SELENIUM IN POULTRY DIETS: EFFECT ON pH, COLOR, GLYCOGEN AND LACTATE KINETIC IN FRESH AND AGED *Pectoralis* AND *Gastrocnemius* MUSCLES

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Abstract – The aim of this study was to evaluate the effect of the supplementation on finishing broiler diets with selenium on parameters of meat quality. For this, a corn soya based diet was supplemented with 0,3 ppm of Se from an organic (Selenomethionine) and inorganic source (sodium selenite) and offered to thirty five day old male chickens Ross. At 56 days, the animals were slaughtered. At 10, 45, 90 min and 24 hours post mortem, pH, color, glycogen and lactate content of the *Pectoralis* and *Gastrocnemius* muscles were determined. According to the results, selenium supplementation caused greater pH than the basal diet, darker and redder in *Pectoralis*. Glycogen initial at 10 min was lower with Selenomethionine in *Pectoralis,* but glycogen degradation and final glycogen were not different with Se supplementation. No differences in initial glycogen in *Gastrocnemius* were observed. An effect of diet was obtained on the lactate level with Se supplementation without effect of source. Selenium supplementation is a valuable tool to modulate pH, colour and glycogen store and could be used to improve the quality of poultry meat.

I. INTRODUCTION

The consumption of poultry meat has increased in recent years in the region and the world due to the high nutritional value, health - effect and functional attributes (1). However, the production of poultry meat is facing new challenges that make the concept of nutritional, sensory and technological quality. The major problems of poultry meat that occur in the post mortem may be originated in the ante mortem period, when diet is one of the factors that may influence them. In the post mortem avian muscle suffers important metabolic changes that result in a decrease in the pH of the meat up to 24 hours. Speed of fall and the final value reached; inherit sensory, organoleptic, nutritional and technological quality of poultry meat. The extent and rate of pH fall hits the most indicative of the sensory quality parameters (texture, juiciness, tenderness, flavor, and odor) that affect the acceptability for consumption and promotes a series of biochemical processes modifying the suitability of meat for processing and preservation (2). Oxidative processes such as lipid peroxidation and carbonyl formation (3) is the most prevalent factor in conservation and would strongly affect the water holding and colour. Glycogen stores in the *pre mortem*, is key on the pH falling. A strategic dietary modification to modulate the glycogen utilization could be improve the meat quality and the properties of this for processing. Dietary selenium whose antioxidant effect has been well showed (4), has also a insulin-like (5) effect and it has been observed that it could modify the glycogen stores and the glycolysis (6). According this role in muscle, a hypothesis that the Se supplementation could modulate the glycogen metabolism in poultry could be raised. However, the assimilative capacity of the Se dietary and the possible effect in muscle is largely dependent on the source used, either organic as selenomethionine or inorganic like sodium selenite (7, 8). In relation to the above exposed, the aim of this work was to study the effect of the incorporation of dietary organic and inorganic sources of selenium on pH, colour, and glycogen and lactate kinetic *post mortem* in the avian muscles.

II. MATERIALS AND METHODS

One-day old Ross birds were grown until thirty -five days on litter floor, in climate room with a 23 hours photoperiod. They were fed with a commercial corn-soya diet (21.2% CP, 3191 kcal/kg ME) and fresh water was given *ad libitum*. At thirty-five days twenty-seven birds were divided into three groups of nine birds each one and fed, *ad libitum*, with one of the experimental diets until sacrifice. At fifty-six days old, all the birds were sacrificed according to the CHEA rules. A corn-soya base diet was formulated and considered as a basal diet (9). The other two diets were supplemented with Se from an organic source (0.3 ppm Se, as seleniometionina, SeMet) and an inorganic

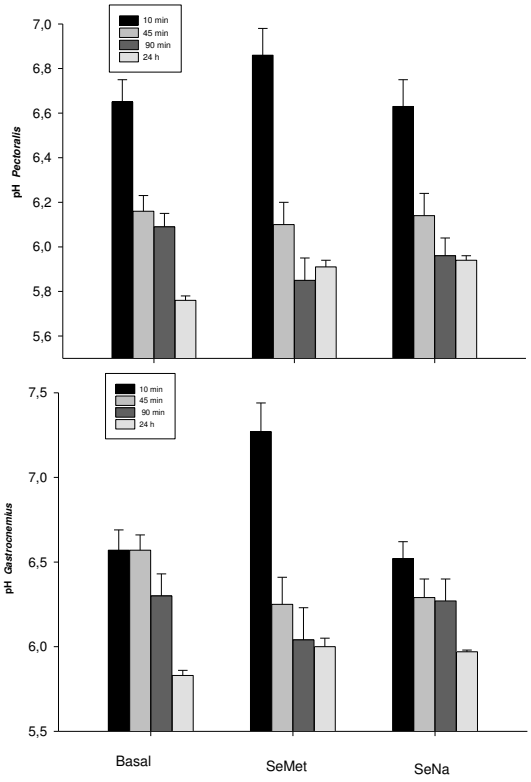
source (0.3 ppm Se, as sodium selenite, SeNa). All diets were iso- protein and iso- energetic (20% CP, 3100 Kcal/kg ME). Immediately after slaughter, pH, color and determinations of glycogen and lactate were carried up at 10, 45, 90 minutes and 24 hours *post mortem* (maintained at 4°C) in the *Pectoralis* and *Gastrocnemius* muscle. To measure pH, a penetration pH meter LT Lutron pH-201 was used. Meat color was determined using CIELAB method L*, a* b* at 10, 45 minutes and 24 hours with a Minolta Lab CR-10 colorimeter. Glycogen was determined as free glucose with an enzymatic colorimetric diagnostic kit trinder GOD-POD and expressed as mg glucose/kg fresh meat. Lactate was determined from the same hydrolyzed using an enzymatic colorimetric kit LO-POD Spinreact 10001330 and expressed as mg lactate/kg fresh meat. Data were analyzed by repeated measures ANOVA (NCSS, 2007) with mains effects of diet, muscle and time *post mortem* or ANOVA one way (for the same muscle and among diets at each time) and *post hoc* Tukey test when significance was obtained ($p<0.05$).

