The influence of genetic selection on the milk fatty acid profile of spring calving dairy cows

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1. Introduction

- Bovine milk contains ~70% saturated fat and 30% unsaturated fat
- Research has shown health benefits associated with unsaturated fats in milk

Has genetic selection influenced the fat composition of milk?

2. Materials and Methods

- 3 groups of Holstein-Friesian (HF) defined:

1. National average genetic merit North American HF
LowNA (n=46) EBI* = €49
2. High genetic merit North American HF
HighNA (n=46) EBI = €77
3. High genetic merit New Zealand HF
HighNZ (n=48) EBI = €89

- Weekly milk samples analysed using mid-infrared spectrometry
- Prediction equations used to determine fat composition
- Fats predicted from milk:
  1. saturated fat (**SAT**)
  2. unsaturated fat (**UNSAT**)
  3. monounsaturated fat (**MONO**)
  3. short chain fatty acids (**SCFA**)
  4. medium chain fatty acids (**MCFA**)
  5. long chain fatty acids (**LCFA**)

***EBI = Economic breeding index - Irelands total merit index**

- Model to investigate the effect of genetic selection on fat composition:

$$Y = \text{Genotype} + \text{Treatment} + \text{Parity} + \text{Week of Lactation} + \text{Cow}$$

3. Results

- Mean fat percent ranged from 4.4% (LowNA) to 4.8% (HighNZ)
- Differences in fat composition observed between HF cows of New Zealand ancestry and HF cows of North American ancestry (Table below)
- No statistical differences between the fat composition of the high and low North American HF group

Effect of genetic group on milk fat constituents (g/100 kg fat)

	SAT	UNSAT	MONO	SCFA	MCFA	LCFA
High NA	66.1 (0.31)^a	35.8 (0.31)^a	29.9 (0.27)^a	9.3 (0.08)^a	46.5 (0.32)^a	44.6 (0.36)^a
Low NA	65.8 (0.30)^a	36.1 (0.31)^a	30.2 (0.27)^a	9.3 (0.08)^a	46.3 (0.32)^a	45.0 (0.36)^a
High NZ	66.8 (0.29)^b	35.1 (0.29)^b	29.2 (0.26)^b	9.6 (0.07)^b	47.2 (0.30)^b	43.7 (0.34)^b
P-value	<0.01	<0.01	<0.01	<0.001	<0.05	<0.01

HighNZ cows produce more saturated fats and less unsaturated fats per kg fat than either the HighNA or LowNA cows

4. Conclusion

- Genetic variation for milk composition is evident
- Cows of NZ ancestry produce more SAT and less UNSAT than cows of NA ancestry
- Selection for the Irish total merit index (EBI) has not influenced the fatty acid profile of milk