



# Breeding better health into Texels

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SRUC Research

**iTexel conference 17 November 2018**

*Leading the way in Agriculture and Rural Research, Education and Consulting*

# Why worry about health traits?

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- 'Narrow' selection for 'production only' traits in other species has led to
  - Deterioration in health & fitness of > 100 different traits
- Elite breeding flocks
  - Offspring used on commercial farms
- Genomics offers faster-track solution
  - Health traits are hard to measure

ALSO.....

# We spend a lot of time 'Managing' the problems of disease





# What kind of life?



This??



Or this??



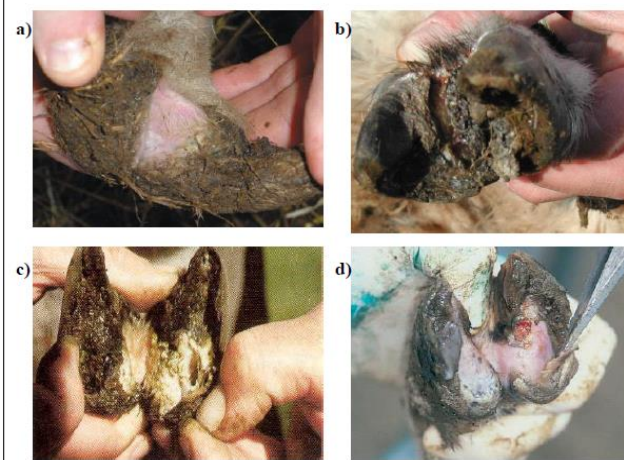


# MASTITIS





# FOOTROT



# Farm visit timings



- **2015 & 2016** data recorded at:
  - Mid-lactation: Average days in milk = 38 days
  - Late-lactation: Average days in milk = 113 days
- **2017 & 2018** data recorded at:
  - 8-week weight: Average days in milk = 62 days

# Number of records



Year	No. ewes
2015*	3,339
2016*	3,482
2017	1,712
2018	1,652

**> 10,000  
records**

**8,764  
genotypes**

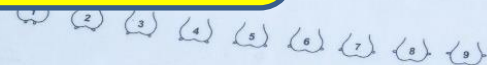
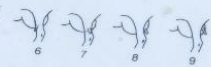
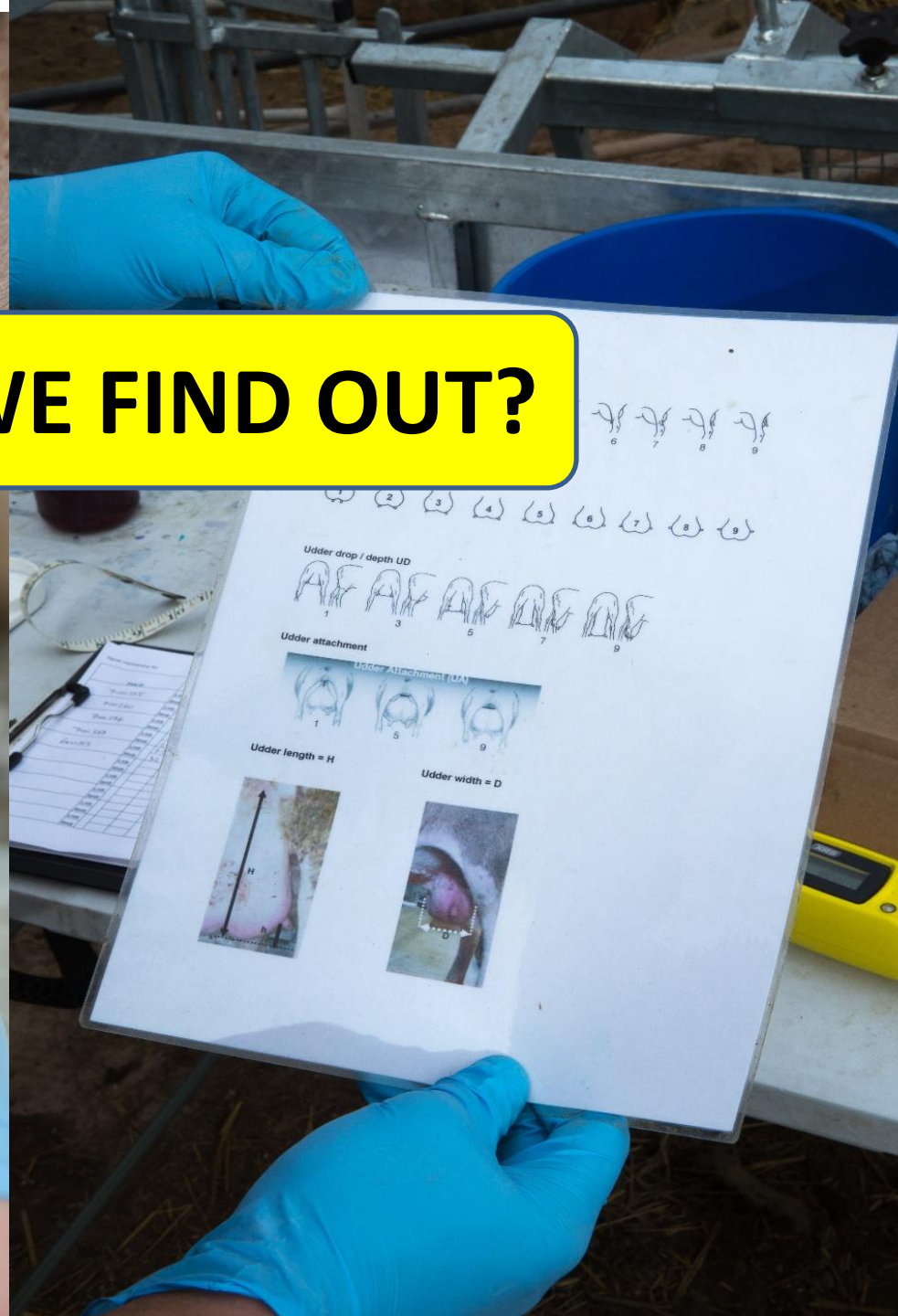
\*ewes scored twice @ 38 & 115



