Natural Antibodies measured in Blood Plasma and Milk of Dutch Dairy Cattle

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Acknowledgements

Introduction 'Weerbaar Vee'

'Weerbaar Vee' → Resistance / Resilience of an animal

Health of cows depends on:
- Housing facilities
- Management farmer
- Natural resistance of cow (genetics)

Healthier cows → Productive life ⬆

Main goal: To make natural resistance measurable

→ Find a predictor for natural resistance

→ Results in healthier cows

# How do we reach this goal?
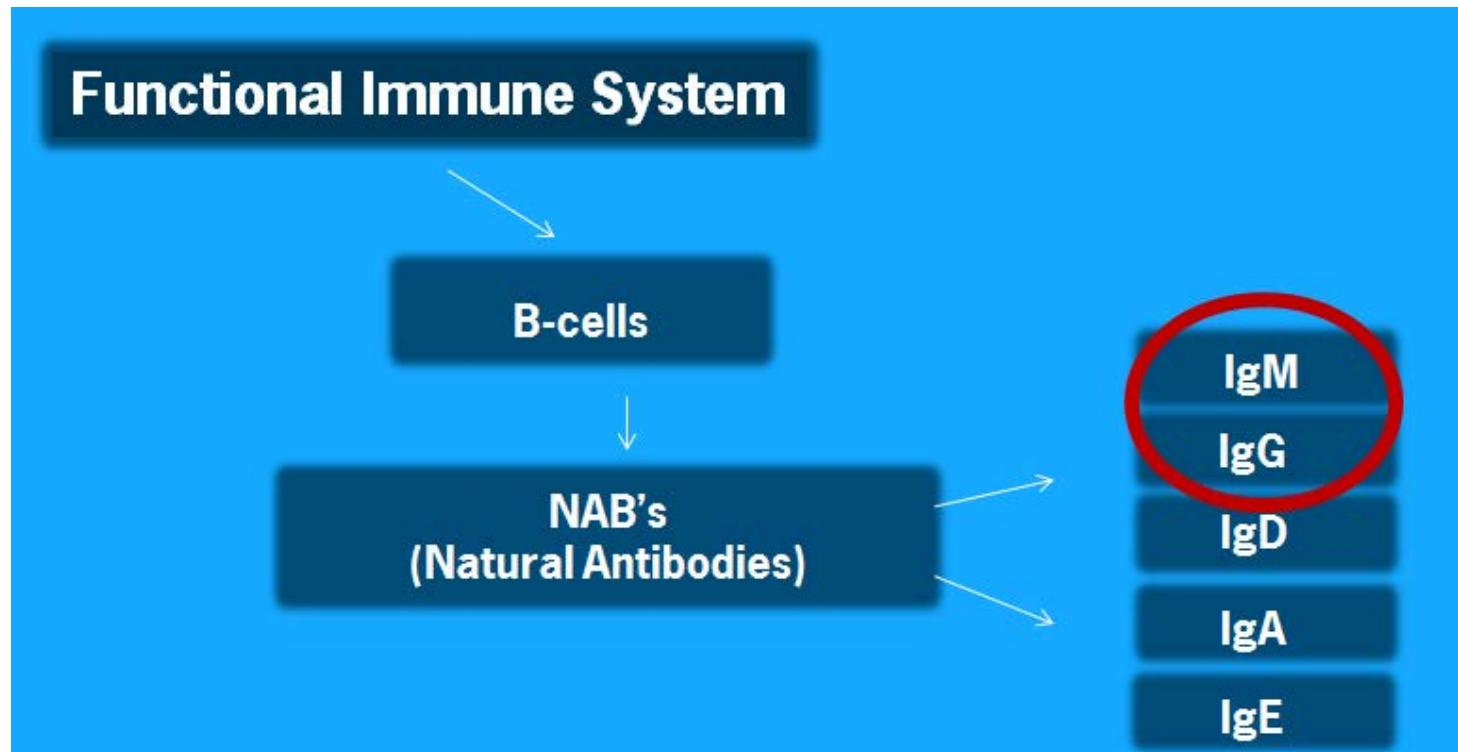
NAbs → Present in individuals without prior exposure to external antigen/pathogen

Aim of this study

- Same information from NAbs in blood/milk?

- What factors have influence on NAb levels?

- Are NAbs heritable?
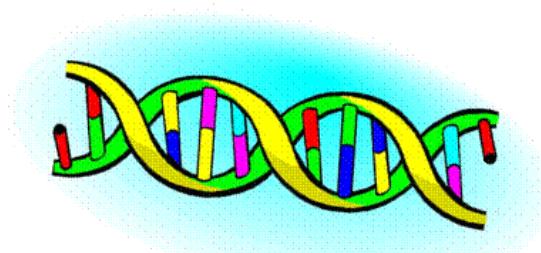
Material & Methods 1

- **Milk : All lactating cows (60-214)**

- **Blood : ± 70 cows (lactating and non lactating)**

  → Blood and milk samples taken from same day

- **29 Dutch dairy farms involved (productive cows = n>60)**

Data

Animals → 2919

→ Blood Plasma → 2103
→ Milk → 2869
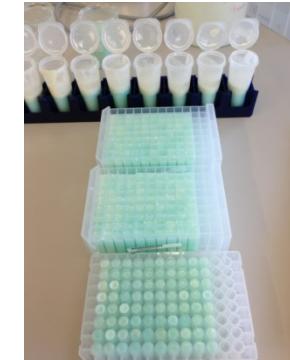
Nab-titres

- ELISA tests → 2 isotypes of NABs binding KLH :
  - IgM
  - IgG

- KLH = keyhole limpet hemocyanin

  → for cows naive antigen (glycoprotein)

