

A decorative graphic consisting of three overlapping shapes: a dark brown arrow pointing right, a light blue arrow pointing down, and a solid brown rectangle in the top right corner.

# **Breeding for resistance against Paratuberculosis: Genetic relation between antibody response and faecal shedding of MAP in dairy cattle**

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# What is Paratuberculosis?

Paratuberculosis is a chronic intestinal infection of ruminants caused by *Mycobacterium avium* ssp. Paratuberculosis (MAP).

Infections will develop slowly into:

- chronic intractable diarrhea
- weight loss
- production losses
- low birth weight of calves
- ultimately death since no treatment is available



# Economical importance

In The Netherlands in 2008:

47% of farms had at least one positive animal  
2.4% of all animals was positive

Economical loss:

770,- euro/year per herd (50 animals) with infected cows

For every animal that develops clinical signs

- there will be 7 to 10 animals excreting
- there will be a further 7 to 10 infected, but not yet excreting (possibly excreting in the future)

# Is breeding against Paratbc possible?

- Goal is reduction of faecal shedding of MAP
  - Tool is antibody response in milk
- > Are genetic variations of antibody levels and faecal excretion present?
- > Is a lower antibody level in milk related to less faecal shedding?

# Data

Causative agent of paratuberculosis:

*Mycobacterium avium* ssp. *Paratuberculosis* (MAP)

Two data sets:

- 1) Individual milk samples tested by Elisa for antibodies against MAP (trait=PA1)
- 2) Individual faecal samples tested for MAP bacteria (trait=PA2)

# Method

- Estimation of genetic parameters for PA1 and PA2
- Estimation of genetic correlation between breeding values for PA1 and PA2

# Results: genetic effects

	PA1	PA2
$\sigma^2_g$	0.004	0.005
$\sigma^2_{perm}$	0.033	0.021
$\sigma^2_p$	0.081	0.081
repeatability	0.42 (0.003)	0.28 (0.006)
$h^2$	0.05 (0.003)	0.06 (0.008)

*Heritability and genetic variation indicate possibilities for selection.*

# Genetic correlation

- Genetic correlation between breeding values estimated with milk (PA1) and faecal (PA2) analyses
- Genetic correlation was estimated, accounting for differences in repeatability of breeding values (MACE)
- Sires have at least 15 daughters
- Genetic correlation PA1-PA2: 0.81



# Implications

- Genetic standard deviation for ELISA test (antibody levels): 0.063
- *Increase* in breeding value means *decrease* in antibody levels
- Using a bull with 1 genetic standard deviation higher breeding value: 2.8% less daughters tested positive