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Genetic variation in *Mycobacterium avium* subspecies *paratuberculosis* specific antibody response in milk of Dutch dairy goats

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Dairy goat farming in the Netherlands

- >1980: professional dairy goat sector develops
- 2011: ~350 herds, on average 650 goats
- 1% of world goat milk, 7% of European goat milk
- 70% of milk for cheese production
- Export is very important: Germany, France
- Herds nonrandomly distributed

Source: www.gddeventer.com

Large numbers

Separate rearing with respect to disease control

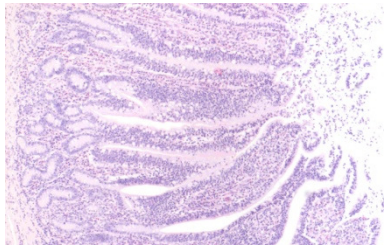
Labour is expensive, intensive use of equipment

Paratuberculosis or Johne's disease

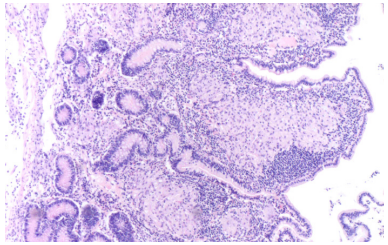
Mycobacterium avium

subspecies *paratuberculosis* (MAP)

