



# The Effect of Synchronized Breeding on Genetic Evaluations of Fertility Traits in Dairy Cattle

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# Introduction

- Fertility
  - Is a common concern among producers
  - Important role in dairy industry profitability
- Heat detection
  - Major limiting factor to reproductive success using AI
  - Labor intensive, time-consuming, high potential for errors
  - Decreased estrus expression in high-producing cows

# Introduction

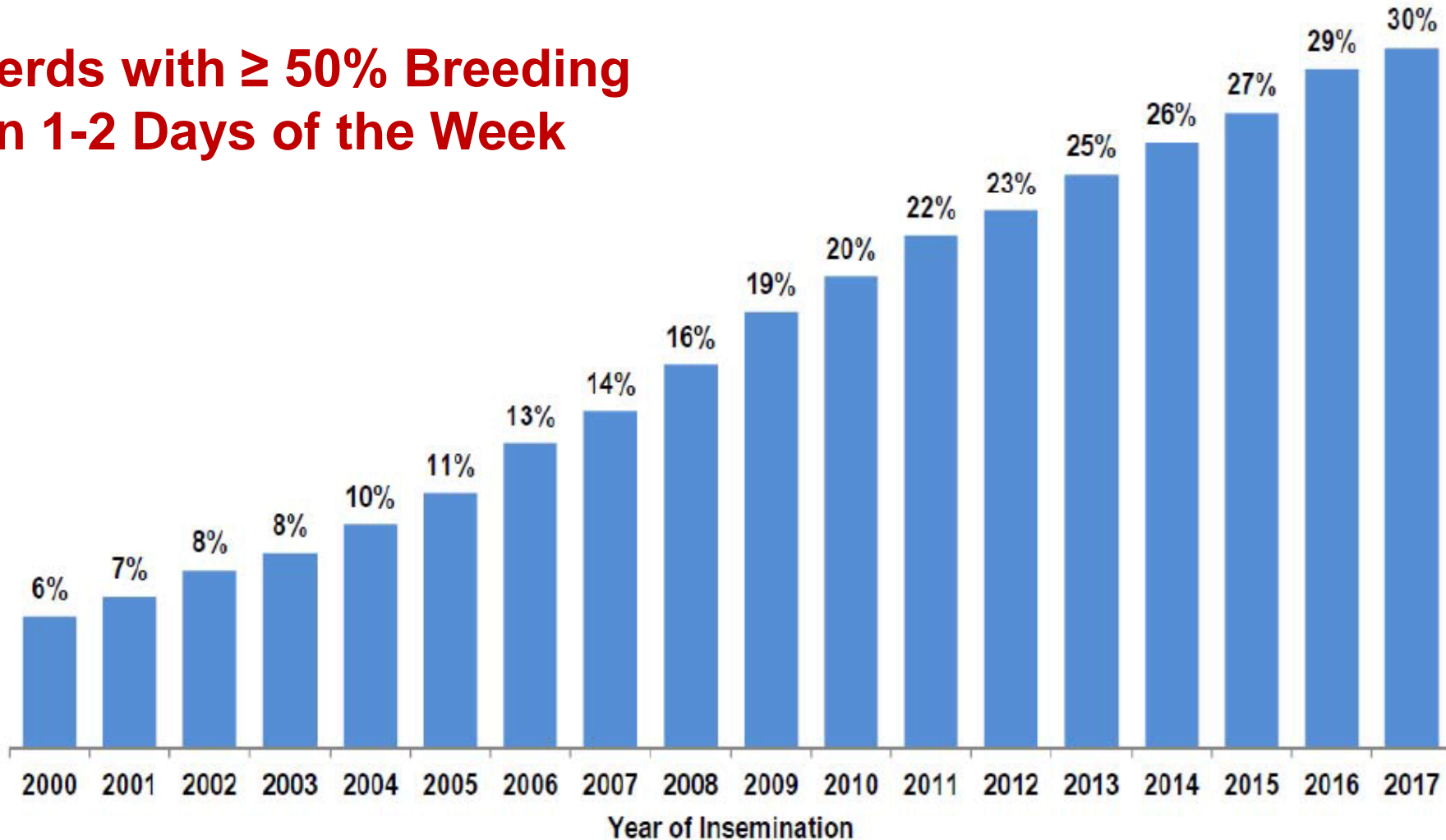
- Heat synchronization protocols (timed AI)
  - Management solution
  - Facilitate/eliminate heat detection activities
  - Ovulation time more predictable
- Physiological changes
  - Phenotypes are masked
  - Genetically inferior cows get favorable phenotype
  - Trait definition ?

