# GENETIC ANALYSIS OF RUMINAL ACIDOSIS RESISTANCE IN DAIRY COWS

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# RUMINAL ACIDOSIS

## Definition
pH < 5.5

## Cause
feeding a high level of rapidly digestible carbohydrate

## Symptoms
- Lower milk production
- Damage to GI-tract
- Reduced feed intake
- Diarrhea
- Weight loss
- Death

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# MEASURING PH OF THE RUMEN

Currently 2 techniques available:

- Rumenocentesis

- Oral stomach tube

# MPR (MILK PRODUCTION REGISTRATION) DEFINITION OF RUMINAL ACIDOSIS

< The percentage of fat is under 4 and the percentage of fat is under the percentage of protein between day 60 and day 120 in lactation. >

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# OBJECTIVE

Increasing ruminal acidosis (RA) resistance in the dairy cattle population using the MPR definition as indicator

Research questions
- Is ruminal acidosis based on the MPR definition heritable?
- What is the variability of ruminal acidosis within parity?
- What are the genetic correlations with other traits?

# DATA

- 60,000,000   test day records
  - 33,000,000   Lactations
  - 11,000,000   Dutch and Flemish animals
  - 41,000   herds

- Full pedigree

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# TRAITS

Fat%* <4
and
Fat %* < Protein%**
⎫
⎬  Ruminal acidosis = 1
⎭

Fat%* ≥ 4
or
Fat %* ≥ Protein%**
⎫
⎬  No ruminal acidosis = 0
⎭

For cows between day 60 and 120 in lactation
For parity 1, 2 and 3 and higher (3+) separately

* Corrected for their fat EBV
** Corrected for their protein EBV

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# PREVALENCE (DAUGHTER MEANS)
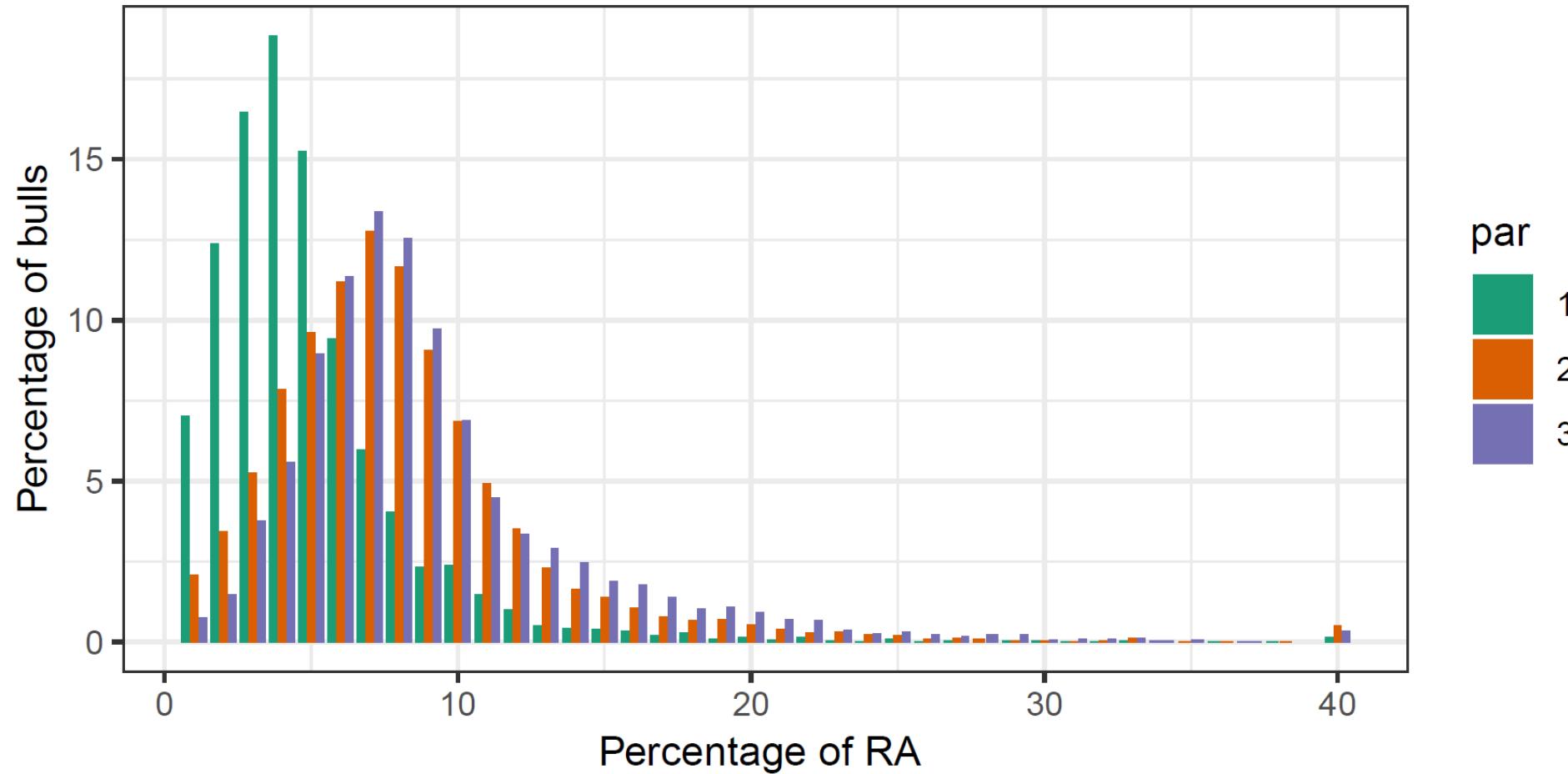
# MODELS

