

Preliminary study on the effects of crude glycerol on the intramuscular fatty acid composition in growing pigs

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- **Biodiesel** = mixture of fatty acid methylesters (FAMEs) from vegetable oils or animal fats
- **Glycerol** is a by-product of biodiesel production
 - a. accounts for the 10% of the total product
 - b. wide range of use (pharmaceuticals, cosmetics)
 - c. as crude by-product in animal feeding (energy source)
- Indications of influence of glycerol on meat quality (drip loss, ultimate pH)
- No clear consensus on the effect of glycerol on meat FA

- Differences between studies on the effects of glycerol on meat FA have been attributed to:

- the amount and profile of FA residues in crude glycerol or
- the reduction of other feedstuffs due to glycerol addition

which potentially modify the dietary FA profile

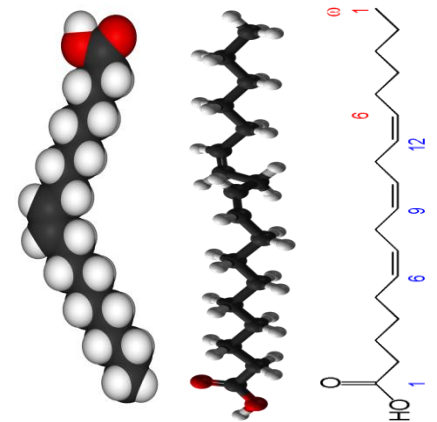
- Amount and profile of FA in glycerol may depend on:
 - efficiency of industrial process to extract the FAMES
 - FA of the oil or fat used

To test:

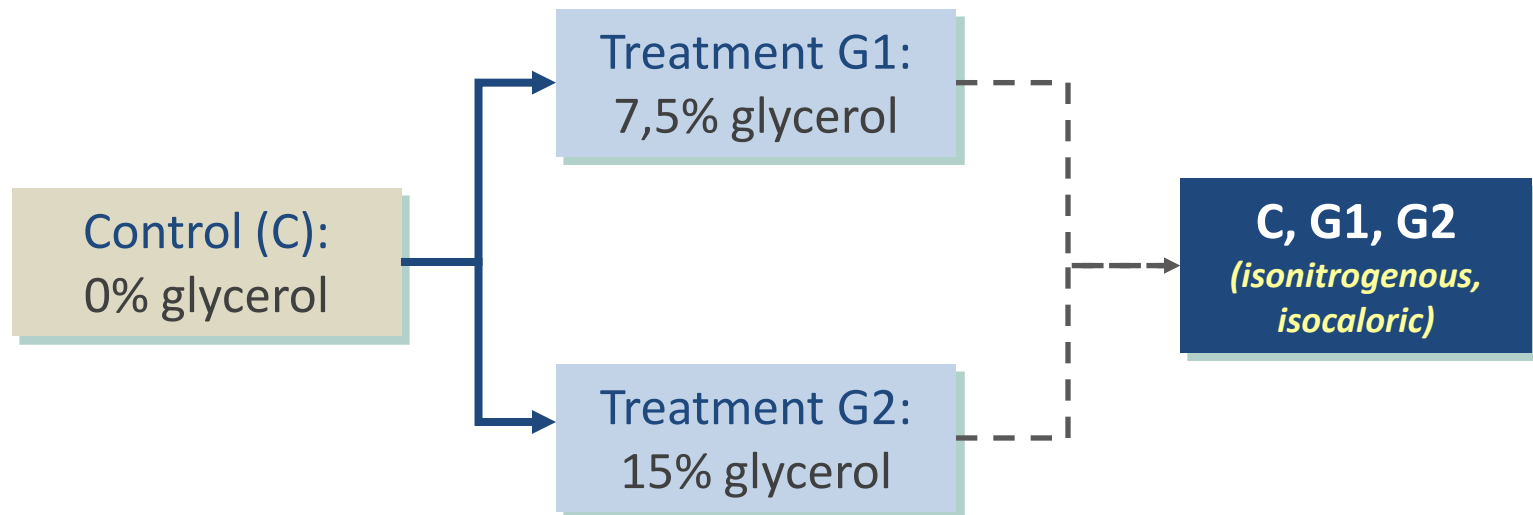
the hypothesis that crude glycerol addition (at the expense of maize mainly) at 7.5 and 15 % in piglet diets

diets

- has an effect on the intramuscular fatty acid composition, due to
- FA residues



