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Milk fatty acid profile in goats receiving high forage or high concentrate diets supplemented, or not, with either whole rapeseeds or sunflower oil

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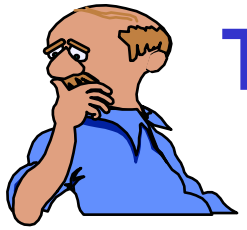
Mammary lipid metabolism :



To evaluate nutritional means to modulate the milk fatty acid composition

To decipher the key level of the regulation of lipid synthesis in mammary gland

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WP3.1.3: Nutrition study on goats

(Months 18-36)

- ✓ **Topics :** Effect of the level of concentrate and lipid supplement on mammary metabolism

- ✓ **Aims :** (i) enhance milk *cis*-MUFA content (particularly oleic acid),
  (ii) maximise differences of milk fat secretion btw goats and cows

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How to maximize the "oleic/trans-18:1" responses in milk fat ?

(INRA 2000-04 database, 43 diets on 413 goats)*
+ (published cow papers)

① Dietary fatty acids

Oleic >> linoleic > or = linolenic

Seeds >> Oils

② Forages

Alfalfa hay > grass hay >>> maize silage

** Chilliard et al, JDS 2003, Woodhead Ltd 2006*

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Experimental design :

A 4x4 Latin Square design with 4-week periods

⇨ 16 lactating goats receiving :

- **high forage /concentrate (60/40) : F**
- **high forage /concentrate + 6-7% whole rapeseeds: F-RS**
- **low forage /concentrate (30/70): C**
- **low forage /concentrate + 4-5% sunflower oil: C-SO**

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Goat dairy performances & Milk FAs (oleic, *trans*)

Diet	F	F-RS	C	C-SO
Milk Yield (kg/d)	4.3^{a}	3.9^{b}	4.2^{a}	4.3^{a}
Fat content (g/kg)	33^{b}	39^{a}	32^{b}	38^{a}
Fat yield (g/d)	140^{bc}	147^{b}	135^{c}	162^{a}
Oleic acid (% FAs)	14.8^{b}	22.7^{a}	14.2^{b}	14.8^{b}
Total *trans* FAs (%)	2.7^{c}	4.4^{b}	3.7^{b}	14.5^{a}

Goat milk FA profile
(*trans*, saturated, PUFA)

Diet	F	F-RS	C	C-SO
Total *trans* FA (%)	2.7^{c}	4.4^{b}	3.7^{b}	14.5^{a}
Incl t11-18:1	0.9^{b}	0.9^{b}	1.3^{b}	7.7^{a}
c9, t11-CLA	0.5^{b}	0.5^{b}	0.8^{b}	3.5^{a}
others	1.3^{d}	3.0^{b}	1.6^{c}	3.3^{a}
Atherogenic FA index (1)	84^{a}	60^{b}	83^{a}	62^{b}
18:3n-3 / 18:2n-6	0.3^{b}	0.5^{a}	0.2^{c}	0.1^{d}

(1) % C12:0 + 4 (% C14:0) + % C16:0)

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Conclusions:

Both F-RS and C-SO ↘ saturated FAs

F-RS ↗ oleic; C-SO ↗ CLA & trans FA

Goat and cow respond very differently :

- milk fat content and yield

- milk FA profile (trans FAs)

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Perspectives :

Effects of these diets (with largely different FA profiles) on mammary gene expression ?

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Development of micro array for transcriptome analyses to identify genes of interest

(C. Leroux et al.)

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Poster Session Ph7.11, Abstract n° 542 by S. Ollier et al :

- **Identification of around 200 genes (among 8,400) regulated by feed deprivation in mammary gland.**

Procedure of micro-array analyses available and will be applied to lipid supplemented diets

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