# Introduction

- Breeding programs
  - Rely on accurate phenotypic data
  - Crucial for prediction of breeding values
- These inflated phenotypes can be potential source of bias on genetic evaluations
- Timed AI data is not available
  - Currently unable to correct for this effect

# Estimating Number of Herds on Timed AI

**% Herds with  $\geq 50\%$  Breeding on 1-2 Days of the Week**



# Objective

Assess the **potential bias** that **timed AI** might add to the estimated **genetic parameters** of female fertility traits

# Simulation

3,000 Dams



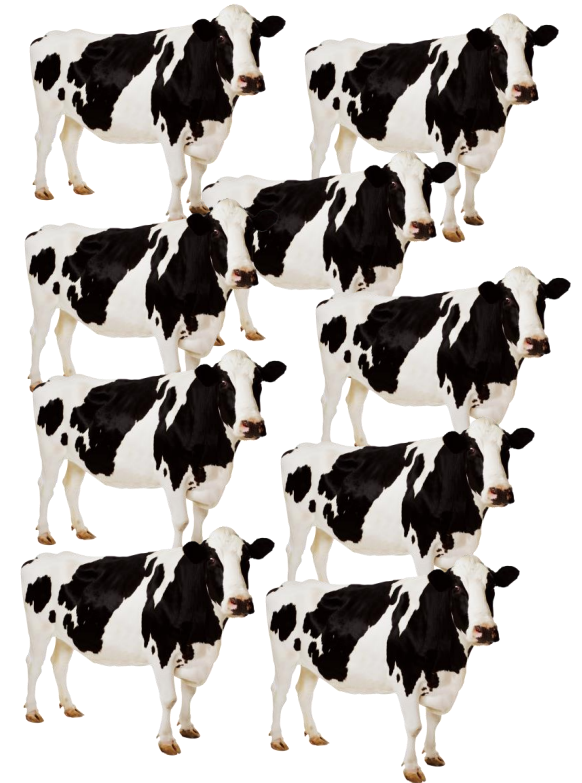
400 Sires



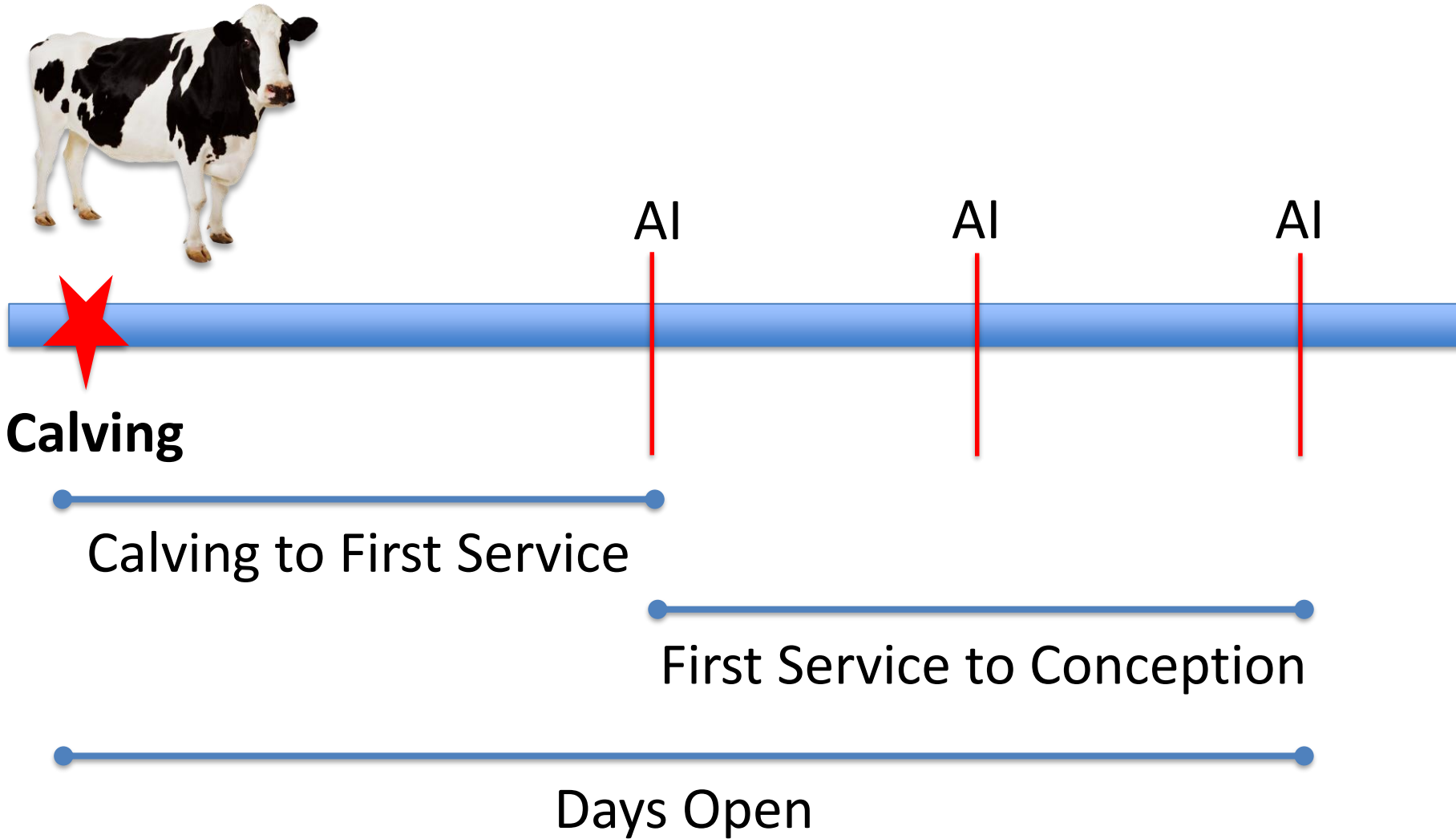
