i>						
BUT	31.3	Reference	Basis			
Au	49.1	0.05 (0.03)	1.04 (0.53-1.72)		0.086	
<i>Feeding strategy</i>						
K	41.5	Reference	Basis			
V1	43.4	0.09 (0.22)	1.10 (0.72-1.69)	0.660	<0.001	
V2	35.6	-0.81 (0.23)	0.44 (0.28-0.70)	0.001		
<i>Husbandry System</i>						
HS 1	15.3	Reference	Basis			
HS 2	74.2	2.26 (0.24)	9.64 (6.08-15.26)	<0.001	<0.001	0.51
HS 3	43.8	1.13 (0.23)	3.09 (1.95-4.89)	<0.001		
<i>Age</i>						
12 LW	24.4	Reference	Basis			
16 LW	39.8	1.29 (0.18)	3.62 (7.37-15.60)	<0.001	<0.001	
20 LW	60.4	2.37 (0.19)	10.72 (7.37-15.60)	<0.001		
<i>Genoytpe*Feed</i>		0.49 (0.13)	1.64 (0.81-3.21)		0.027	
<i>Genotype*Age</i>		1.49 (0.38)	3.44 (2.29-5.59)		<0.001	
Constant		-3.00 (0.26)				

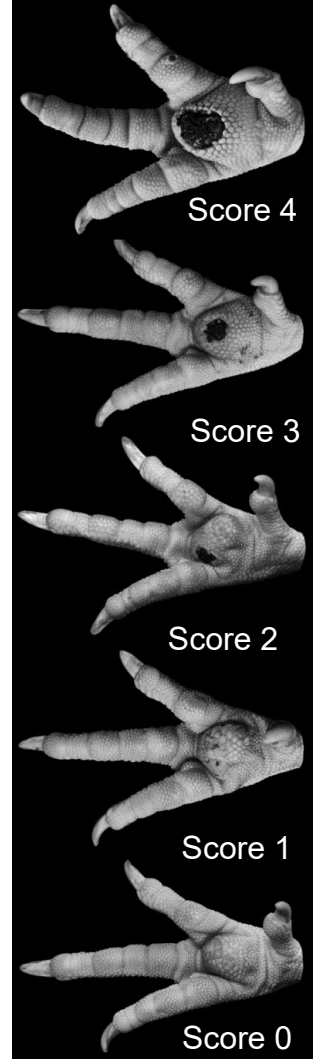
Footpad dermatitis during rearing



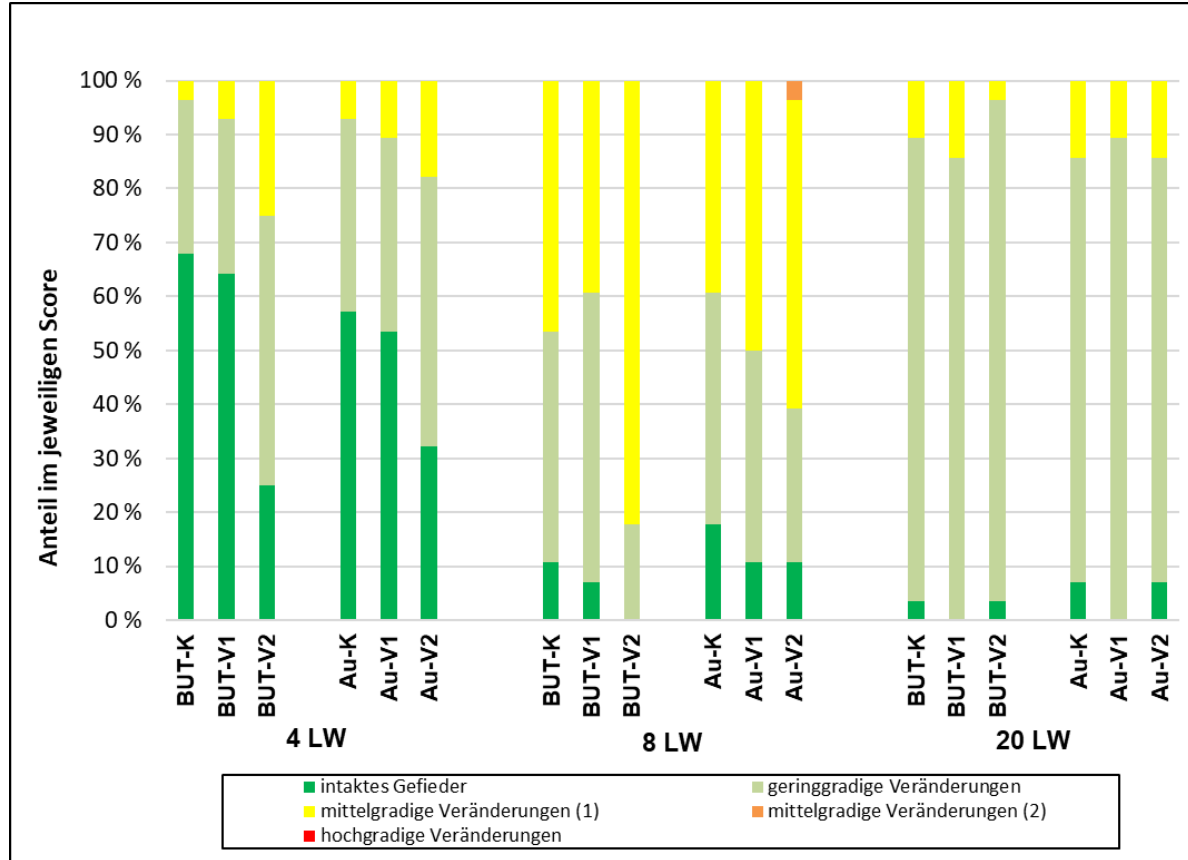
Significant effect of Feed. Husbandry. Age. Genotype*Feed and Genotype*Husbandry ($p < 0.05$)

Ranking of Husbandry: HS1 < HS3 < HS2

Hocking et al. (2008)