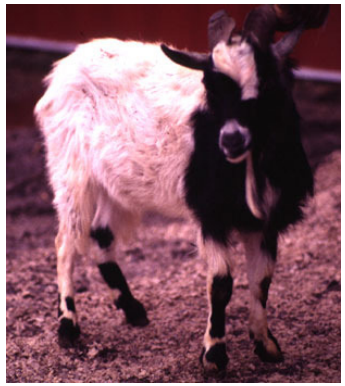
Lesions in the distal part of the ileum



healthy

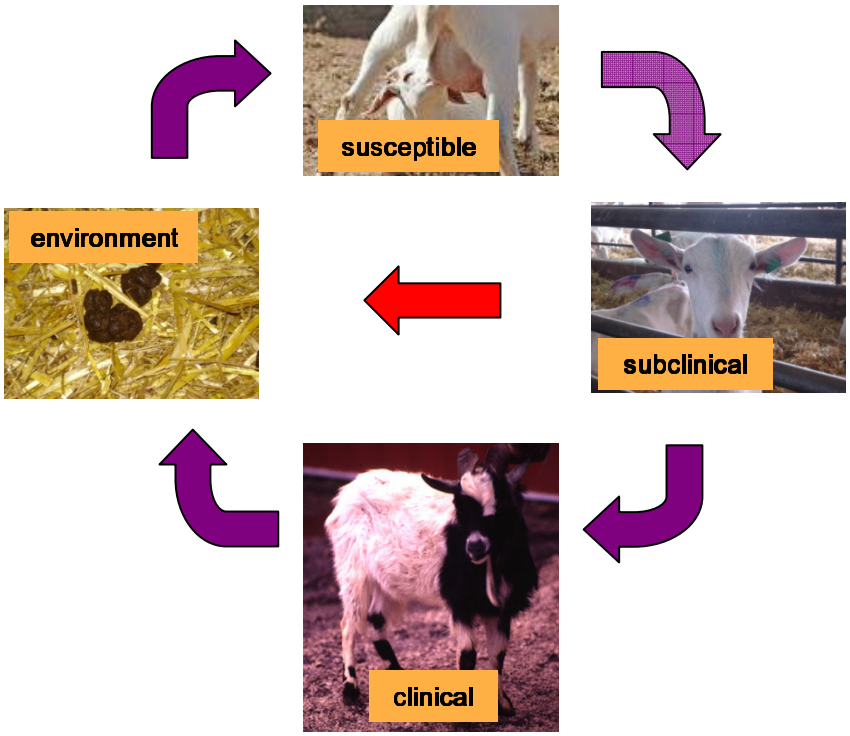


infected

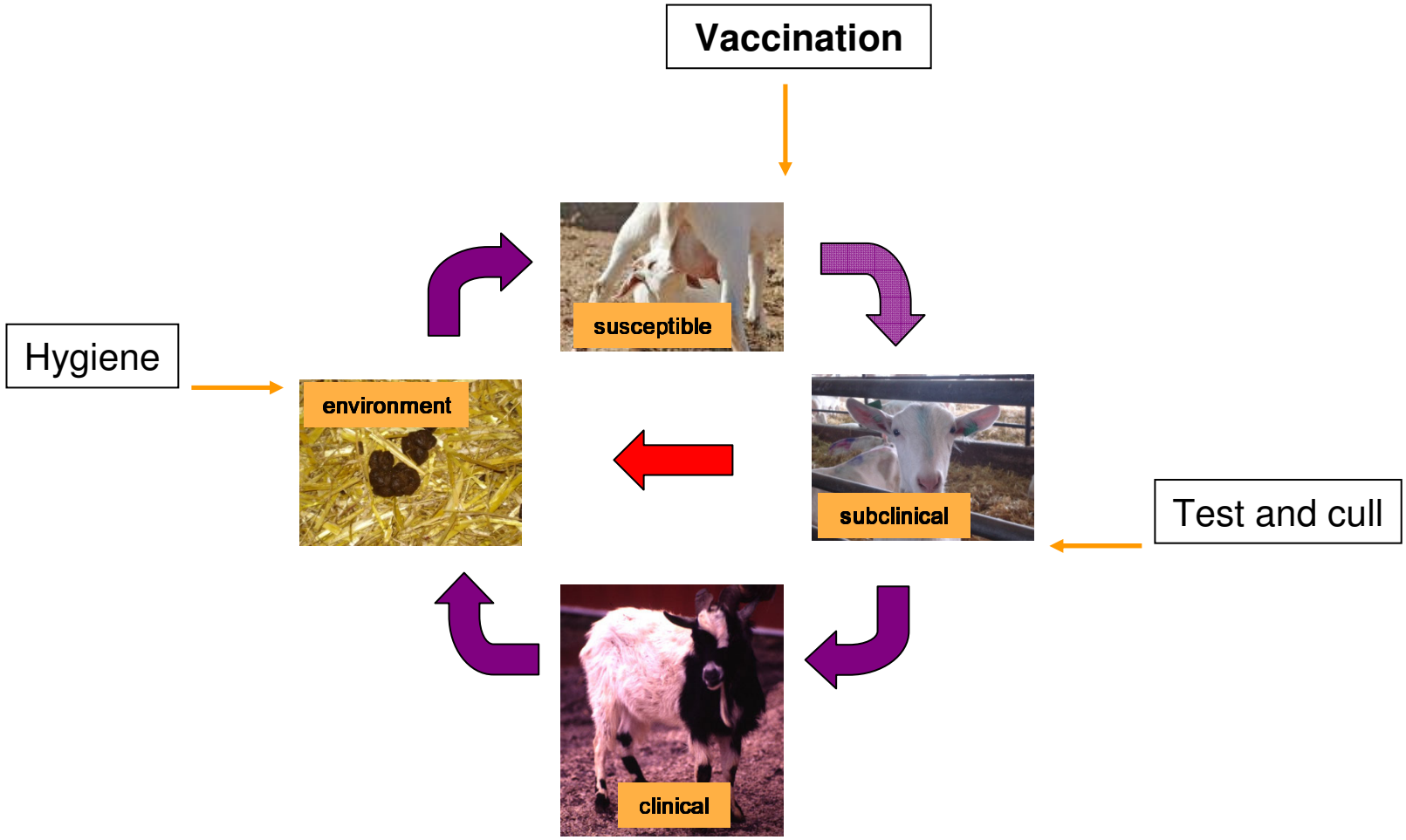


Clinical signs

Development of disease



Control of disease



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Diagnostic tests

ELISA: Enzyme-Linked Immuno Sorbent Assay

Detection of antibody response specific for MAP in milk

ELISA: Enzyme-Linked Immuno Sorbent Assay

Detection of antibody response specific for MAP in serum

In vitro cultivation of fecal MAP

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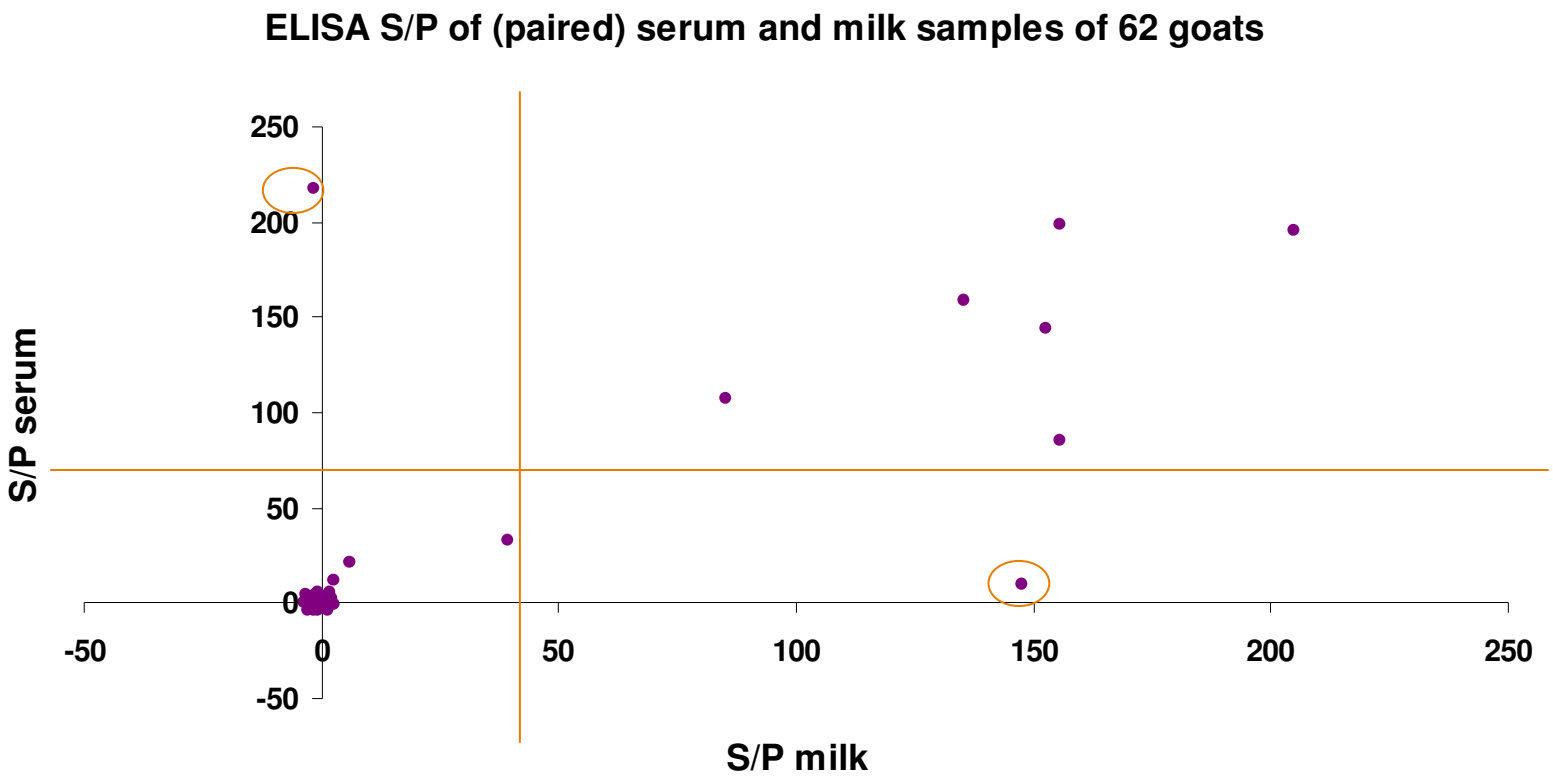
ELISA in milk versus serum



ELISA in milk versus serum highly correlated

