PROJECT DESCRIPTION – Master's Thesis at the Center for Quantitative genetics and Genomic (https://qgg.au.dk/)

Project title	PREDICTIVE ABILITY OF HOST GENETICS AND RUMEN MICROBIAL COMPOSITION FOR BOVINE MILK CONTENT OF VITAMIN B2 and B12
Main subject area	Animal Genomics, microbiomics
Supervisor and Position E-mail	Grum Gebreyesus, Postdoc: grum.gebreyesus@mbg.au.dk
Co-Supervisor(s), Position(s) E-mail	Bart Buitenhuis: Associate professor; bart.buitenhuis@qgg.au.dk Nina Poulsen: Nina Aagaard Poulsen; nina.poulsen@food.au.dk
Project start	To be decided in agreement with the supervisor.
Physical location of project and students work	Center for Quantitative Genetics and Genomics, AU Foulum, DK-8830 Tjele
Project description	
Project goal and background	Studies have established links between vitamin B12 deficiency and several disorders in humans. Milk and dairy product are some of the best sources for several minerals and vitamins, including riboflavin (vitamin B2) and cobalamin (vitamin B12). The primary origin of these water-soluble vitamins is the biosynthesis by the microorganisms in the rumen. Recently, we have shown that the rumen microbial composition can be more predictive of the milk concentrations of acetate and beta-hydroxybutyric acid; the two major ketone bodies in dairy cow. Building up on these methodologies, this masters project will investigate the proportion of variation in milk vitamin B2 and B12 content that can be explained by the cows' genetics and the composition of the microbiome in its rumen. Furthermore, prediction accuracies using genomic and microbial relationship matrices will be compared through cross validation. Genotype and phenotype data on cows and 16S rRNA sequence data are available for the rumen bacterial and archaeal community.
Specific research topic(s)	1. Estimate proportion of variation in B2 and B12 content of bovine milk explained by host genetics and rumen microbiome 2. Identify bacterial and archaeal OTUs significantly associated with B2 and B12 content of milk

	3. Assess prediction accuracy for B2 and B12 using genomic and microbial relationship matrices
Methods	GWAS, linear mixed models, cross-validation
Additional information	30-45-60 ECTS thesis as appropriate. The MSc student is invited to co-author a scientific publication.