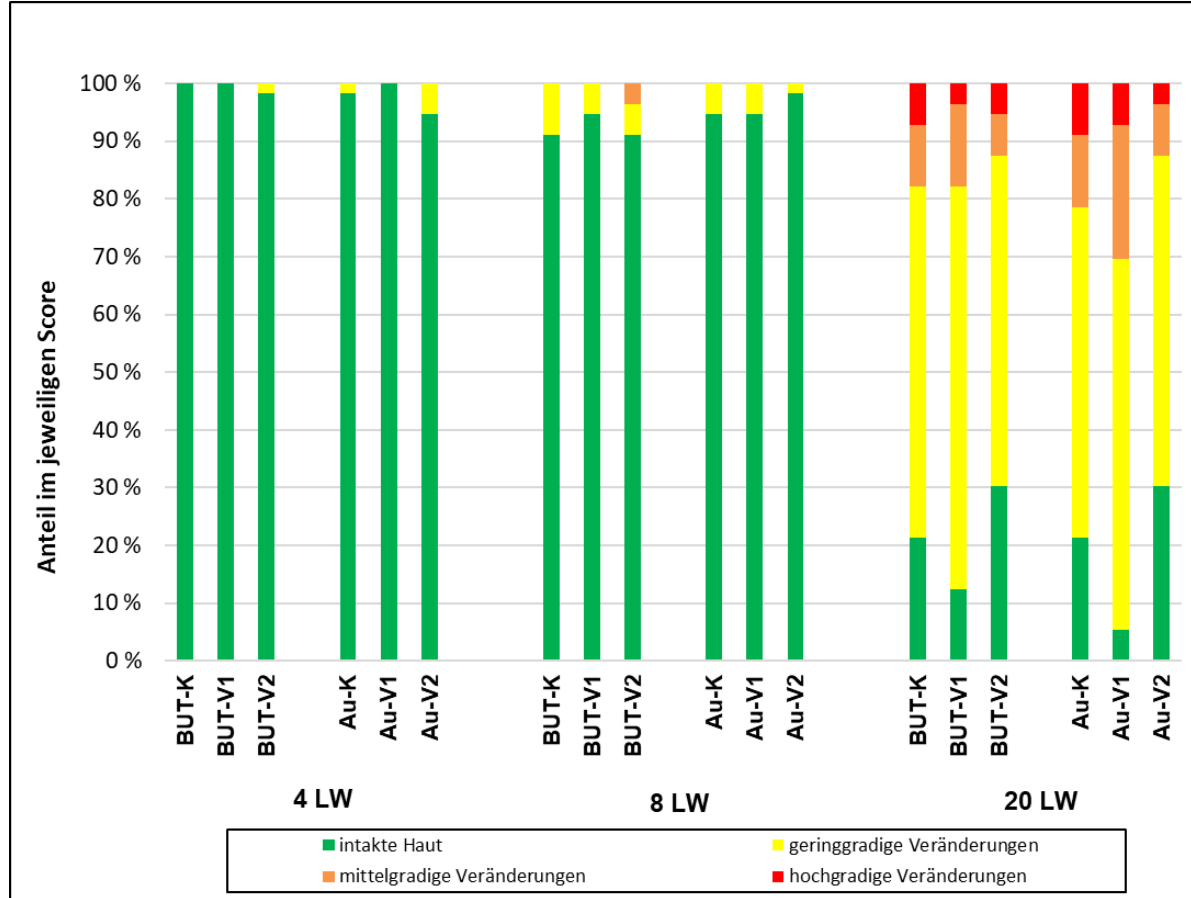
Plumage condition



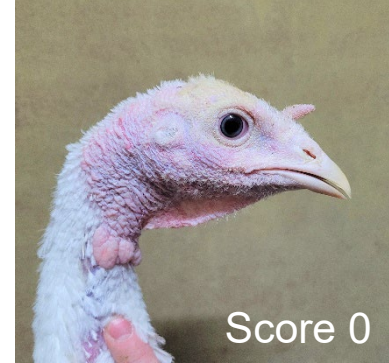
Significant effects of Age. Feed. Feed*Age ($p < 0.05$)

Control group with less alterations than V2

Injuries



significant effect of Age and interaction of Feed*Age ($p < 0.05$)



Conclusions



A more restrictive EAA supply did not result in an increase in plumage damage and skin injuries associated with behavioral disorders.



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Thank you
for your attention!

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Feeding

Item	Phase 1		Phase 2		Phase 3		Phase 4		Phase 5	
	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
DM	90.8	90.7	86.5	87.2	88.0	88.2	87.4	87.2	88.7	87.1
Crude ash	81.0	82.0	68.0	67.0	70.0	63.0	58.0	60.0	53.0	52.0
Crude protein	280	278	245	246	216	218	188	186	170	163
Lysine	14.2	14.3	12.0	12.5	11.0	10.7	9.5	9.4	7.6	7.3
Methionine	5.0	4.8	4.3	4.5	3.9	3.9	3.4	3.3	2.9	2.7
AME _N (MJ) ¹	11.6	11.5	11.5	11.5	11.6	11.8	12.0	12.0	12.4	11.9
Lysine/AME _N (g/MJ)	1.22	1.24	1.04	1.09	0.95	0.91	0.79	0.78	0.61	0.61
Methionine/AME _N (g/MJ)	0.43	0.42	0.37	0.39	0.34	0.33	0.28	0.28	0.23	0.23
Riboflavin (mg/kg)	4.5	8.9	3.8	11.9	4.7	5.2	3.0	5.2	2.7	4.9