20 Generations

100 replicates

30,000 Cows  
200 Herds

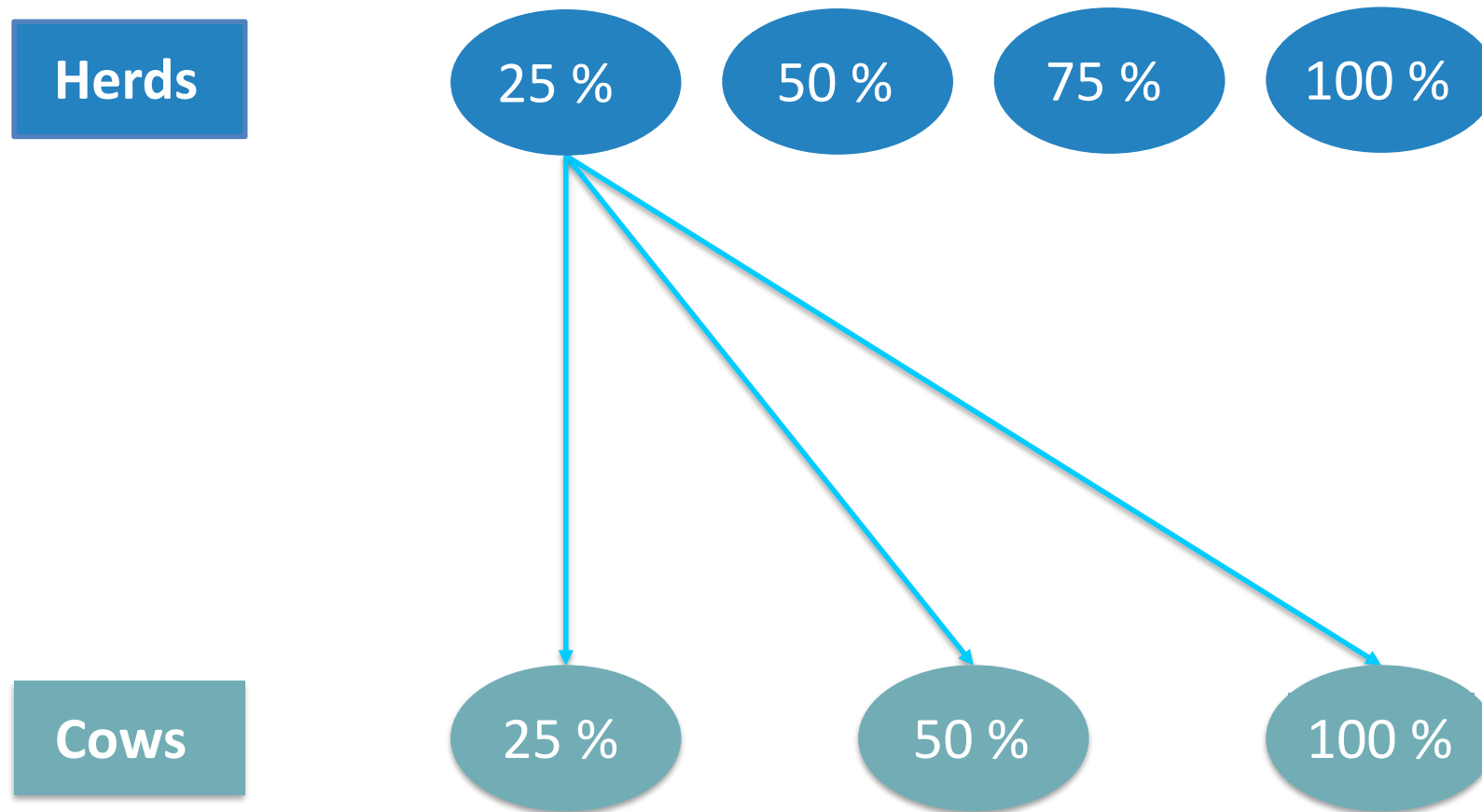


# Trait Definitions



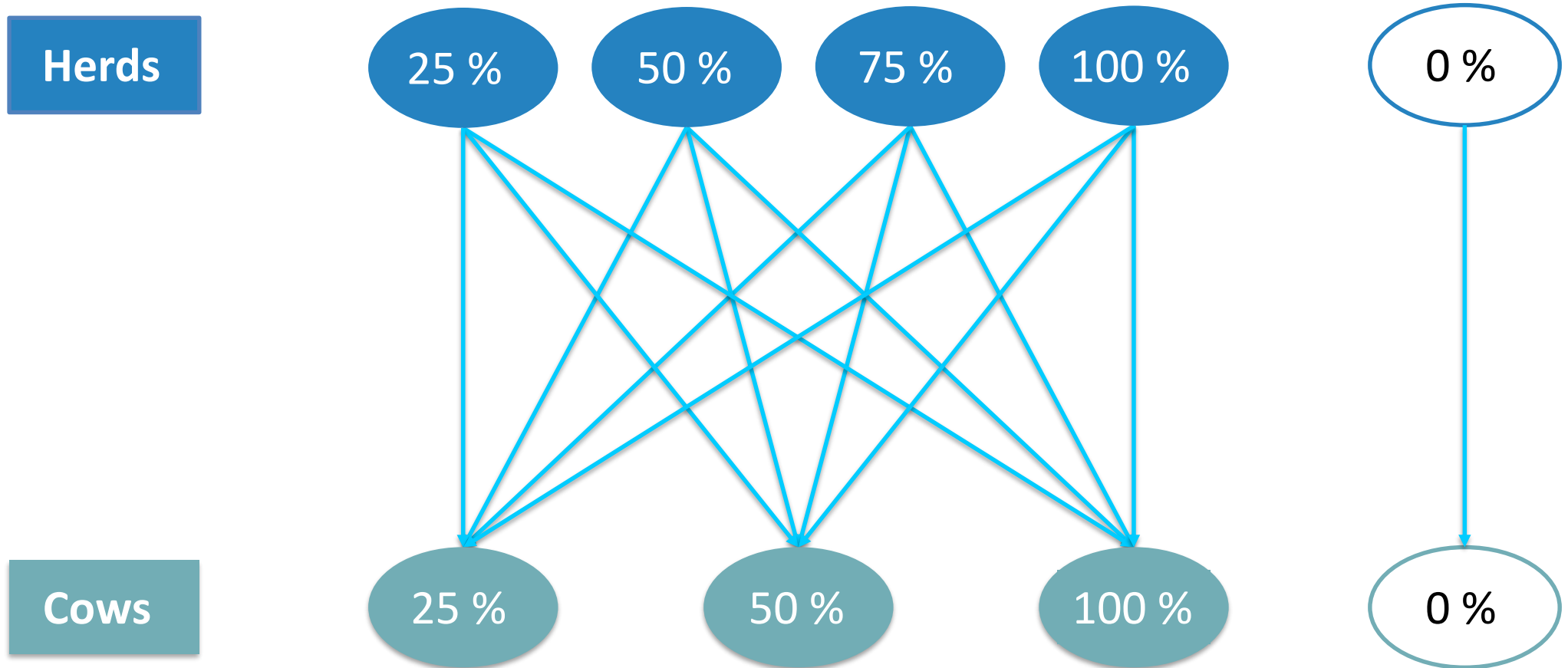


# Scenarios



# Scenarios

## 13 Scenarios



# Statistical Model

- Animal multi-trait model:

$$y = Xb + Za + Wh + e$$

$y$  = observations (CTFS, FSCT, DO)