$$Y1_{ijklnopqr} = HY_i + YM_j + DIM_k + AAC_l + HET_n + REC_o + \underline{A_p + PE_q} + Res_{ijklnopqr}$$

$$Y2_{ijknopqr} = HY_i + YM_j + DIM_k + HET_n + REC_o + \underline{A_p + PE_q} + Res_{ijknopqr}$$

$$Y3_{ijkmnopqr} = HY_i + YM_j + DIM_k + PAR_m + HET_n + REC_o + \underline{A_p + PE_q} + Res_{ijkmnopqr}$$

<u>Traits</u>
Y1 : RA par 1
Y2 : RA par 2
Y3 : RA  par 3+

<u>Fixed effects</u>
HY    : herd year
YM    : year month
DIM   : days in milk
AAC  : age at calving (parity 1)
PAR  : parity (parity 3+)
HET  : heterosis
REC  : recombination

<u>Random effects</u>
A     : animal
PE   : permanent environment
Res : residual

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# PARAMETERS

| Trait | heritability | Repeatability | Genetic standard deviation |
|-------|-------------|---------------|---------------------------|
| RA 1 | 0.010 | 0.14 | 0.02 |
| RA 2 | 0.013 | 0.14 | 0.03 |
| RA 3+ | 0.009 | 0.07 | 0.02 |

Genetic correlations between traits

| | RA 1 | RA 2 | RA 3 |
|------|------|------|------|
| RA 1 | 1.00 | | |
| RA 2 | 0.67 | 1.00 | |
| RA 3 | 0.59 | 0.89 | 1.00 |

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Genetic trend HF bulls

*relative breeding value based on population of 2010, with genetic standard deviation of 4 points.