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Study aim

- Eradication of Johne's disease difficult using classical control strategies e.g. vaccination, test and cull and hygiene
- New approach: genetic selection for animals resistant to disease
- Study aim: genetic parameter estimation for MAP specific antibody response in goat milk

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Animals

- 965 goats from one non-vaccinated herd
- Known pedigree
- At least two years old
- Additional information: date of birth, parity, milk yield on test day
- Five consecutive ELISAs, time interval of three months

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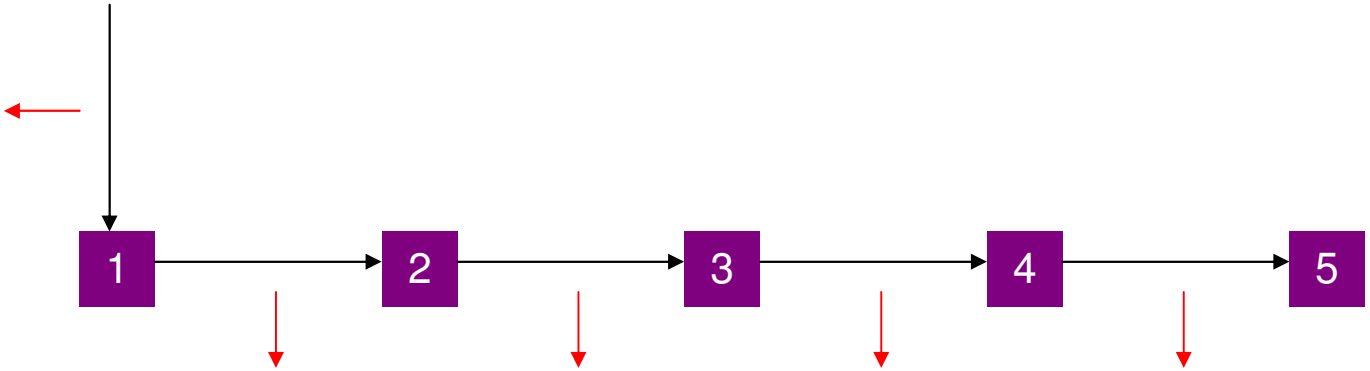
Sampling flow chart