$b$  = fixed effect year at calving

$a$  = random additive genetic effect

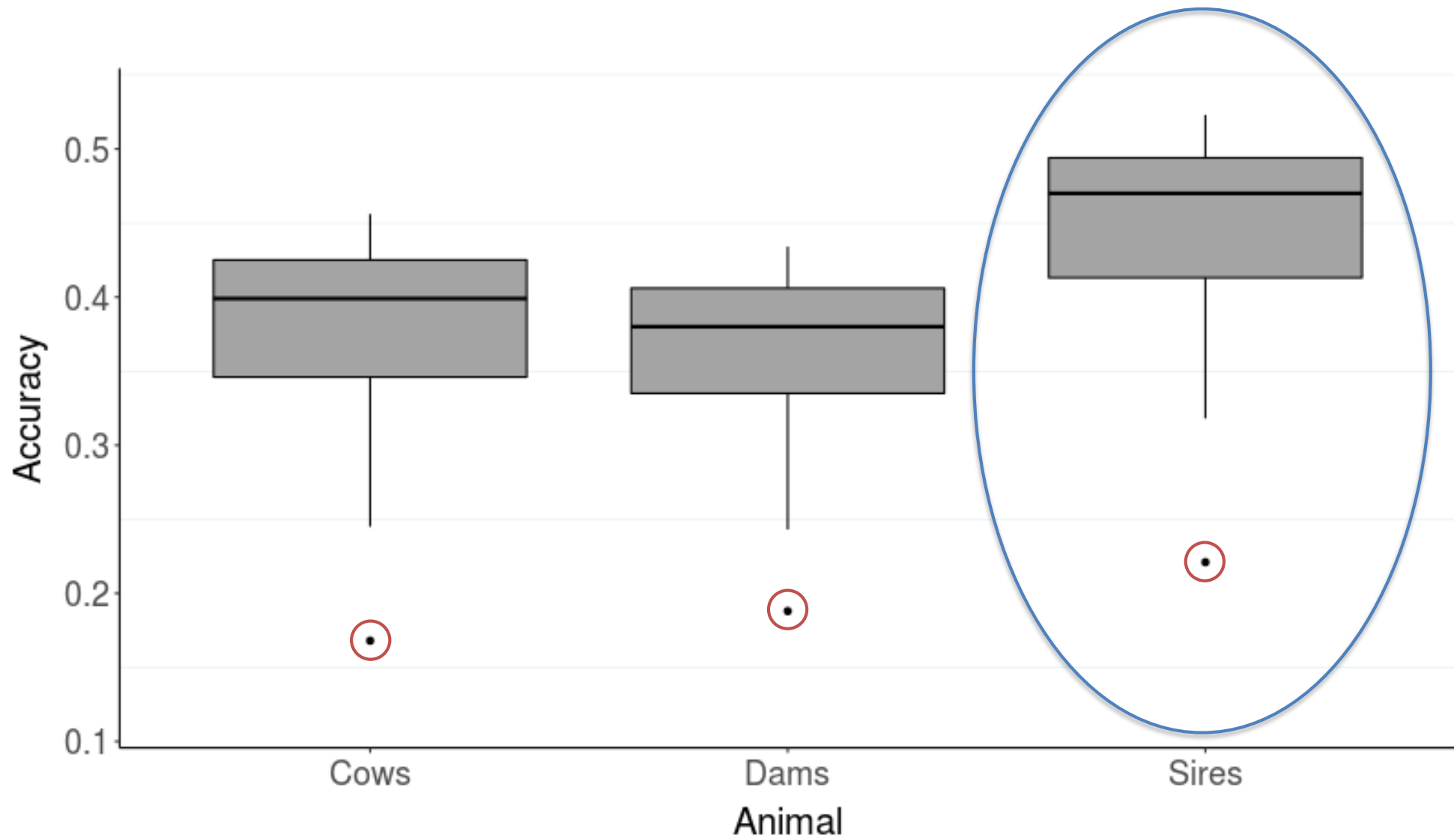
$h$  = random herd-year-season effect

$e$  = random residuals effect

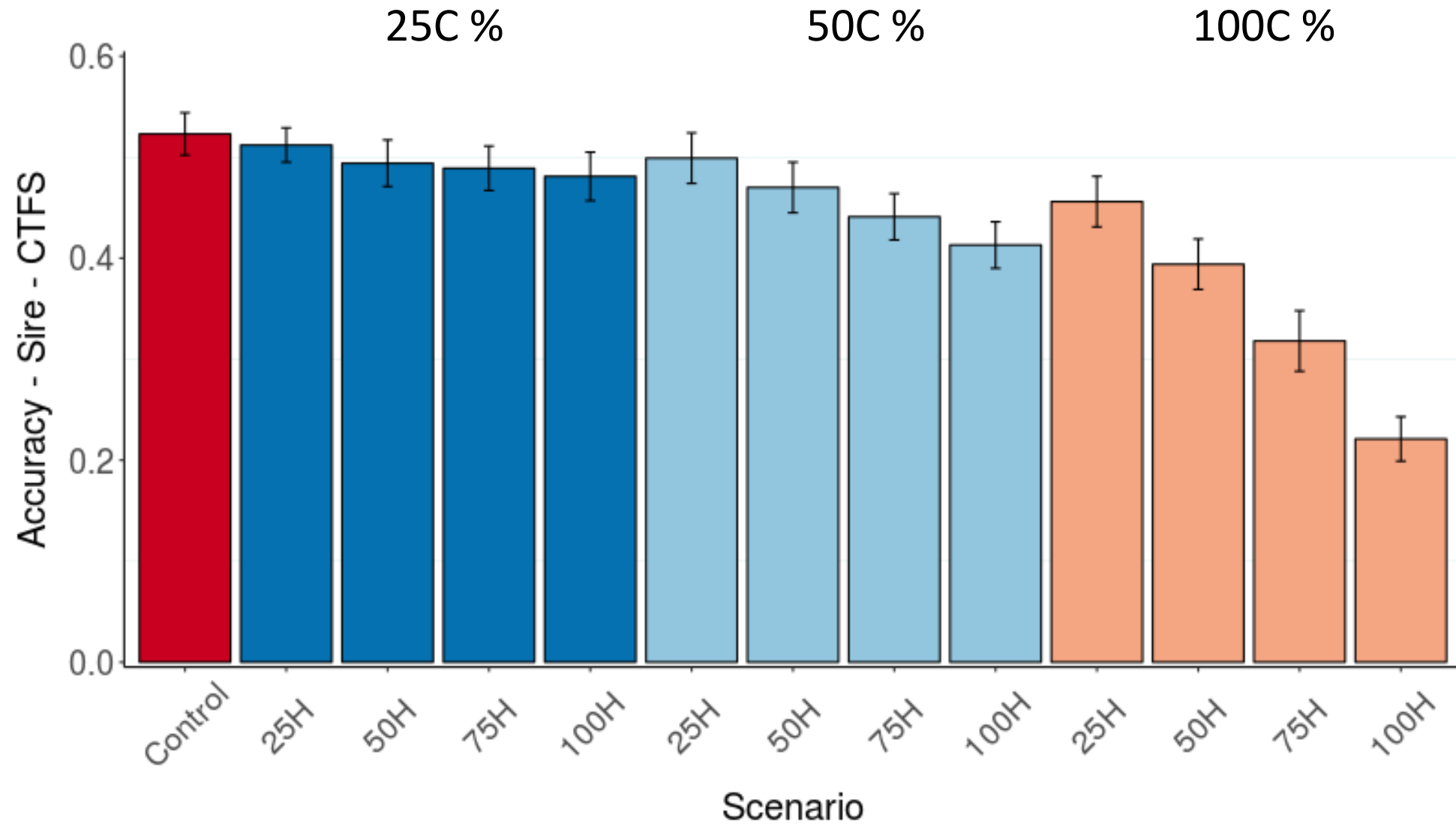
# Assessing Effect of Timed AI

1. Correlation between TBV and EBV (accuracy)
2. Differences in the mean EBV of top 25, 50, 75 and 100 sires
3. Changes in the rank correlation
4. Changes in the genetic trend over 20 generations