# Milk sampling & nasal swab



# WHAT DID WE FIND OUT?



Udder drop / depth UD



Udder attachment



Udder length = H

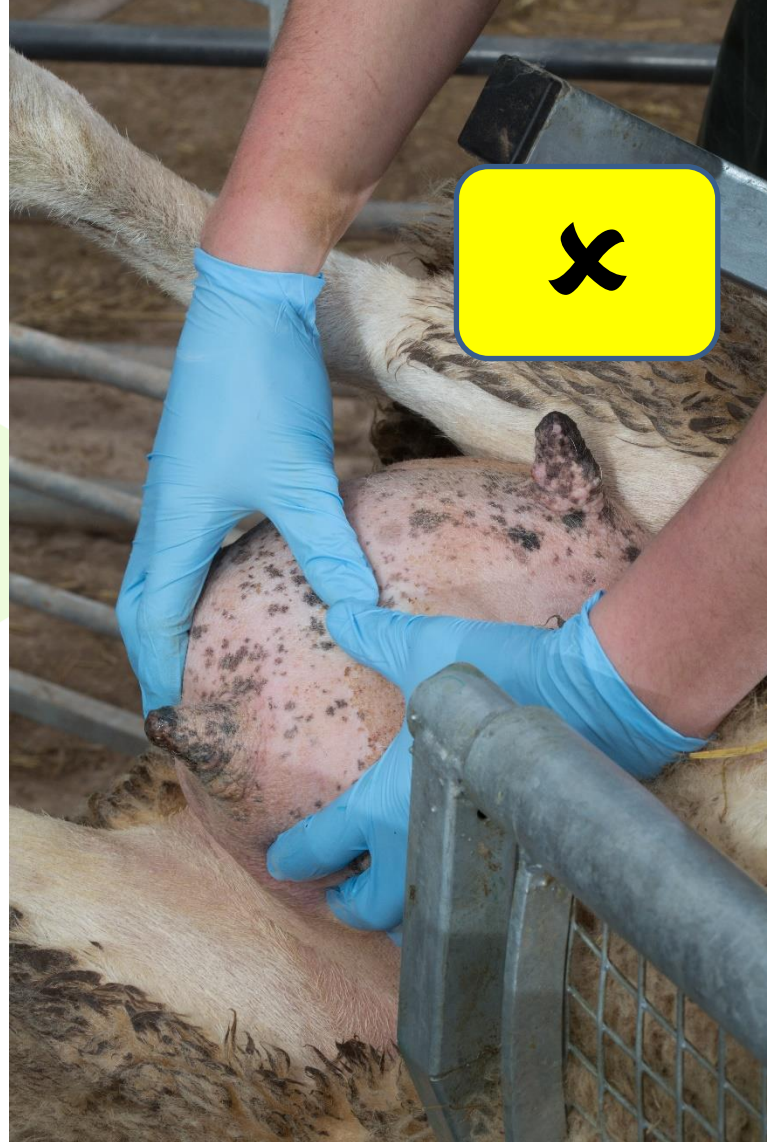


Udder width = D





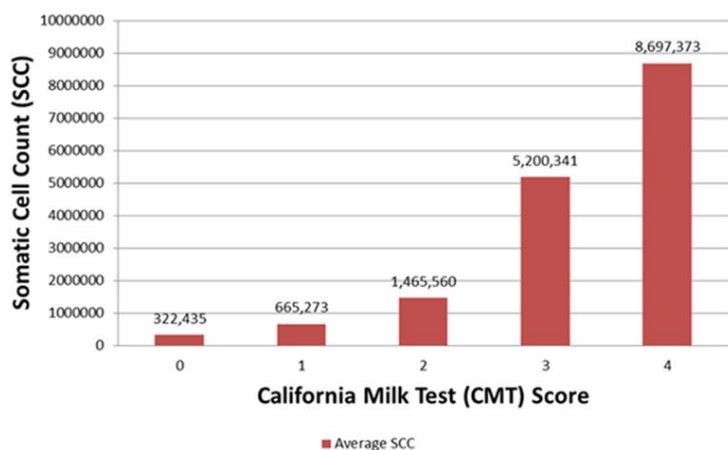
# Mastitis 'phenotyping'



# Somatic Cell Count vs CMT?

- Good predictor ✓

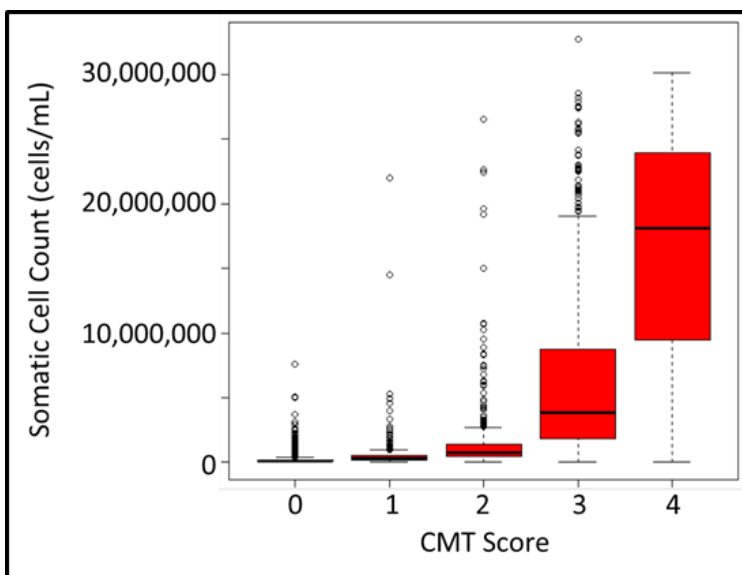
Average SCC for each CMT score



Score 0 (healthy)