III. RESULTS AND DISCUSSION

In this work pH was measured at 10, 45 and 90 min and 24 hours *post mortem* in response to the organic and inorganic selenium sources, which results are shown in Figure 1. The supplementation with Se did not affect the pH values ($p>0.45$) when both muscles are considered. There was a clear effect of muscle ($P=0.004$) and a clear effect of time ($P=0.004$), which is in accordance with the changes in the muscle metabolism that occur after sacrifice. When each time is considered, in *Pectoralis* and in *Gastrocnemius*, at 24 hours *post mortem*, SeNa and SeMet provoked pH higher than basal diet ($p<0.001$ and $p<0.05$ respectively). The animals feed with SeMet showed a darker and redder meat at 24 hours *post mortem*, but in accordance with the values found by (2) in *Pectoralis* muscle of commercial chickens. No other differences were found in b* parameters.

Mains effects of diet on glycogen were not obtained, while significant differences due to muscle and time were observed (Table 1). Glycogen initial at 10 min was lower with SeMet in *Pectoralis,* but glycogen degradation and final glycogen were not different with Se supplementation ($p>0.47$). No differences in initial glycogen in *Gastrocnemius* were observed.

An effect of diet was obtained on the lactate level with Se supplementation (Table 2). More lactate was produced in meat from animals receiving Se ($p<0.05$), without effect of source.



Main effects					P
Diet	Basal	SeMet	SeNa		
	6.26	6.28	6.26		0.45
Time	10min	45min	90min	24hs	
	6.75a	6.25b	6.11c	5.90d	0.01
Muscle	*Gastrocnemius*		*Pectoralis*		
	6.39a		6.18b		0.01

Figure1. Effect of organic (SeMet) and inorganic (SeNa) Se supplementation in a diet received two weeks prior sacrifice on pH evolution at 10, 45, 90 min and 24 hours *post mortem* in the *Pectoralis* and *Gastrocnemius* muscles. Data are mean ± SEM. Mains effects are analyzed by repeated measures ANOVA for diet, muscle and time *post mortem* .

Table 1. Effect of supplementation and source of Selenium (SeMet, selenium methionene; SeNa, Senite de sodium) in poultry diet on the kinetics of glycogen (g/100 g meat) at 10, 45, 90 min and 24 hours *post mortem* in *Pectoralis* (PM) and *Gastrocnemius* (GM) muscles.

Data are mean ± SEM. Mains effects are analyzed by repeated measures ANOVA for diet, muscle and time *post mortem.*

		Selenium source		
Muscles	Time *post mortem*	Basal	SeMet	SeNa
PM	10min	11.3	6.35	14.4
	45min	8.16	6.04	7.58
	90 min	7.60	7.74	5.91
	24 hours	4.67	6.56	5.92
GM	10 min	4.03	3.98	5.47
	45 min	4.84	3.74	4.31
	90 min	4.43	5.62	4.56
	24 hours	4.76	4.56	4.76
Main effects:				
	Diet: p<0.47			
	Muscle: p<0.001 PM>GM			
	Time: p<0.01 10 min>45 min>90 min>24 hours			

Table 2. Effect of supplementation and source of Selenium (SeMet, selenium methionine; SeNa, Selenite de sodium) in poultry diet on the kinetics of lactate (g/100 g meat) at 10, 45, 90 min and 24 hours *post mortem* in *Pectoralis* (PM) and *Gastrocnemius* (GM) muscles.

Data are mean ± SEM. Mains effects are analyzed by repeated measures ANOVA for diet, muscle and time *post mortem* .

		Selenium source		
Muscles	Time *post mortem*	Basal	SeMet	SeNa
PM	10 min	0.85	1.43	1.62
	45 min	1.34	1.59	1.64
	90 min	1.54	1.61	1.69
	24 hours	1.74	1.16	1.16
GM	10 min	1.03	0.70	0.88
	45 min	1.35	1.14	0.91
	90 min	1.16	1.25	0.89
	24 hours	1.24	0.94	0.96
Main effects				
	Diet: p<0.05 Basal>SeMet,SeNa			
	Muscle: p<0.001 PM>GM			
	Time: p<0.001 24 hours>90 min>45 min>10 min			

IV. CONCLUSION

Selenium supplementation has modified pH, colour, initial glycogen and level of lactate in poultry meat. The source of Se has influenced initial glycogen but not on the initial lactate level. Strategic dietary selenium could be a tool to improve the meat quality.

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