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

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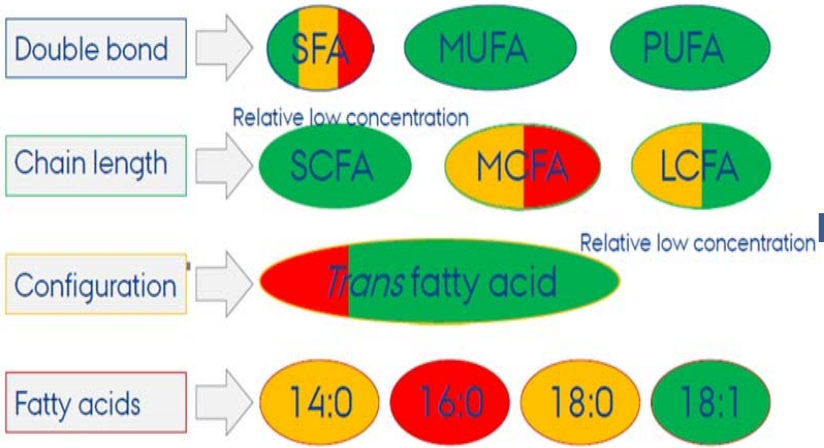
Paper: 321



Milk fat is not just fat

Different fat fractions have influence on human health



Gregersen et al. 2016

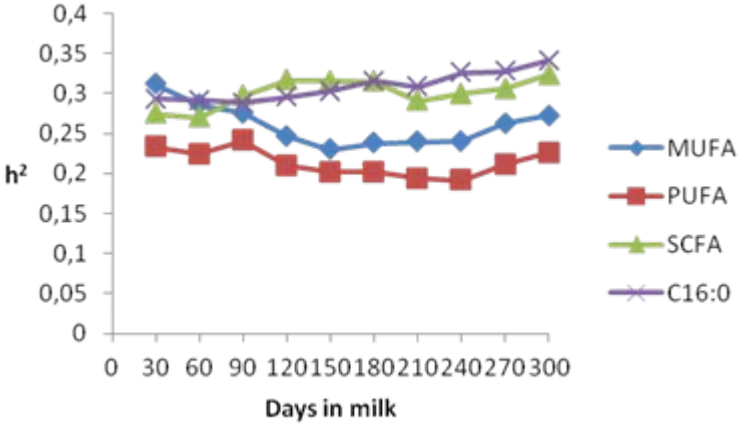
Possibilities to develop new products of milk with high(er) content of specific FA

Poulsen & Larsen, 2016

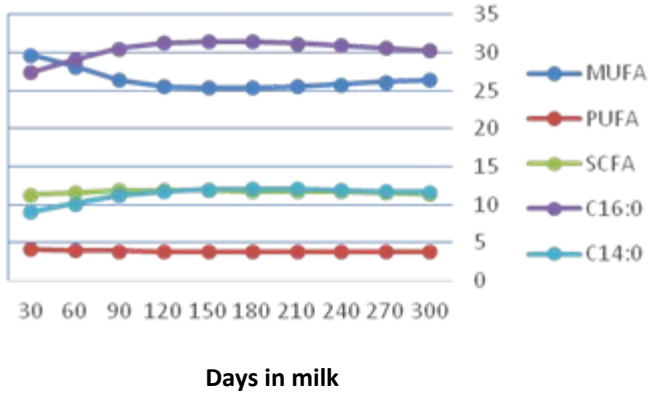
Foss application note 64

Interest in underlying genetics of fat biosynthesis

heritability



% of sum of SFA, MUFA and PUFA



Heritability is not constant over lactation

Fatty acid composition is not constant over lacation

Aim of the study

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

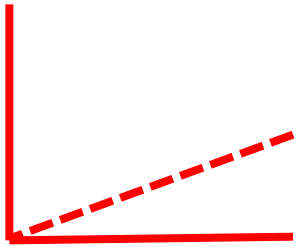
Materials and Methods

- 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

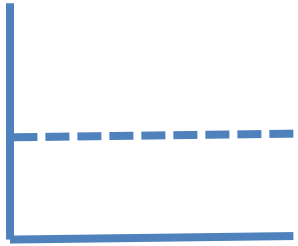
- Bayesian variable selection method

$$Y_{ijklm} = \mu + Parity_i + Season_j + \beta_1 * DIM_{lm} + \beta_2 * e^{-0.065*DIM_{lm}} + Herd_k + Cow_l + CowDIM_l * DIMs_{lm} + e_{ijklm}$$



