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Acidic composition of fresh and dry-cured lard in pigs of Apulo-Calabrese (Calabrese) and Casertana ancient autochthonous genetic types (AAGT)

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Abstract. In the last fifteen years the interest in conjugated linoleic acid isomers (CLA) has increased in relation to their effect on the 'nutritional', 'extranutritional' and 'healthy' for humans. This contribute aims to use the subcutaneous adipose tissue ('lard'), 'fresh' and 'dry-cured' as a means of discriminating racial origin of 'lard'. For this aim, 20 subjects of pig ancient autochthonous genetic types (AAGT) [10 of 'Casertana' (CT) and 10 of 'Apulo Calabrese' ('Calabrese') (CL)], reared at the experimental Farm of ConSDABI Sub-NFP.I – FAO and fed a specially formulated feed not supplemented with linoleic acid (LA) and CLA, were used. The quantitative profile showed an interesting content of CLA, a significant variability depending on the genetic type and product group. CL showed a significantly higher content of CLA and linoleic acid on both 'fresh' and 'dry cured'. In conclusion it is considered that the lard ('fresh' and 'dry-cured') has to be re-evaluated to improve human health.

Keywords. Casertana – Calabrese – CLA – Ancient autochthonous genetic type – Pig.

Composition en acides gras du lard, frais et séché, des types génétiques autochtones Apulo Calabrese et Casertana

Résumé. *Au cours des quinze dernières années, l'intérêt concernant les isomères d'acide linoléique (CLA) a augmenté en lien avec leur effet sur les propriétés 'nutritionnelles', 'extranutritionnelles' et 'santé' pour l'homme. Cette contribution vise à utiliser le gras sous-cutané ('lard') 'frais' et 'séché' pour discriminer l'origine raciale du 'lard'. À cette fin, on a utilisé 20 sujets, 10 Calabresa et 10 Casertana élevés chez le ConSDABI et engraissés avec un aliment spécialement formulé non supplémenté en acide linoléique (LA) et CLA. Le profil quantitatif a montré une teneur intéressante en CLA, variable de façon significative en fonction du type génétique et du groupe de produits, qui a trait à l'étude de la technologie commerciale dans le type génétique. Le CL met en évidence une teneur significativement plus élevée en CLA et en acide linoléique soit sur le 'frais' soit sur le 'séché'. En conclusion on doit fortement réévaluer le lard ('frais' et 'séché') pour la santé de l'homme.*

Mots-clés: *Acides gras – Casertana – Calabrese – CLA – Type génétique autochtone ancien – Porc.*

I – Introduction

Linoleic acid in its conjugated form, so called CLA, was detected for the first time in the lipidic component of milk (Pariza *et al*., 2001) giving rise to a considerable interest for its documented biological effects (Matassino *et al*., 2006; Secchiari, 2006). The biological effects, as demonstrated in a wide range of animal models, are manifested in the following activities: antiatherogenic, antioxidant, anticancer, antibacterial, antiadipogenic (Lin *et al*., 1995); protection against diabetes (Belury *et al*., 2003); promoter of growth factors and immunomodulator (Hwang, 2000 ; Bassaganya-Riera *et al*., 2001, Corino *et al*., 2003). In addition to these biological effects, CLA have the ability to limit the oxidation of polyunsaturated fatty acids (PUFA) in food, reducing the phenomenon of rancidity and thus positively influencing their shelf life (Corino *et al*., 2003).

As it is known, the lipidic profile and, in particular, the content of CLA, are strongly influenced by feed regimen of the animal; even in pigs the influence of feed regimen on the qualitative-quantitative composition of the lipidic fraction was demonstrated (Dugan *et al*., 1997).

With this contribute we want to investigate fatty acid composition and the content of CLA in subcutaneous adipose tissue ('lard') in ‘Apulo Calabrese’ (‘Calabrese’) (CL) and ‘Casertana’ (CT) ancient autochthonous genetic types (AAGT) with the intent to detect differential biomarkers.

II – Materials and methods

The acidic fraction was extracted by the method of Folch from 40 samples of, 'fresh' and 'dry-cured' ‘lard’ obtained from 20 pigs (10 CT and 10 CL) raised in the same farming conditions at the experimental Farm of ConSDABI SUB NFP.I – FAO. The subsequent transesterification of fatty acids linked to glycerol was obtained by methylation of themselves with methanol and, as catalyst, potassium hydroxide (KOH). The methyl esters of fatty acids were then separated by gas chromatography with FID (flame ionization detector) and on-column injector, equipped with CP-Sil 88 column (100 m, 0.25 mm) to better separation. Fatty acid content was expressed as a percentage of total fatty acids revealed. For the assessment of the ‘nutritional’ value of ‘lard’, atherogenic (AI) and thrombogenic (TI) indexes (Ulbricht and Southgaten, 1991) were also calculated.

III – Results

1. Acidic profile

The comparison in saturated (SFA) and unsaturated (UFA) fatty acid of ‘fresh’ and ‘dry-cured’ ‘lard’ from two AAGT’s CL and CT is reported in Table 1.