Score 4 (serious mastitis infection)

Same (ish) genes



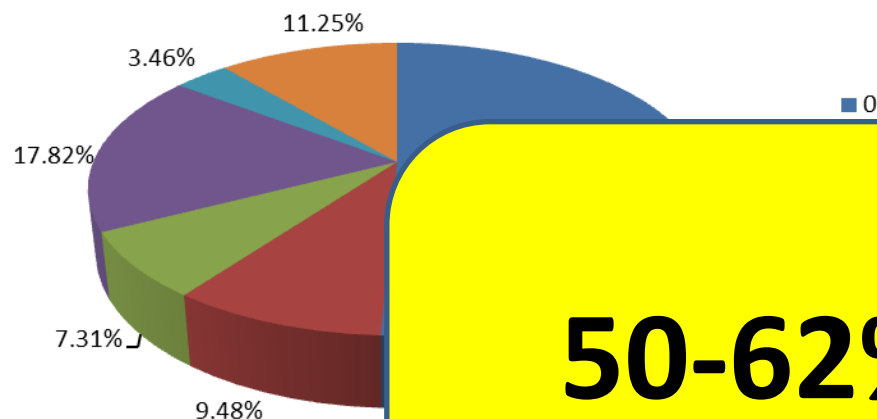
Trait	Heritability
CMT	0.14 (0.08)
SCC	0.23 (0.08)