Megathura crenulata

Material & Methods 3

Model used

$$Y_{ijklmno} = \mu + Parity_i + Lact.Stage_j + SCS_k + Protein_l + Milk\_Yield_m + Herd_n + Animal_o + e_{ijklmno}$$

Fixed

Effects

- **Herd** → **29 herds**
- **Parity** → **different parities**
- **LS** → **days in milk**
- **SCS** → **somatic cell score**

Class

- **Milk Yield** → **daily milk production in kg**
- **Milk protein** → **% proteins in milk**

Continuous

Results : Descriptive

Antibody	N	Mean	SD
M-IgG	2581	4.22	1.45
M-IgM	2608	5.30	1.07
P-IgG	2032	4.48	1.23
P-IgM	2032	7.79	0.78

IgG   **IgM**
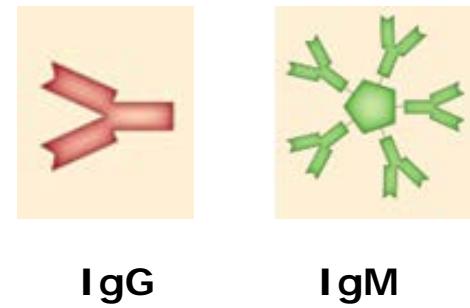
Results : Descriptive

Direction of significant Effects

Effects		NAbs
Parity	⬆	⬆
Lactation Stage	⬆	⬆⬇⬆
SCS	⬆	⬆
Milk Yield	⬆	⬇
Milk Protein	⬆	⬆

Results : Heritability

Heritability → **Milk IgM** → **0.27 (0.05)**
→ **Milk IgG** → **0.21 (0.05)**

→ **Plasma IgM** → **0.29 (0.07)**
→ **Plasma IgG** → **0.16 (0.05)**
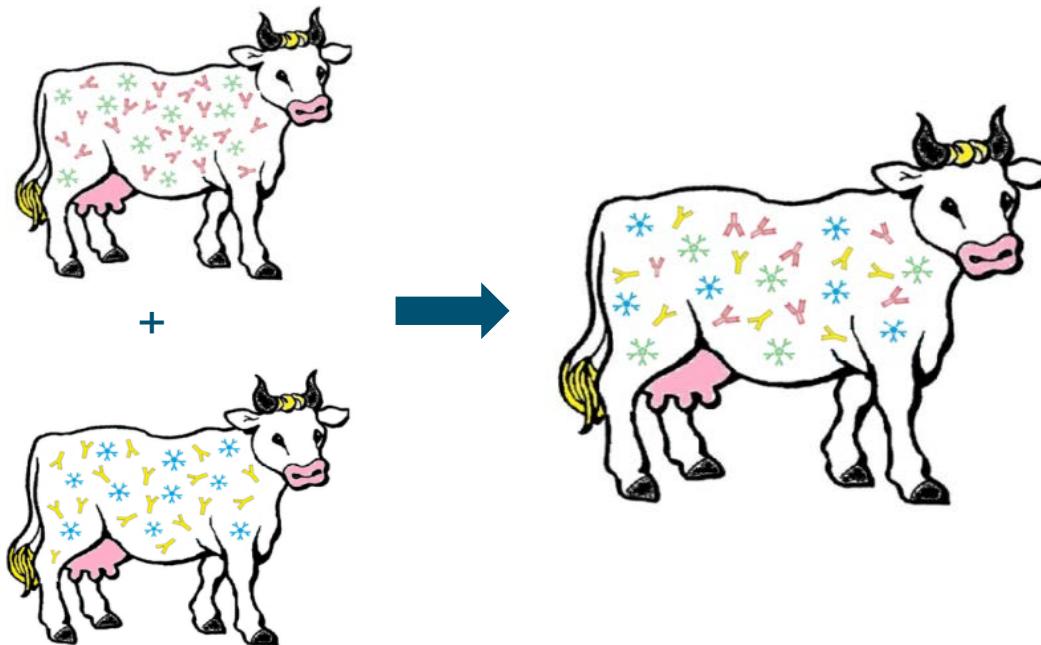
Results : Correlations

Phenotypic / Genotypic

Above diagonal= Phenotypic
Below diagonal = Genotypic

	M-IgM	M-IgG	P-IgM	P-IgG
M-IgM	1	**0.40** (0.02)	**0.41** (0.02)	**0.11** (0.03)
M-IgG	**0.69** (0.11)	1	**0.11** (0.03)	**0.46** (0.02)
P-IgM	**0.78** (0.09)	**0.16** (0.18)	1	**0.33** (0.02)
P-IgG	**0.54** (0.18)	**0.77** (0.13)	**0.23** (0.19)	1

—— Milk vs Blood

—— IgM vs IgG

Take home messages

1. It is possible to breed for Nabs (h^2 between 0.16 and 0.29)

2. Correlations:

		Phenotypic	Genotypic
milk vs blood		Moderate	High
antibody vs snowflake		Moderate	High

What's next?

- Relationship between NAbs and diseases

- Relationship between NAbs and longevity

- Investigate if NAbs can be a predictor of resistance and can be implemented in breeding programs
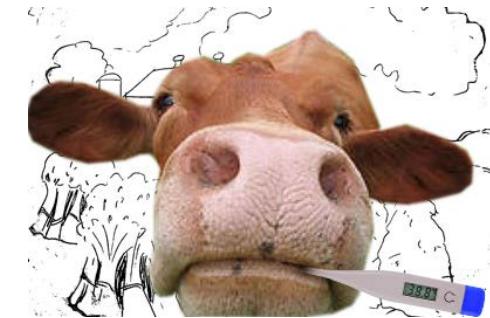
Thanks for your attention!

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