ELISA sensitivity: 0.35.
ELISA specificity: 0.98.



Culling:

- Selection of animals few months before start data collection
- Decision of farmer based on low production or disease
- Decision of farmer based on positive ELISA

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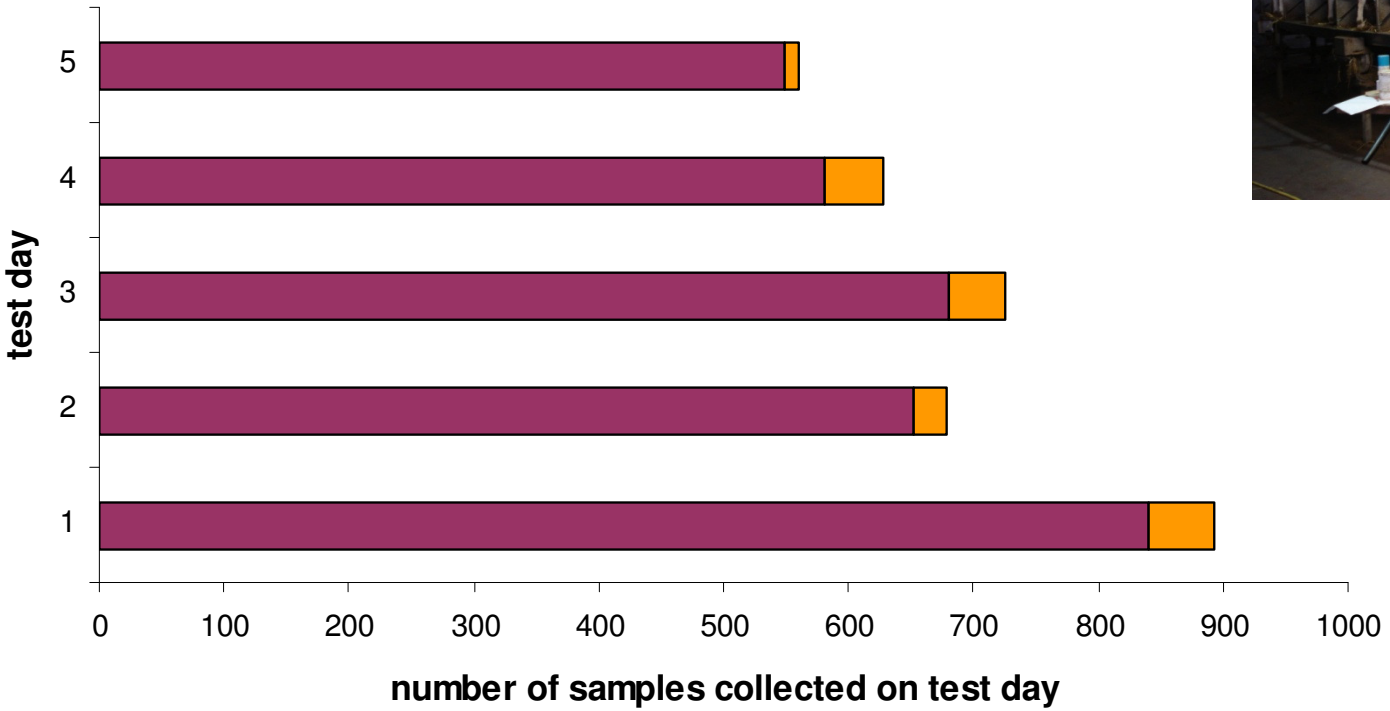
Data for analysis



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Genetic parameter estimation

- Estimation of variance components
- Y = log transformed ELISA test result
- Model 1: sire model with maximum ELISA value over five consecutive samplings
  - Fixed effects: parity, year of birth and location
  - random: sire, error
- Model 2: sire model with repeated measurements
  - Fixed effects: parity, year of birth and location
  - random: sire, animal, error