Slope effect on SNP

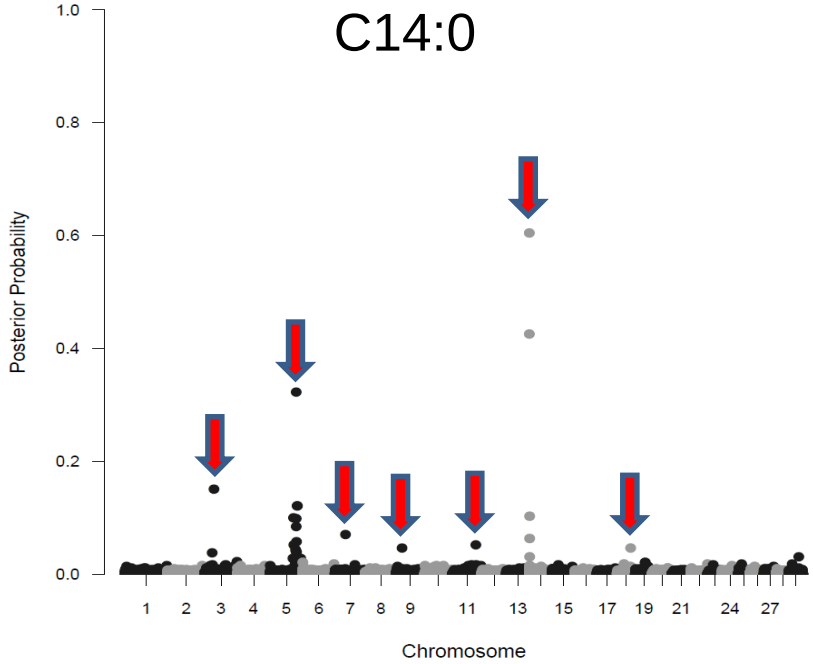
- Parity and Season: fixed
- Days in milk: covariate (Wilmink)
- Herd: Random
- Error: Random



Intercept effect on SNP

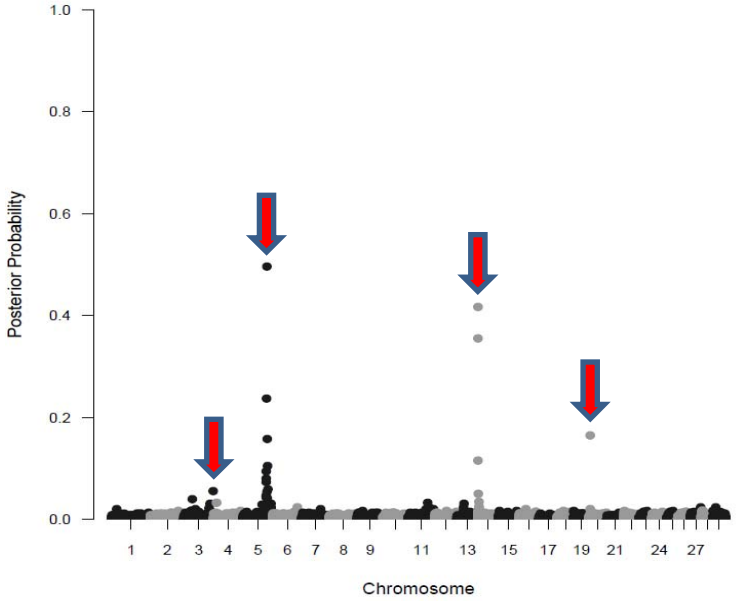
Significant SNPs for intercept effect

C14:0



21 significant SNPs (BF>20)
2.45% σ_P^2

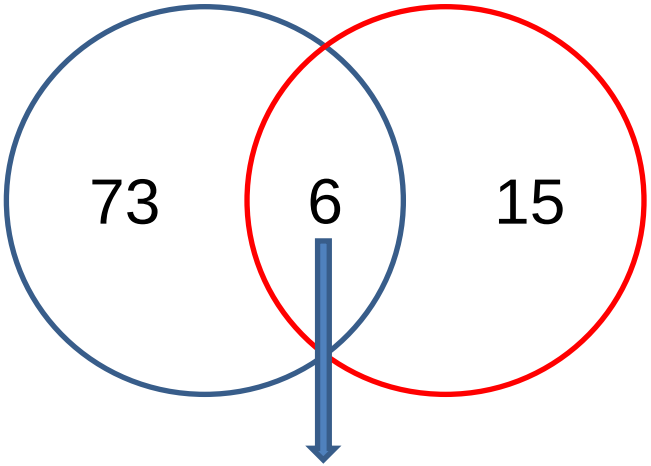
C16:0



18 significant SNPs
2.10% of σ_P^2

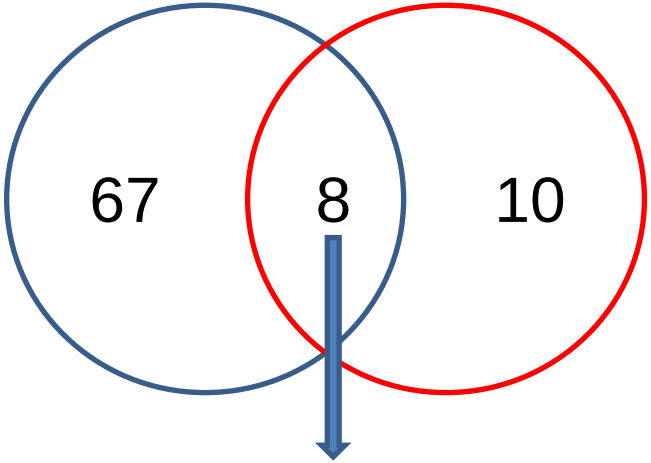
Overlap SNPs intercept *versus* slope effect

C14:0_intercept C14:0_slope



BTA5 and BTA14

C16:0_intercept C16:0_slope



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

Thank you for your attention

Acknowledgement:

SOBCOWS: Specialized organic breeding goals and breeding schemes for dairy cattle

STØTTET AF promilleafgiftsfonden for landbrug

gudp ICROFS Organic RDD AARHUS UNIVERSITET SEGES det økologiske mejeri NATURMÆLK VIKING RYK NordGen Nordic Genetic Resource Center