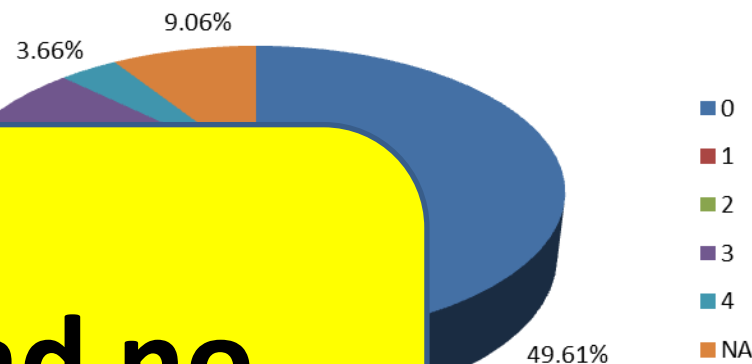
# CMT scores - summary



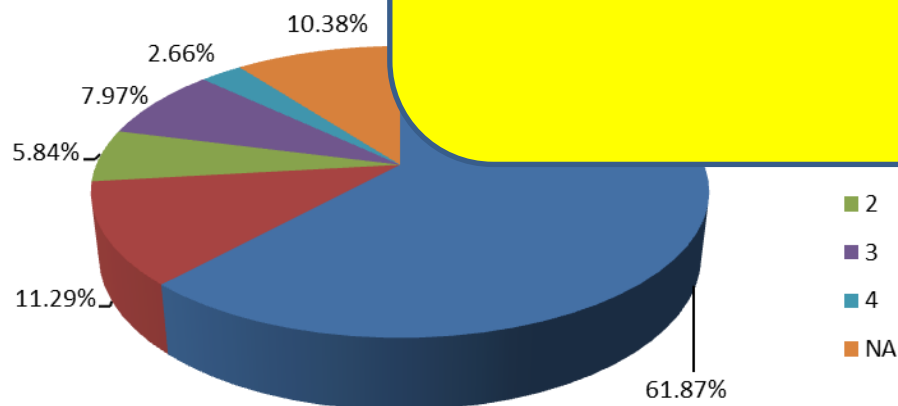
Overall CMT Scores Collected 2015



Overall CMT Scores Collected 2016



Overall CMT Scores Collected 2017



Overall CMT Scores Collected 2018

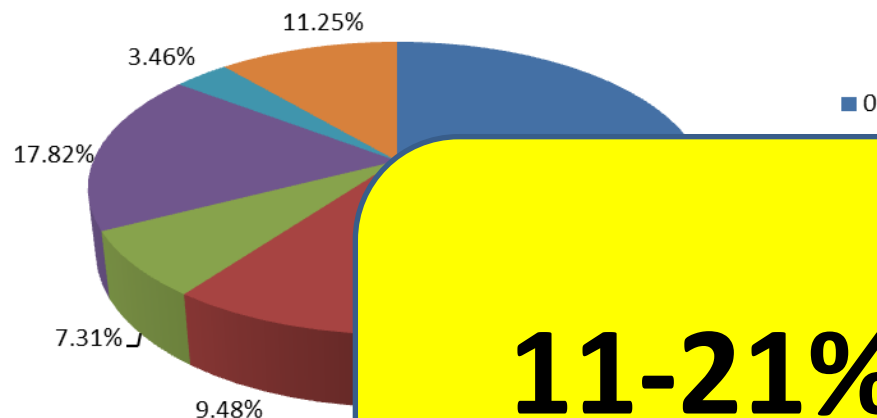


**50-62% had no mastitis**

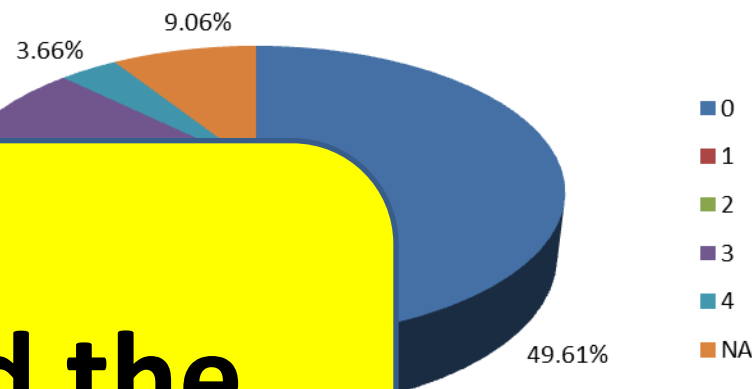
# CMT scores - summary



Overall CMT Scores Collected 2015

