Lactation stage dependent genome-wide association mapping for longitudinal data of milk fatty acids in dairy cattle

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Milk fat is not just fat

Different fat fractions have influence on human health

Possibilities to develop new products of milk with high(er) content of specific FA

Foss application note 64

Gregersen et al. 2016

Poulsen & Larsen, 2016
Interest in underlying genetics of fat biosynthesis

Heritability is not constant over lactation
Fatty acid composition is not constant over lactation
Aim of the study

Are there SNP markers influencing the slope of the fatty acid content in the milk?
Materials and Methods

• 3,213 Danish Holstein cows with 24,661 milk samples
• 352 commercial herds
• Genotyped with Eurogenomics chip (10K) and imputed to 50K
• After filtering: 43,807 SNP markers used in the analysis
Materials and Methods

- Bayesian variable selection method

\[ Y_{ijklm} = \mu + Parity_{i} + Season_{j} + \beta_1 \times DIM_{lm} + \beta_2 \times e^{-0.065 \times DIM_{lm}} + Herd_{k} + Cow_{l} + \]

- Parity and Season: fixed
- Days in milk: covariate (Wilmink)
- Herd: Random
- Error: Random

Slope effect on SNP

Intercept effect on SNP
Significant SNPs for intercept effect

C14:0

21 significant SNPs (BF>20)
2.45% $\sigma_p^2$

C16:0

18 significant SNPs
2.10% of $\sigma_p^2$
Overlap SNPs intercept versus slope effect

C14:0_intercept   C14:0_slope

73   6   15

BTA5 and BTA14

C16:0_intercept   C16:0_slope

67   8   10

BTA5 and BTA14
Conclusion

• Slope specific SNPs were detected for both C14:0 and C16:0

• "Slope” SNPs only explain a small part of the variation compared to "intercept” SNPs

• To change the C14:0 and C16:0 in the milk it would be better to focus on the intercept effect of the SNPs
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