- 18 weaned Large White × Pietrain piglets (aged 30 d, average BW= 8 kg)
- allotted in 3 treatments Control (C), G1 and G2



Materials and Methods

Main ingredients and chemical composition of diets and crude glycerol (%)

	Treatment			
	C	G1	G2	
Maize	61.0	47.8	38.5	
Soybean meal	30.0	31.0	32.9	
Wheat bran	4.9	10.0	10.0	
Crude glycerol	-	7.5	15.0	Glycerol
Dry matter	89.4	90.0	90.7	97.7
Digestible energy (MJ/kg)	13.5	13.5	13.6	14,4
Crude protein	19.5	19.5	19.5	-
Ether extract	3.0	2.8	2.5	0.52

Crude glycerol from the processing of a mixture of vegetable oils (palm, soybean, cotton and rape seed) at random proportions

- **Glycerol:** 0.5 lt from each tank (10 tanks) → pooled in 0.5 lt → 8 replicates (1 g) were analyzed for FA
- **Diets:** 4 replicates (1 g) of each diet were analyzed for FA

Fatty acid (% of total FA)	Diet			Glycerol
	C	G1	G2	
C16:0	14.6	14.9	14.6	13.0
C18:0	2.6	2.6	2.6	2.2
C18:1- <i>cis</i> 9	21.8	21.0	20.9	42.6
C18:2 n -6	53.8	54.2	54.4	31.6
C18:3 n -3	3.7	3.9	4.2	5.9
Others ¹	3.5	3.4	3.3	4.7

¹ C14:0, C16:1, C18:1-*cis*11, C20:0, C20:1, C20:2

- At the end of the growing period (72 days of age) pigs were euthanatized
 - a chop of loin muscle was excised, vacuum packed and kept at -20°C
 - Direct FAME synthesis for all diet, glycerol and muscle samples. GC analysis on polar column (HP-88). Identification and quantification using FAME mix and C13:0 as internal std, respectively
- Linear and quadratic effects of dietary glycerol were studied by using polynomial contrasts (SPSS v.17.0)

- Glycerol FA residues reflected the FA contained in the vegetable oils used for the biofuel production

Fatty acid (% total FA)	Vegetable oil ¹				Glycerol ²
	Palm	Rapeseed	Cotton seed	Soybean	
C16:0	43.8	5.1	24.2	10.8	13.0
C18:0	4.4	1.7	2.3	3.9	2.2
C18:1- <i>cis</i> 9	39.1	60.1	17.4	23.9	42.6
C18:2 n -6	10.2	21.5	53.2	52.1	31.6
C18:3 n -3	0.3	9.9	0.2	7.8	5.9

¹ Adapted from Dubois et al. (2007)