Table 1. Fresh and dry-cured lard: percentage average content of UFA and SFA and significance of the difference between the two AAGTs

Fatty acids	Fresh lard				Dry-cured lard			
	TGAA		Δ(CL-CT)		TGAA		Δ(CL-CT)	
	CL	CT	Value %	Significance	CL	CT	Value %	Significance
SFA	26.38	34.89	-8.5	0.002	29.30	35.56	-6.26	0.092
UFA	73.62	65.11	8.5	0.003	70.68	64.42	6.26	0.092

As shown in Table 1, the ‘lard’ of CL evidenced, regardless of the product merceological class ('fresh' or 'dry-cured'), a higher average percentage content of unsaturated fatty acids (UFA) and consequently a lower content in saturated fatty acids (SFA). The superiority of UFA in CL, compared to the CT, is highly significant for the 'fresh' ‘lard' (P = 0.003) and significant near to the critical limit for the ‘dry-cured’ ‘lard’.

The apparent decrease of UFA in the ‘dry-cured’ ‘lard’, may be related to the enzymatic mechanism of lipases, that, in swine, during ripening, act on triglycerides giving priority to positions 3 and 1, that are usually occupied by UFA, causing a decrease of the latter in their esterified form.

In both AAGTs, UFA, which have greater impact on the total UFA content are oleic and linoleic acids. As shown in Table 2, only linoleic acid was significantly different between the two AAGTs both in the 'fresh' (P <0.0001) and ‘dry-cured’ (P = 0.001).

The difference between the two AAGTs, was significant only for the following fatty acids: (i) in the ‘fresh’ ‘lard’: myristic acid (P <0.0001), heptadecenoic acid (P = 0.002) and stearic acid (P = 0.008); (ii) in the ‘dry-cured’ ‘lard’: myristic acid (P = 0.007) and heptadecenoic acid (P = 0.02).

The average CLA content (Table 2) was significantly higher in CL compared to CT in both ‘fresh’ (P = 0.002) and ‘dry-cured’ ‘lard’ (P = 0.055)

Table 2. Fresh and dry-cured lard: percentage average content of fatty acids and significance of the difference between the two AAGTs

Fatty acids	Fresh lard				Dry-cured lard			
	AAGT		Δ(CL-CT)		AAGT		Δ(CL-CT)	
	CL	CT	%	Signif.	CL	CT	%	Signif.
Lauric	0.038	0.78	-0.040	0.538	0.072	0.087	-0.015	0.971
Myristic	0.876	1.420	-0.543	<0.0001	0.978	1.464	-0.486	0.007
Palmitic	18.014	22.654	-4.640	0.812	19.408	22.714	-3.306	0.066
Palmitolenic	2.179	2.056	0.123	0.499	1.916	1.990	-0.074	0.926
Heptadecanoic	0.211	0.233	-0.022	0.693	0.225	0.238	-0.013	0.956
Heptadecenoic	0.207	0.220	-0.013	0.002	0.216	0.220	-0.004	0.020
Stearic	7.242	10.509	-3.267	0.008	8.629	10.441	-1.812	0.207
Oleic	41.229	40.346	0.883	0.667	40.115	39.318	0.797	0.987
Cis-12-C-18:1	2.254	1.704	0.550	0.045	1.509	1.525	-0.016	0.809
Linoleic	22.592	16.819	5.773	<0.0001	21.987	17.824	4.162	0.001
γ - Linolenic	0.182	0.194	-0.013	0.498	0.208	0.195	0.013	0.544
Linolenic	2.467	2.093	0.373	0.016	2.346	2.218	0.128	0.779
CLA	2.509	1.673	0.836	0.002	2.371	1.773	0.598	0.055

2. Atherogenic and thrombogenic indexes

The different fatty acid composition influenced AI and TI in the two genetic types. From Table 3 it evident that CL pig, than CT, has a significantly lower value of both indices. The values measured for CL are in agreement with those reported by other authors (Matassino *et al.,* 2005) while CT values are slightly higher (Matassino *et al*., 2008).

Table 3. Fresh and dry-cured lard: atherogenic and thrombogenic indexes and significance between the two AAGTs

Indices	Fresh lard				Dry-cured lard			
	AAGT		Δ(CL-CT)		AAGT		Δ(CL-CT)	
	CL	CT	Value %	Signif.	CL	CT	Value %	Signif.
Atherogenic	0.303	0.448	-0.145	0.006	0.342	0.453	-0.110	0.093
Thrombogenic	0.726	1.074	-0.348	0.001	0.837	1.077	-0.240	0.002

IV – Conclusions

The research showed that some fatty acids can be used to discriminate, whith probabilistic approach, both 'fresh' and 'dry-cured 'lard' provided by a given pig AAGT.

In addition, the 'lard' has an atherogenic and thrombogenic index lower in comparison with other animal and plant origin products discretiting many preconceptions about its inclusion in a human food regime.

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