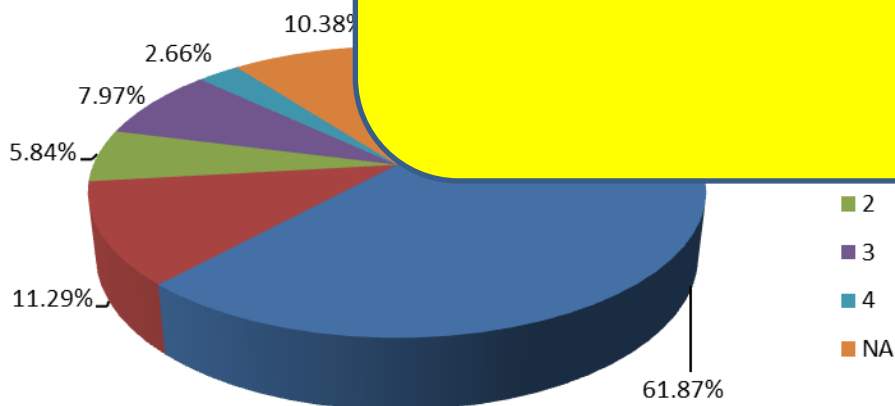


Overall CMT Scores Collected 2016

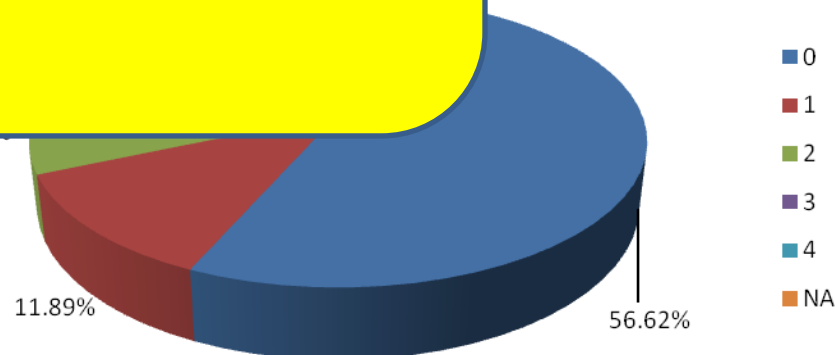


**11-21% had the worst scores**

Overall CMT



Overall CMT Scores Collected 2018



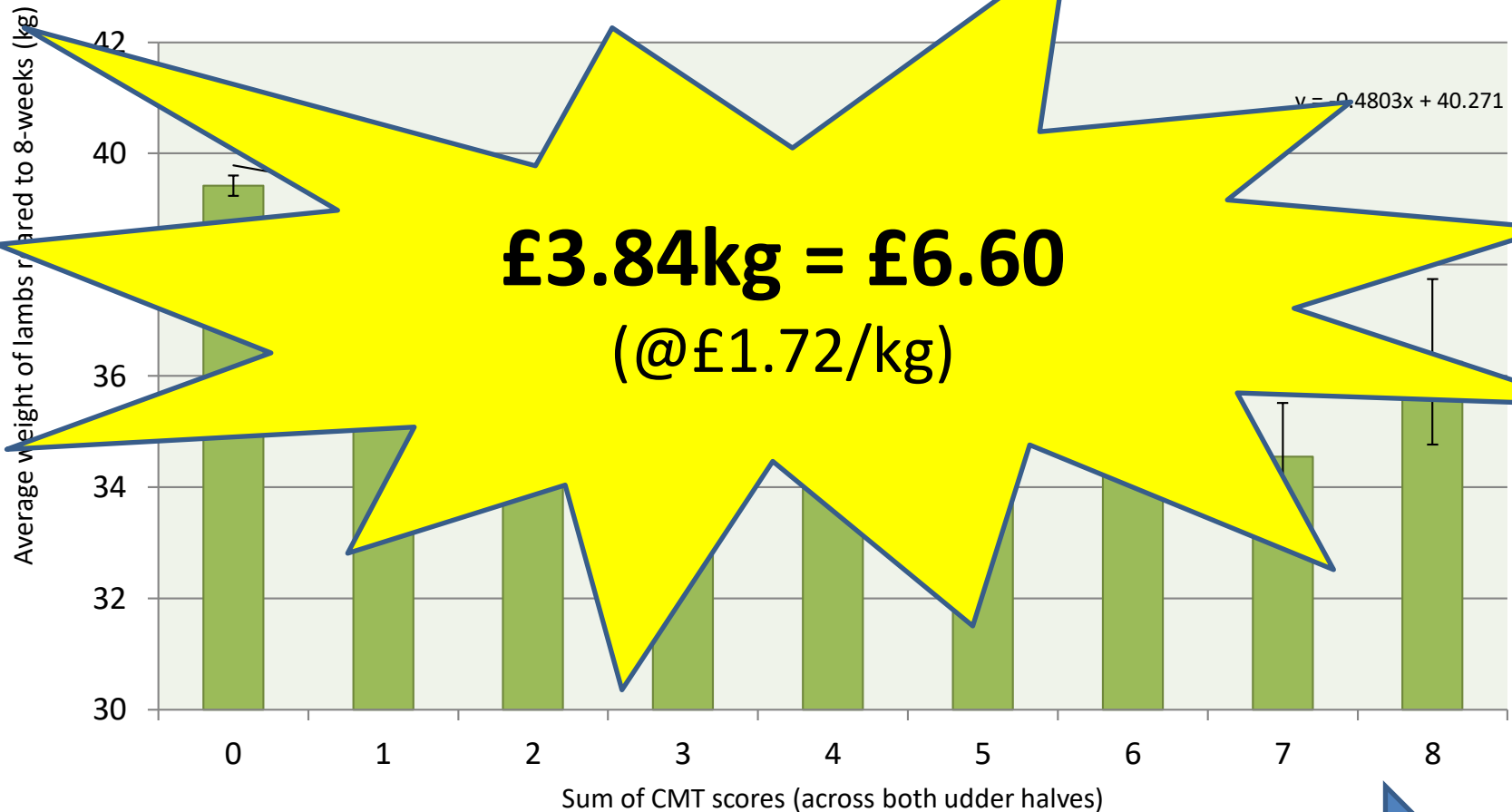


# More mastitis = lower lamb weight



C

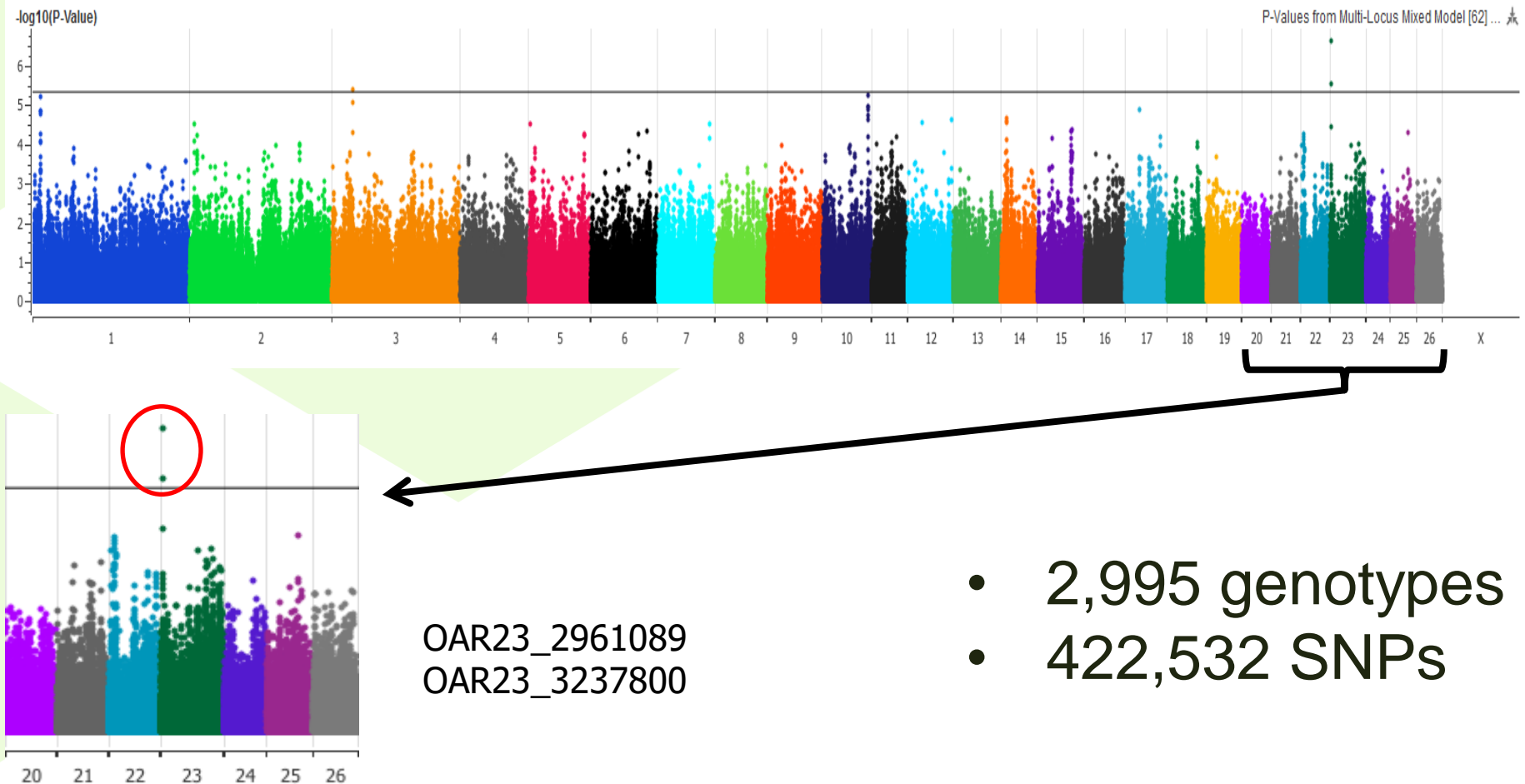
Relationship between CMT and average weight of lambs reared to 8-weeks



