

MEAT FROM ABERDEEN ANGUS STEERS FINISHED ON CONCENTRATE SUPPLEMENTED WITH ORGANIC SELENIUM (2): CARDIOVASCULAR HEALTH INDICES AND LIPID METABOLISM ENZYMES ACTIVITIES

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I. INTRODUCTION

Studies showed that the supplementation with organic selenium in the diet of beef, pig, and chicken could modify the fatty acid profiles of their meat [1]. However, that effect remains controversial, and particularly for bovine meat. As fatty acids are clearly involved in the cardiovascular health of human, this work intended to determine if the feed supplementation with organic selenium of Aberdeen Angus steers finished on concentrate, could modify the fatty acids composition of their meat, and through them some cardiovascular health indices. That has been done through the estimation of some indices based on the fatty acids composition of meat. Those indices are generally used to rank foods about their potential effect on the promotion of cardiovascular diseases. At the same time, the fatty acids composition has been used for the determination of lipid metabolism enzymes activities, such as desaturases, elongases, and thioesterases. Those activities have been done through the estimation by estimation, relating the amount of the specific substrate to the corresponding product of the respective enzyme [1]. These indexes can be used as surrogates of the measure of the true enzyme activities [2]. This part of the investigation has been designed to see if there is an effect of organic selenium on the estimated activities of lipid metabolism enzymes in bovine meat produced on concentrate.

II. MATERIALS AND METHODS

The meat was from ten Aberdeen Angus steers for each treatment (24-28 months, 505-523 kg of final live weight), initially reared on pasture, and finished on concentrate supplemented with organic selenium for 110 days before slaughtering. The concentrate was sorghum silage whole plant and sorghum wet seeds (both high tannins variety), wheat bran and a minerals-vitamins complex having wheat bran as support and containing also urea and Monensin. The selenium supplemented concentrate (Selenium +) contained additionally 0.30 mg Se/kg of dry matter, included as selenium-enriched yeast (ensuring an intake of 1.5 g of selenium /day/steer). After slaughtering, carcasses were kept refrigerated at 1-2 °C for 36 hours Postmortem and then the *Longissimus dorsi* muscle (10-12th rib) was withdrawn and conserved vacuum packaged at - 20 °C until analysis. Fatty acids determination have been done as previously described [1]. The estimation of cardiovascular health indices, including atherogenic (AI), thrombogenic (TI) and hypercholesterolemic (HI) ones, and the lipid metabolism enzymes activities were done according to the procedures previously described [1-2]. Results were statistically analyzed by t-Test using NCSS 2007 software. The Committee on Experimental Animals of the Universidad de la República, Montevideo, Uruguay (CHEA), approved the animal care and handling.

III. RESULTS AND DISCUSSION

The cardiovascular health and lipid metabolism enzymes indices were presented in Table 1. All those estimations were based on the fatty acids composition of the meat (data not presented here). No significant differences have been observed for the saturated (with and without the neutral C18:0 fatty acid), monounsaturated and polyunsaturated fatty acids (Table 1). Almost all of the indices related to the cardiovascular health, such as n-6 fatty acids, DHA + EPA, polyunsaturated/saturated fatty acids ratio, CLA, AI, TI and HI showed no effect of the supplementations with organic selenium. Only the total percentage of n-3 fatty acids detected in meat showed a significant reduction in the meat of selenium supplemented animals (Table 1). This unexpected lower level of n-3 fatty acids, added a bit more controversy about the effect of organic selenium on the fatty acids composition in bovine meat finished on concentrate. In the case of the lipid metabolism enzymes, the only significant effect of the supplementation of organic selenium in the animal diet was the lower activities of $\Delta 5 + \Delta 6$ desaturases. That could explain the lower percentage of total n-3 fatty acids observed here. Indeed, $\Delta 5 + \Delta 6$ desaturases are responsible for the biosynthesis of the n-6 and n-3 polyunsaturated fatty acids in animal tissues.

Table 1: Cardiovascular health indices and lipid metabolism enzymes activities of *Longissimus dorsi* muscle, of Aberdeen Angus steers finished on concentrate supplemented with organic selenium.

	Control		Selenium +		Significance P=
	Means	SEM	Means	SEM	
Cardiovascular health indices					
SFA %	48.27	1.12	47.21	0.79	0.45
SFA wit/C18:0 %	34.18	1.11	32.70	0.63	0.26
C12+14+16 %	32.46	1.07	31.16	0.59	0.30
MUFA %	46.68	0.92	48.46	0.72	0.15
C18:1 %	41.00	0.96	42.89	0.67	0.12
PUFA %	3.42	0.36	2.67	0.28	0.12
n-6 %	2.65	0.29	2.15	0.24	0.21
n-3 %	0.54	0.08	0.36	0.04	0.05
n-6/n-3	5.12	0.31	6.27	0.48	0.06
DHA+EPA %	0.14	0.03	0.08	0.02	0.15
CLA %	0.23	0.03	0.16	0.02	0.06
PUFA/SFA ratio	0.07	0.01	0.06	0.01	0.21
AI	0.95	0.06	0.86	0.03	0.21
TI	1.99	0.10	1.93	0.06	0.61
HI	1.90	0.09	2.02	0.06	0.27
Lipid metabolism enzymes activities					
$\Delta 9$ desaturases Combined Index	1.00	0.04	1.05	0.03	0.34
$\Delta 9$ Desaturase C14	0.18	0.01	0.19	0.01	0.36
$\Delta 9$ Desaturase C16	0.15	0.01	0.15	0.01	0.75
$\Delta 9$ Desaturase C18	2.96	0.13	2.97	0.09	0.95
Elongases	0.48	0.03	0.51	0.01	0.30
Thioesterases	10.31	0.65	11.33	0.45	0.21
$\Delta 5+\Delta 6$ desaturases	14.92	2.09	8.47	1.53	0.02

Values expressed as % are means as % of total detected fatty acids. SEM= standard error of mean, SFA= saturated fatty acids, MUFA= monounsaturated fatty acids, PUFA= polyunsaturated fatty acids, C12+14+16 = sum of C12:0 + C14:0 + C16:0 fatty acids, DHA= C22:6n3. EPA= C20:5n3, CLA= conjugated linoleic acid isomer cis9 trans 11, SFA wit/C18:0= SFA without C18:8, AI= atherogenic indices, TI= thrombogenic indices, HI= hypercholesterolemic indices.

IV. CONCLUSION

The results of the present investigation are inconclusive about the effect of the supplementation of organic selenium on the cardiovascular health and lipid metabolism indices, both based on the fatty acids composition of meat. The controversy about if the organic selenium could modulate some cardiovascular health indices, through the fatty acids composition of meat, has not been resolved here, and more investigation is necessary to highlight the impact of organic selenium on the lipids metabolism and fatty acids composition of bovine meat produced on concentrate.

REFERENCES

- [1] del Puerto, M., Cabrera, M.C. & Saadoun, A. (2017). A Note on Fatty Acids Profile of Meat from Broiler Chickens Supplemented with Inorganic or Organic Selenium. *International Journal of Food Science* 2017, Article ID 7613069, 8 pages, 2017. doi:10.1155/2017/7613069.
- [2] Dal Bosco, A., Mugnai, C., Ruggeri, S., Mattioli, S. & Castellini, C. (2012). Fatty acid composition of meat and estimated indices of lipid metabolism in different poultry genotypes reared under organic system. *Poultry Science* 91: 2039–2045.