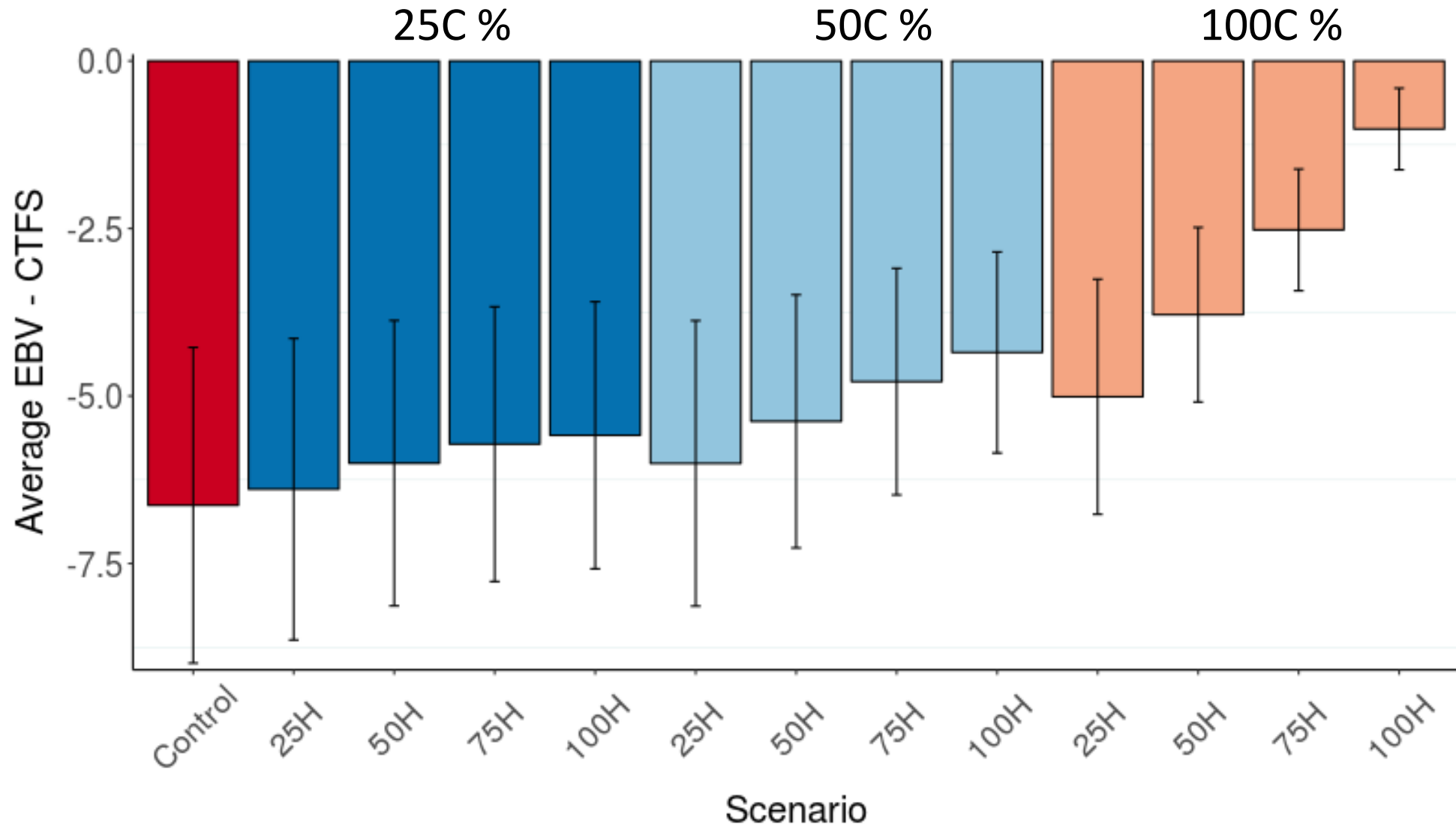
# Accuracy



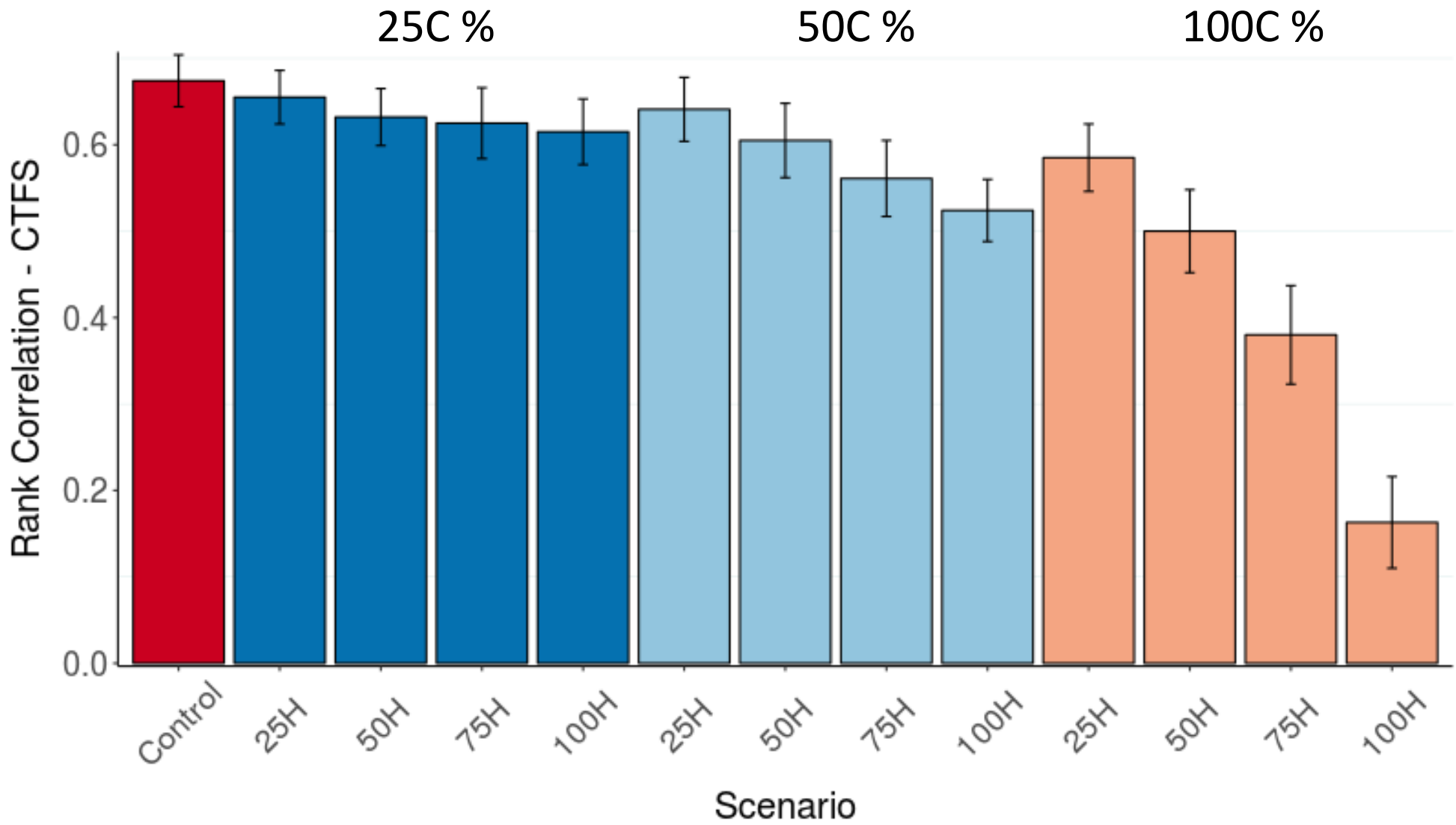