Worse

# Looking for major genes

- Region of interest identified on Chromosome 23





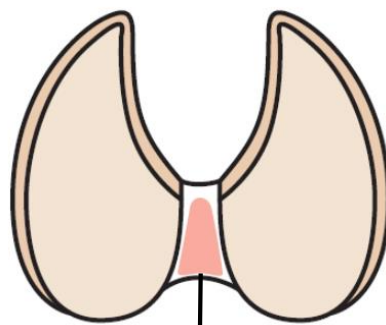


**What about  
Footrot?**

# Foot scoring method



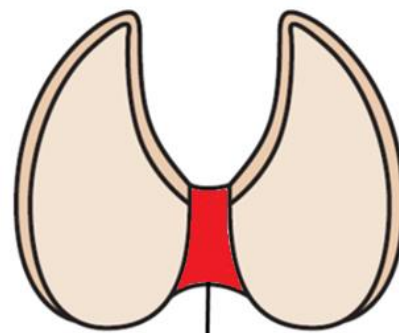
- 1: Non-specific inflammation of the interdigital skin



Interdigital dermatitis



- 2: Necrotic, severe inflammation



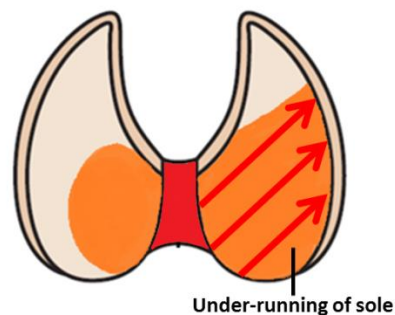
Severe inflammation



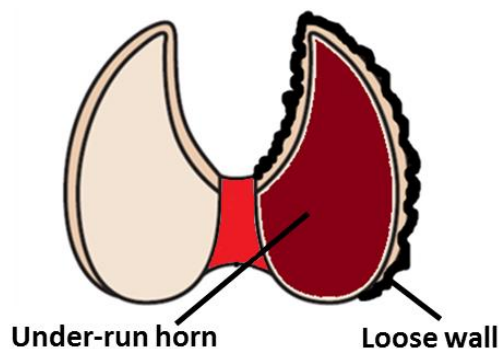


# Foot scoring method

- 3: Under-run of the sole, restricted to soft horn of the heel



- 4: Under-run of the sole of the foot including the hard horn of the toe and wall