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Heritability

model	sire var	animal var	res var	h2
model 1 - maximum value	0,014		0,632	0.089 (0.060)
model 2 - repeated measurements	0,012	0,381	0,145	0.091 (0.073)

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Further analysis

- Number of variables in model will be expanded (milk yield on test day, breed)
- Sire-maternal grandsire model optimal for paratuberculosis
- Infection status based on bacterial culture of tissue may be included

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Conclusions

- Genetic variation of MAP specific antibody response in milk seem to exist in Dutch dairy goats
- Breeding for disease resistance to contribute to a more effective control of paratuberculosis seems possible

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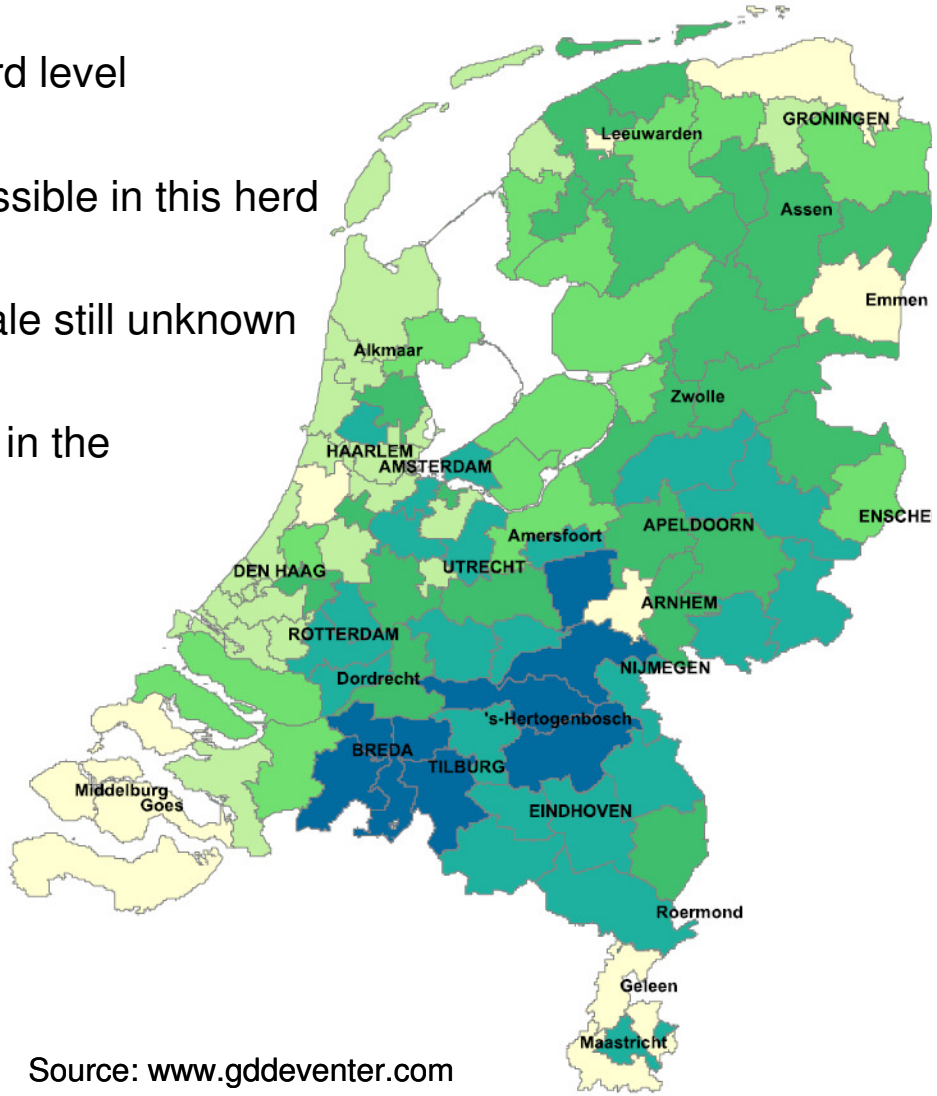
Discussion

- Genetic variation estimated on herd level
- Breeding for resistance seems possible in this herd
- Genetic variation on a national scale still unknown
- Pedigree registration not common in the Netherlands
- Intensive use of vaccine makes diagnostics difficult



Source: www.gddeventer.com


Thank you for your attention!

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Sampling details

	test day				
ELISA test result	1	2	3	4	5
positive	52	26	45	47	13
negative	840	653	680	581	548
missing	73	286	240	337	404
total	965	965	965	965	965

# ELISA test results	# of goats
1	128
2	90
3	159
4	241
5	347