A higher EBV means less ruminal acidosis
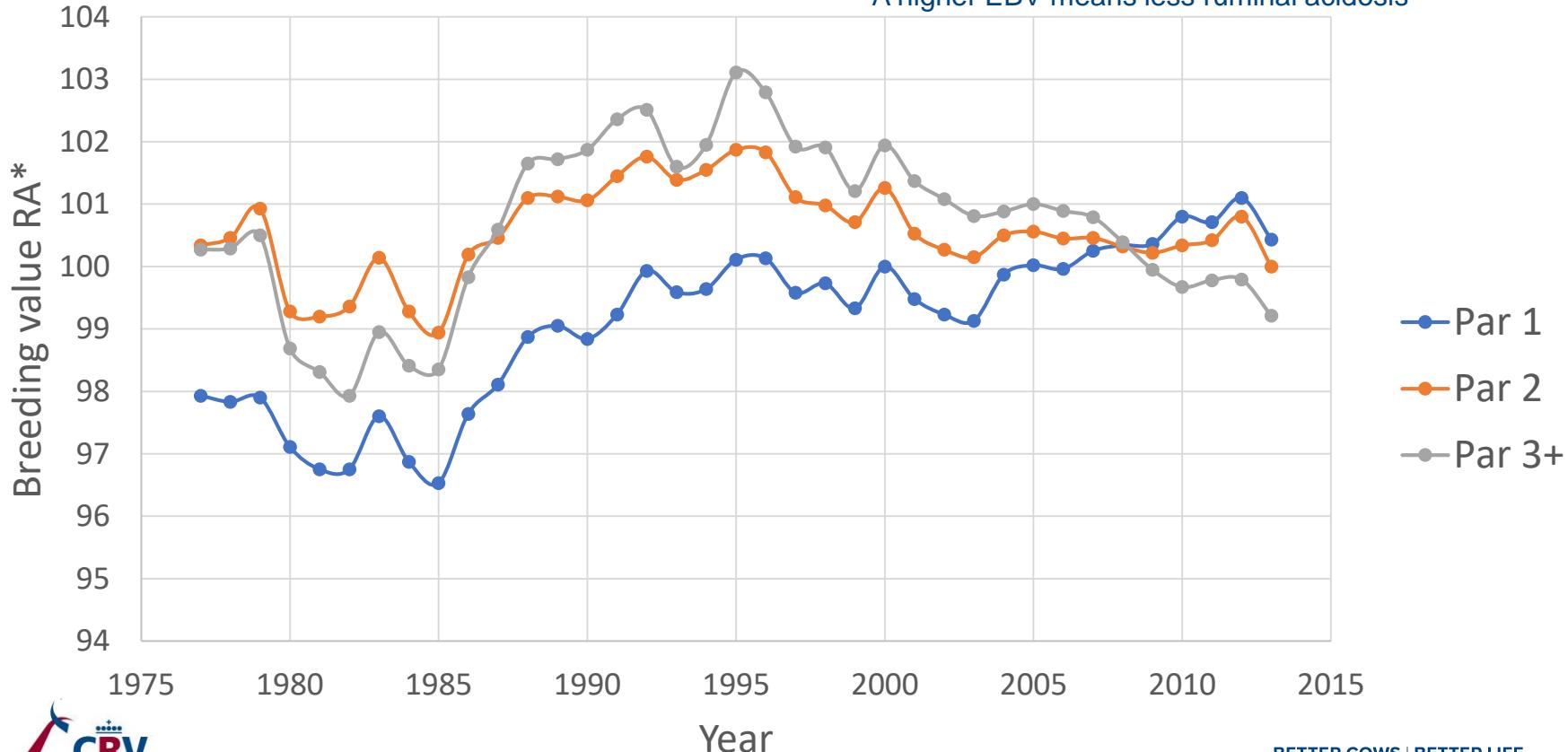
Genetic correlation EBV RA with other traits
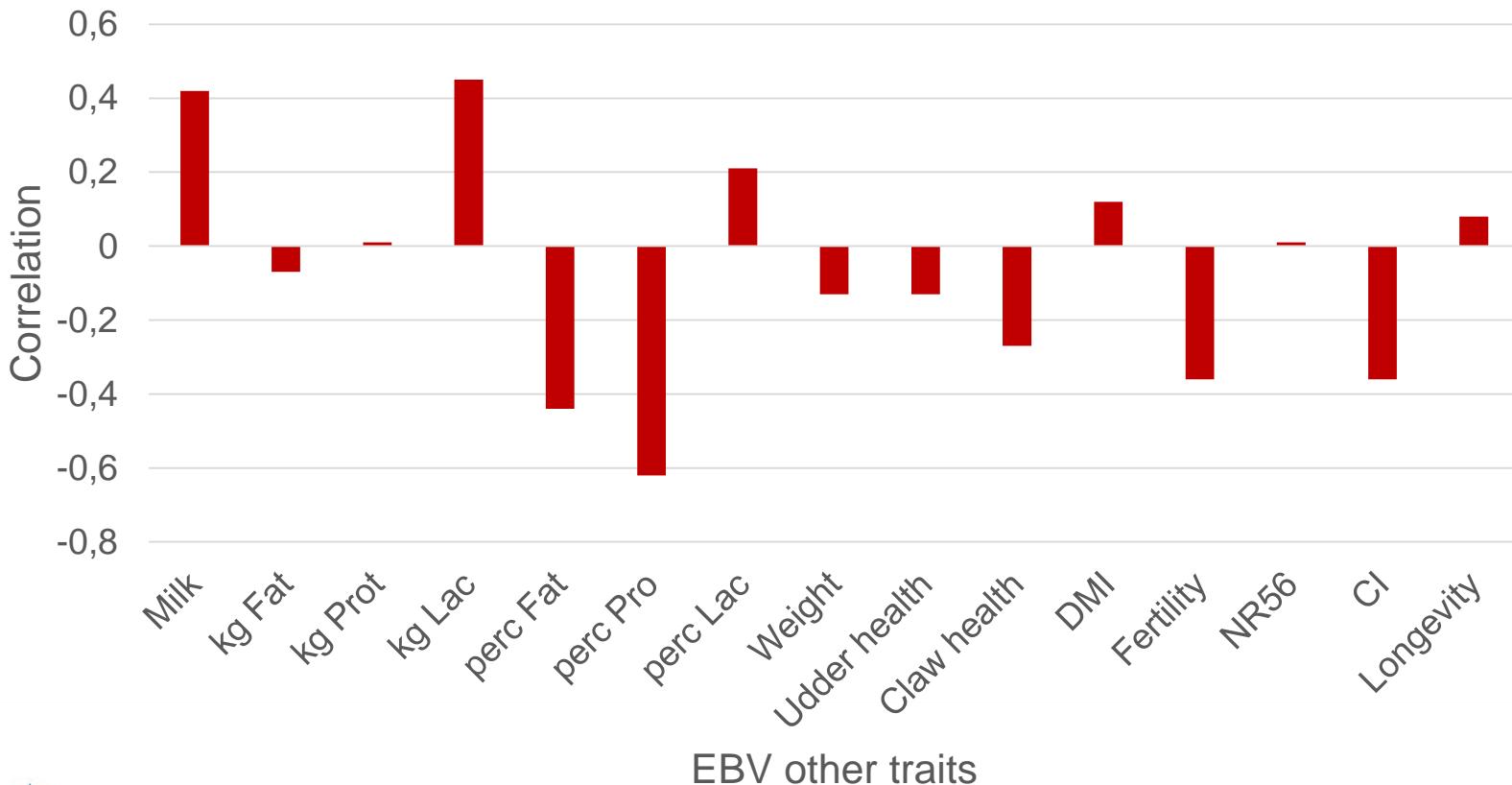
# CONCLUSIONS

- Prevalence of 5%

- Negative genetic trend par 2 and 3+ (increase of RA)

- Genetic standard deviation of 2%

- Heritability of 0.01

- Positive correlation with efficiency traits

- Negative correlation with health traits

-  What is the relationship between this indicator and real ruminal acidosis?

Thank you for your attention.
Are there any questions?

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