² As analyzed

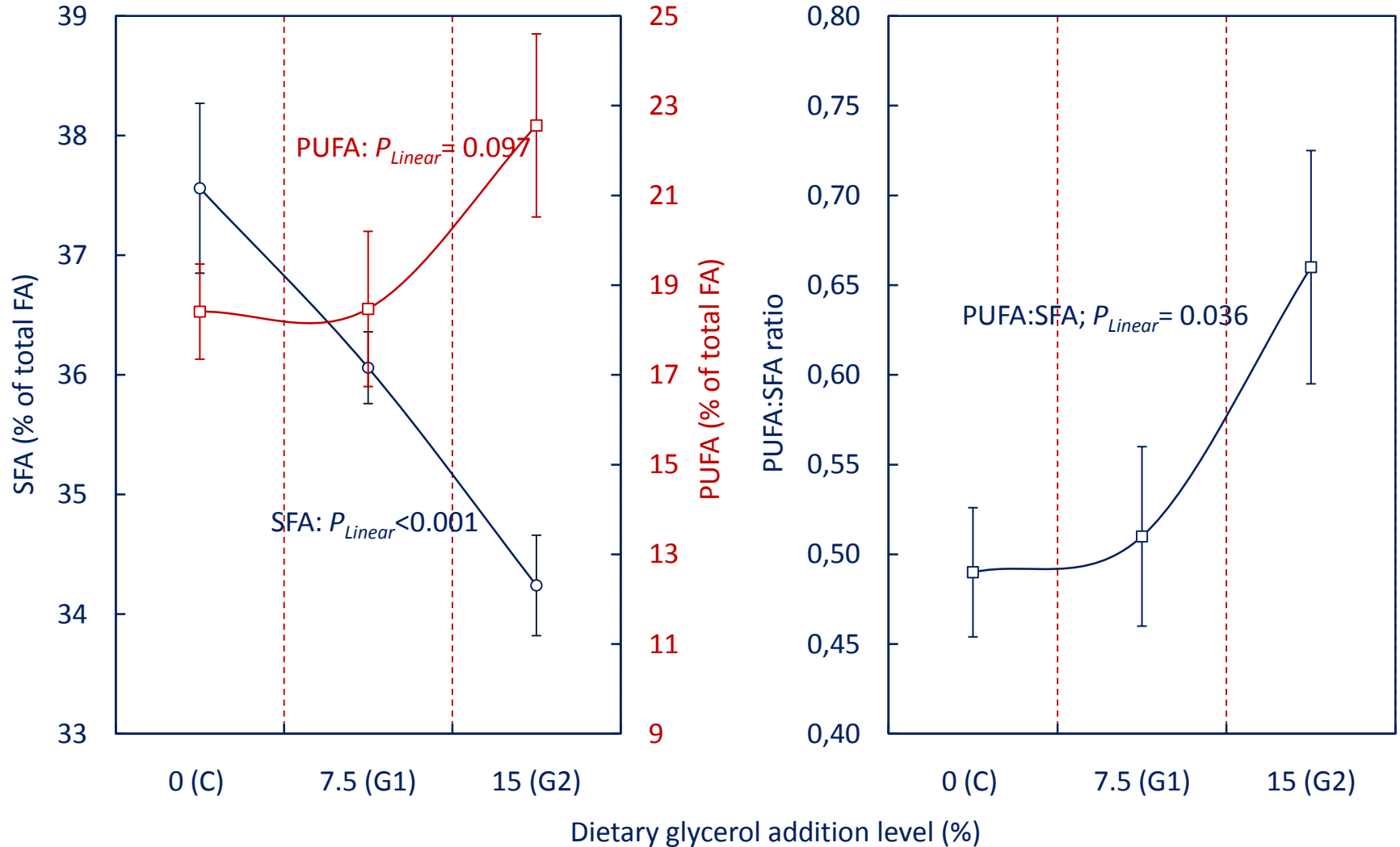
Intramuscular total weights of FA (mg FA/100g wet tissue) and FA composition (% of total FA)

(treatment)	Glycerol addition level (%)			SEM ¹	P_{Linear} ²
	0 (C)	7.5 (G1)	15.0 (G2)		
Total FA	1076	1196	967	110.8	0.483
C14:0	1.16	0.99	0.83	0.095	0.003
C16:0	24.34	22.59	20.96	0.724	<0.001
C18:2 n -6	13.48	13.47	15.63	1.528	0.180
C18:3 n -3	0.42	0.42	0.58	0.052	0.007
C20:3 n -6	0.38	0.39	0.59	0.092	0.037
C20:5 n -3	0.08	0.06	0.18	0.034	0.017
C22:6 n -3	0.30	0.33	0.50	0.045	0.009

¹ SEM, standard error of means

² P-values of polynomial contrasts

Intramuscular SFA, PUFA (% of total FA) and PUFA:SFA ratio



- Modified intramuscular FA profile can be attributed to dietary FA changes brought about by glycerol addition (to some extent)
 - PUFA increasing trend due to dietary PUFA increase
 - SFA decrease likely indicates the conversion of glycerol to glucose rather than to FA
- The effect of glycerol is expected to vary due to the:
 - origin of crude glycerol (saturation degree of FA in the vegetable oil and/or animal fat), level of addition, and regime of supplementation

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Thank you for your
attention