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APRI FACTS

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CARCASS QUALITY AND SKIN INTEGRITY OF TOE-TRIMMED BROILER CHICKENS

Introduction

Some strains of commercial broilers are more excitable than others and are prone to inflicting damage on one another. Minimizing carcass scratches is essential to ensuring high quality processed product. Additionally, carcass scratches are often associated with cellulitis, which is the most common reason for carcass condemnation across Canada. Carcasses from birds on increasing day length consistently have more damage to the skin in the form of scratches than birds on continuous light. Toe-trimming or clipping is a procedure widely used in the turkey industry to reduce carcass damage. Traditionally, turkeys have been toe trimmed using a procedure similar to beak trimming. This is a labor-intensive process and contributes to the rising costs of poultry production. Currently, equipment is in use that uses microwave energy to sterilize the germinal tissue from which the claw grows on newly hatched chicks. The objective of this study was to determine if treating the toes of day old broiler chicks with microwave energy to disrupt claw growth would influence growth performance and cause stressful behavior that could impact meat quality and animal welfare.

Trial

Male and female broilers (728 each) were grown under two photoperiod programs known to influence bird activity and growth rate. Half the birds from each sex were toe-treated using a Microwave Claw Processor (Nova-Tech Engineering Inc., MN, USA) where each of the three front toes was treated with microwave energy for 0.8 seconds. All broilers were given 24h light for the first three days. From day four on, half the birds from each sex were on a continuous light schedule while the other half was subjected to an increasing photoperiod program (Table 1). Feed and water were available ad libitum. All birds were given the same starter, grower, and finisher rations. The brooding temperature was 32°C from day 0 to day 7, and then reduced 3°C per week to 21°C. Birds were batch-weighed on a weekly basis. Blood samples were collected from three birds per treatment at 21 and 25 days. Skin samples (right pelvic back area) were collected from two birds per treatment at 38 days. Five birds per treatment were shipped for custom processing on day 38, number of scratches and bruises were recorded for each of these carcasses.

Table 1. Lighting programs used for male and female broilers

Age (d)	Lighting		Light intensity (lux)
	Continuous	Increasing	
0-3	24L[1]:0D[2]	24L:0D	20
4-6	23L:1D	10L:14D	20
7-9	23L:1D	10L:14D	5
10-16	23L:1D	12L:12D	5
17-22	23L:1D	14L:10D	5
23-29	23L:1D	18L:6D	5
30-38	23L:1D	23L:1D	5

[1]L: light [2]D: darkness

Results

Throughout the trial, birds on the increasing photoperiod were lighter than those with continuous light (CL). Bird weight at slaughter was 2.05 kg for the CL and 2.06 kg for the increasing lighting program. Toe-treated birds had lower body weights on day 7, but were the same weight as untreated birds by market age. Neither the microwave toe-treatment nor the lighting programs had a significant effect on the feed conversion ratio (FCR). Toe-treated birds had significantly stronger skin than their untreated counterparts. This may be related to the fact that the activity of enzymes involved in collagen turnover where present at different concentrations in blood plasma samples. The number of bruises on carcasses was less for toe-treated birds**,** also indicating improved skin structure (Table 2). Most importantly, the number of carcasses with scratches was reduced from 80% to 4% with the implementation of microwave toe-treatment. Microwave toe-treatment did not affect plasma creatine kinase activity, heterophil to lymphocyte ratio, or the duration of tonic immobility, suggesting that microwave toe-treatment did not influence the bird's stress or fear levels.

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Table 2. Effect of lighting, microwave toe-treatment and sex on carcass scratches and bruises at 38 days of age

	Treatment					
	Lighting		Toe		Sex	
	Continuous	Increasing	Intact	Treated	Female	Male
Scratched birds	59	76	130	7	70	66
Unscratched birds	100	83	29	152	89	93
Total birds	159	159	159	159	159	159
Scratched birds (%)	37.11	47.80	81.76	4.40	44.03	41.51
X^2	3.720		194.016		0.206	
Probability	0.050		<0.001		0.650	
Bruised birds	41	33	43	29	39	34
Unbruised birds	118	126	116	130	120	125
Total birds	159	159	159	159	159	159
Bruised birds (%)	25.79	20.75	27.04	18.24	24.53	21.38
X^2	1.127		3.519		0.445	
Probability	0.288		0.061		0.505	

Carcass scratches and bruises data were analyzed by Chi-square.

Industry impact

Microwave toe-treatment significantly reduced carcass scratches and increased skin strength without detrimental effects on growth performance. The increasing photoperiod program decreased mortality, reduced feeding costs, and increased skin strength without reducing overall performance of the birds. Used in combination, these methods increase carcasses quality and are therefore of great value to producers and processors, as well as the live bird. The increase in mortality for toe-treated female birds should be addressed further to determine whether adjustments in microwave exposure can reduce this problem while maintaining the benefits of reduced carcass damage. The reduction in early growth caused by the toe-treatment suggests that the toe-treatment could pose an initial stress in the broilers, although the pain endured by the bird early in life may outweigh the chronic pain of lacerations to the skin of birds later in the rearing period.

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