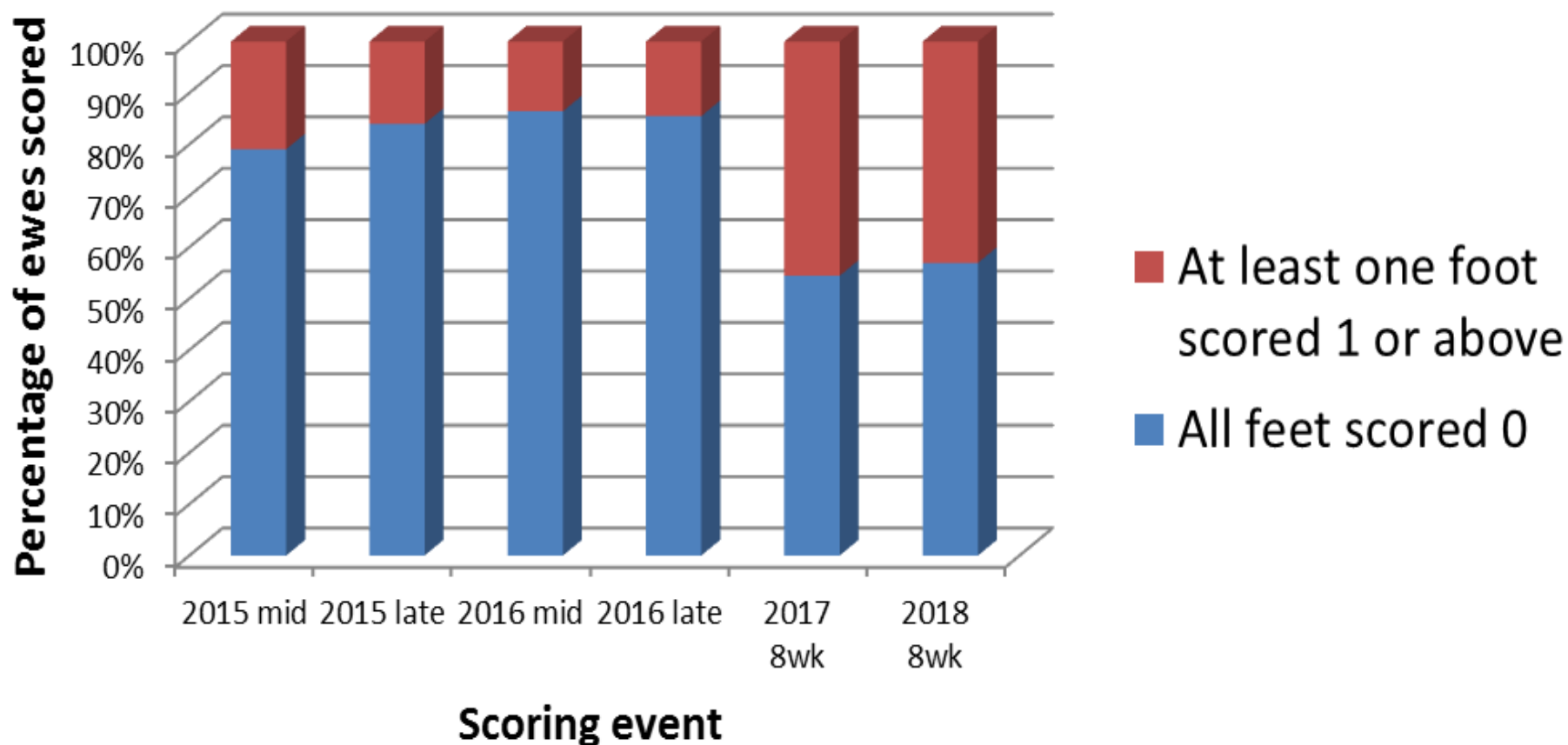




# Foot scores



## Proportion of ewes scored



# Resistance to Footrot is under low to moderate genetic control

Heritability 0.18

## Breeding resistance to footrot

65

- Foot scoring useful tool to differentiate footrot & other hoof lesions

- 5-point scale,  $h^2 \sim 0.2$



Conington et al., 2008 *Vet Res Comm.*  
Nieuwhof et al., 2008 *Animal*



Fig. 1: Score 0. Clean hoof – no signs of footrot



Fig. 2: Score 1. Mild interdigital dermatitis (scald).



Fig. 3: Score 2. More extensive interdigital dermatitis.



Fig. 4: Score 3. Severe interdigital dermatitis and under-running of the horn of the heel and sole

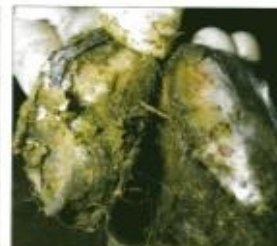


Fig. 5: Score 4. Severe interdigital dermatitis and under-running of the horn of the heel and sole.

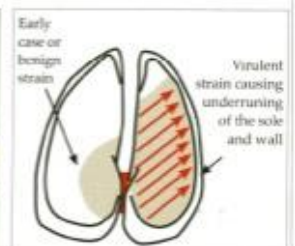
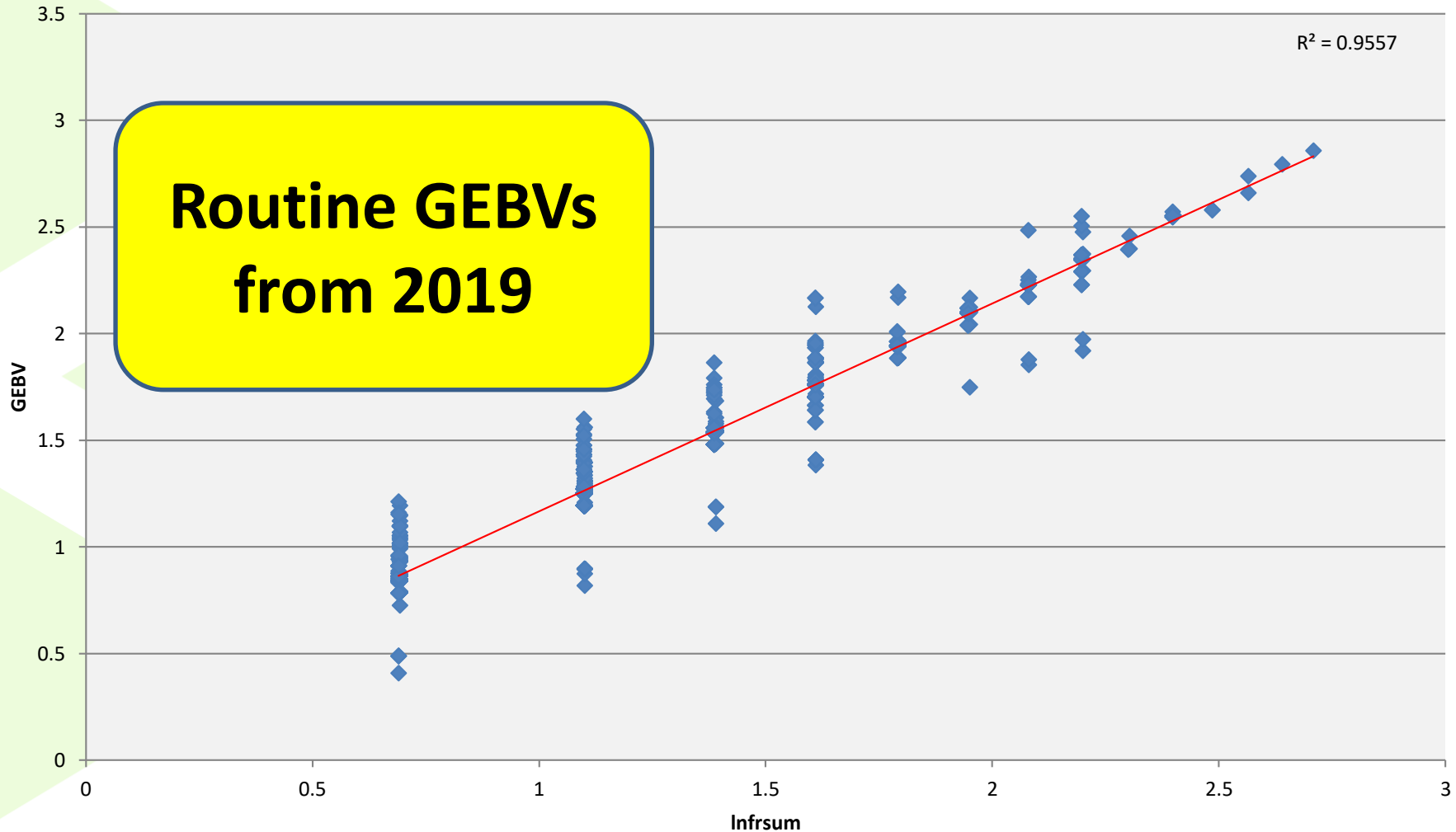


