




The RobustMilk project



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Animal Breeding & Genomics Centre


Outline of project




- Innovative and practical breeding tools for improved dairy products from more robust dairy cows
- April 2008 – April 2012
- www.robustmilk.eu





Objective





- To **develop new practical technologies** to allow breeders to re-focus their selection to include **milk quality** and **dairy cow robustness** and to evaluate the **consequences of selection** for these traits taking cognisance of various milk production systems




Definition robustness



- Healthy, fertile, long-living cow
- The capacity to handle environmental disturbances in commonly accepted, economic and sustainable farming systems


Project partners





- Animal Sciences Group, The Netherlands (coordinator)
- Teagasc Moorepark, Ireland
- Gembloux Agricultural University, Belgium
- Swedish University of Agricultural Science, Sweden
- Wageningen University, The Netherlands
- Scottish Agricultural College, UK





Workpackages






1. Common database
2. Phenotypic measurement tools
3. Statistical tools
4. Genomic tools
5. Integration and dissemination
6. Management

WP 1: Database 



- Long term strategy
- Inclusion of data of different research farms
- International pedigree file
- Pointer database
 - Direct data transfer on a project basis


 

WP 2: Phenotypic measurement 

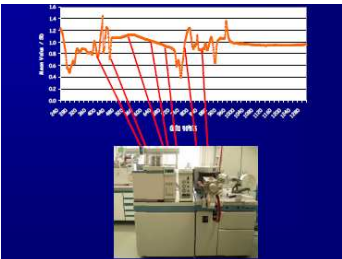
tools



- Predict milk quality using mid-infra red spectrometry (MIR)
 - Milk fatty acid content (GC)
 - Milk lactoferrin content (ELISA)
- Predict animal robustness (health, fertility) using MIR
- Estimate genetic parameters


 

WP 2: Phenotypic measurement 

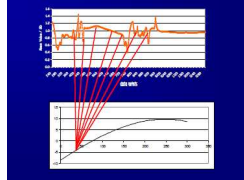
tools





 


WP 2: Phenotypic measurement 

tools






- Regression of MIR on gas chromatography = prediction equation

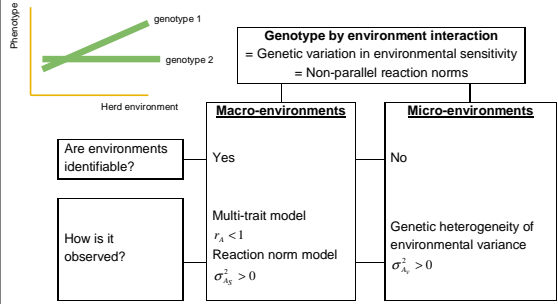
 

WP 3: Statistical tools 

- Statistical models for robustness
 - Genotype by environment interaction
 - Macro- and micro-environmental sensitivity
- Statistical tools for milk quality (SCC)
 - Longitudinal data analysis
 - Also look at variation in SCC
- Joint model for robustness and milk quality

WP 3: Statistical tools 





Genotype by environment interaction
= Genetic variation in environmental sensitivity
= Non-parallel reaction norms


Are environments identifiable? Yes / No

How is it observed? $r_A < 1$, Reaction norm model, $\sigma_{A_s}^2 > 0$

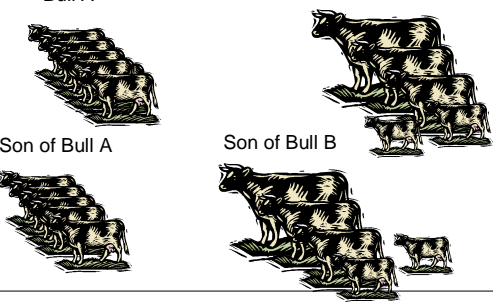
Macro-environments / **Micro-environments**

Genetic heterogeneity of environmental variance $\sigma_{A_s}^2 > 0$



 


WP 3: Statistical tools 

Bull A Micro environment Bull B





Son of Bull A Son of Bull B


 

WP 3: Statistical tools 



- Development of MCMC algorithm to estimate genetic variation in environmental variance (Han Mulder)
 - Currently testing with simulation
 - Message: advanced methods are necessary as well as high quality data
 - Test on real data
- Estimation of reaction norm parameters on Irish data (Jack Windig)
- Future: combine reaction norm model and genetic heterogeneity of environmental variance model


→ If genetic variation exists, it can be utilized to breed more robust and uniform cows



WP 4: Genomic tools 

- Genotype 2,000 Holstein-Friesian cows with excellent phenotypes
- Undertake whole genome association
 - Robustness traits
 - Milk quality
- Development of genomic selection tools
 - Multi-trait extension (Mario Calus)

WP 5: Integration and dissemination 

- Website
 - <http://www.robustmilk.eu>
- Development of selection indices
 - Collection of genetic parameters
 - Collection of (non)-economic weights
 - Evaluate consequences of selection
- Communicate results with scientific community and stakeholders



Thank you for your attention!

<http://www.robustmilk.eu>




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