Fig. 6. Illustration of scores 3 and 4 (Courtesy of Agnes Winter)

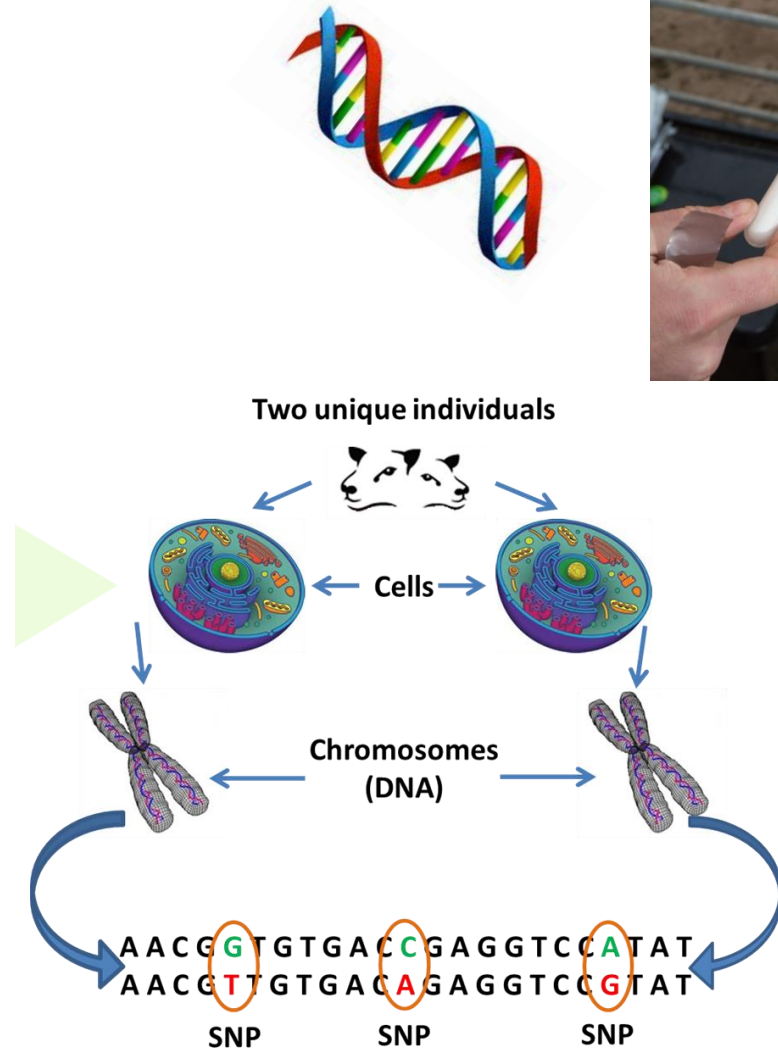
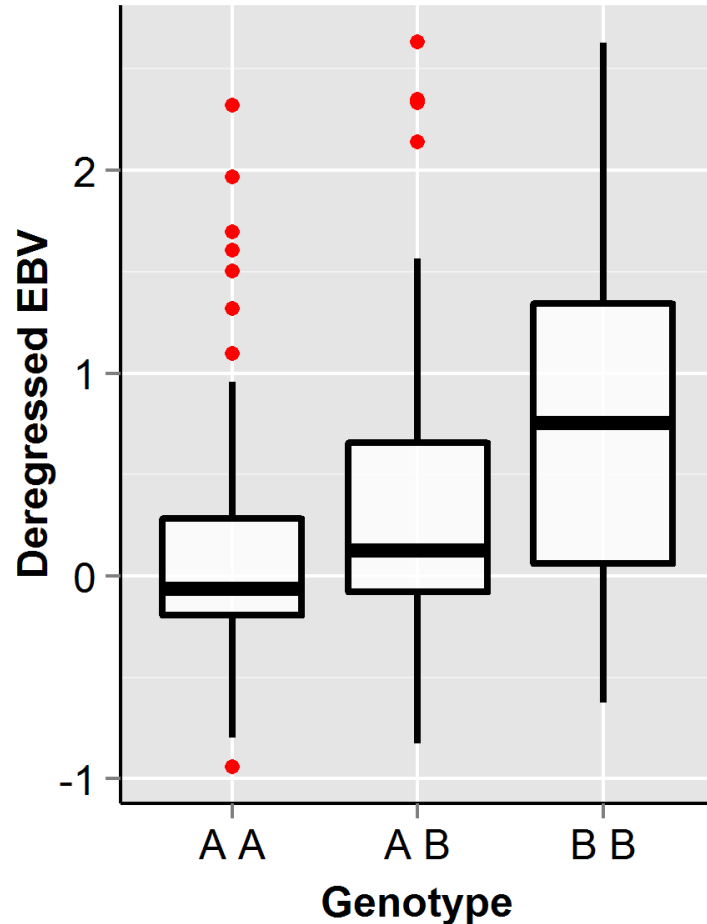
# Footrot GEBV

Correlation between GEBV and phenotype **0.98**





# Value of using genomic selection



**Example of SNP OAR2\_198741802.1**

# Main messages

**Health traits**

**High  
prevalence**



**Heritable**

**£6.60**



# Acknowledgements



Innovate UK  
Technology Strategy Board



**Phenotype Farmers**  
– you know who you are!