# Accuracy



# Average EBV – Top 25 Sires

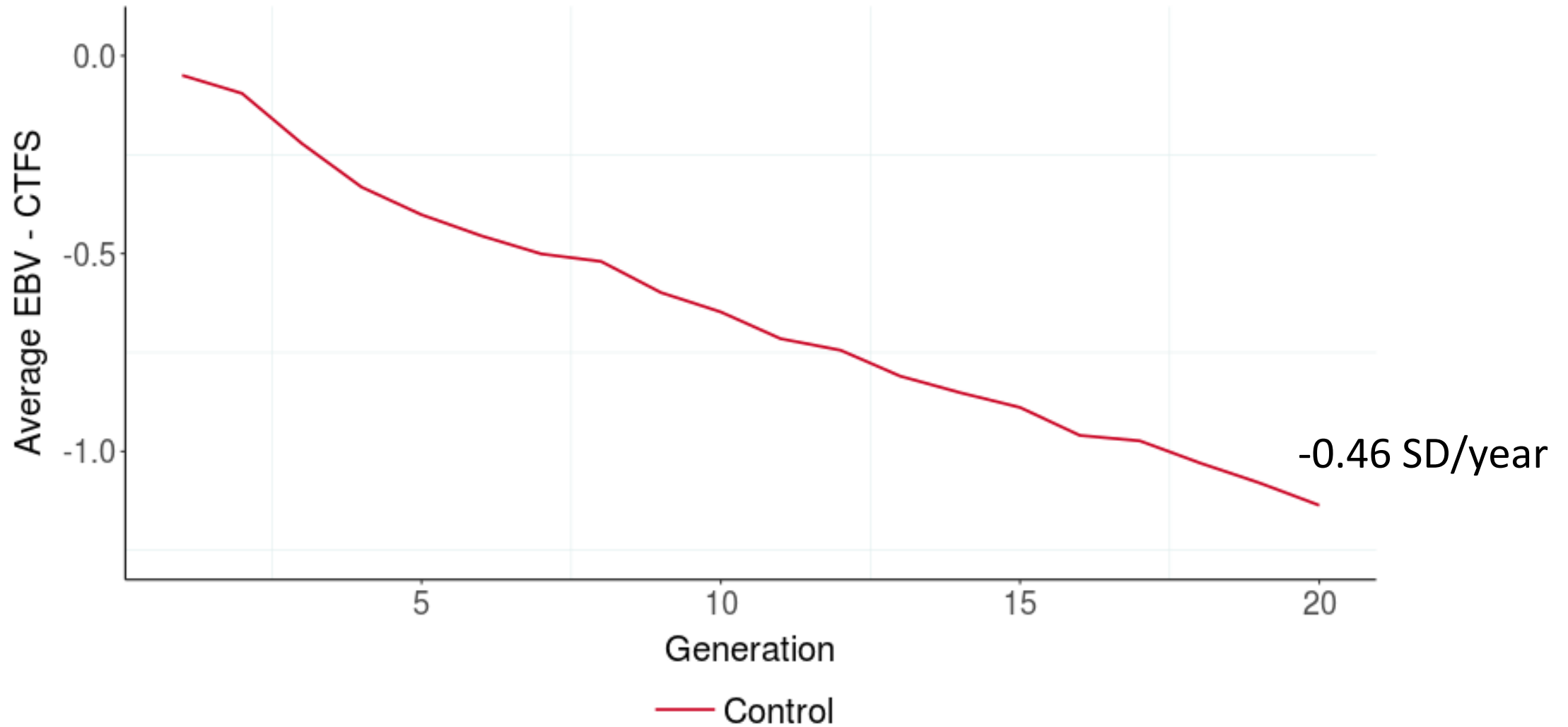


# Rank Correlation with TBV

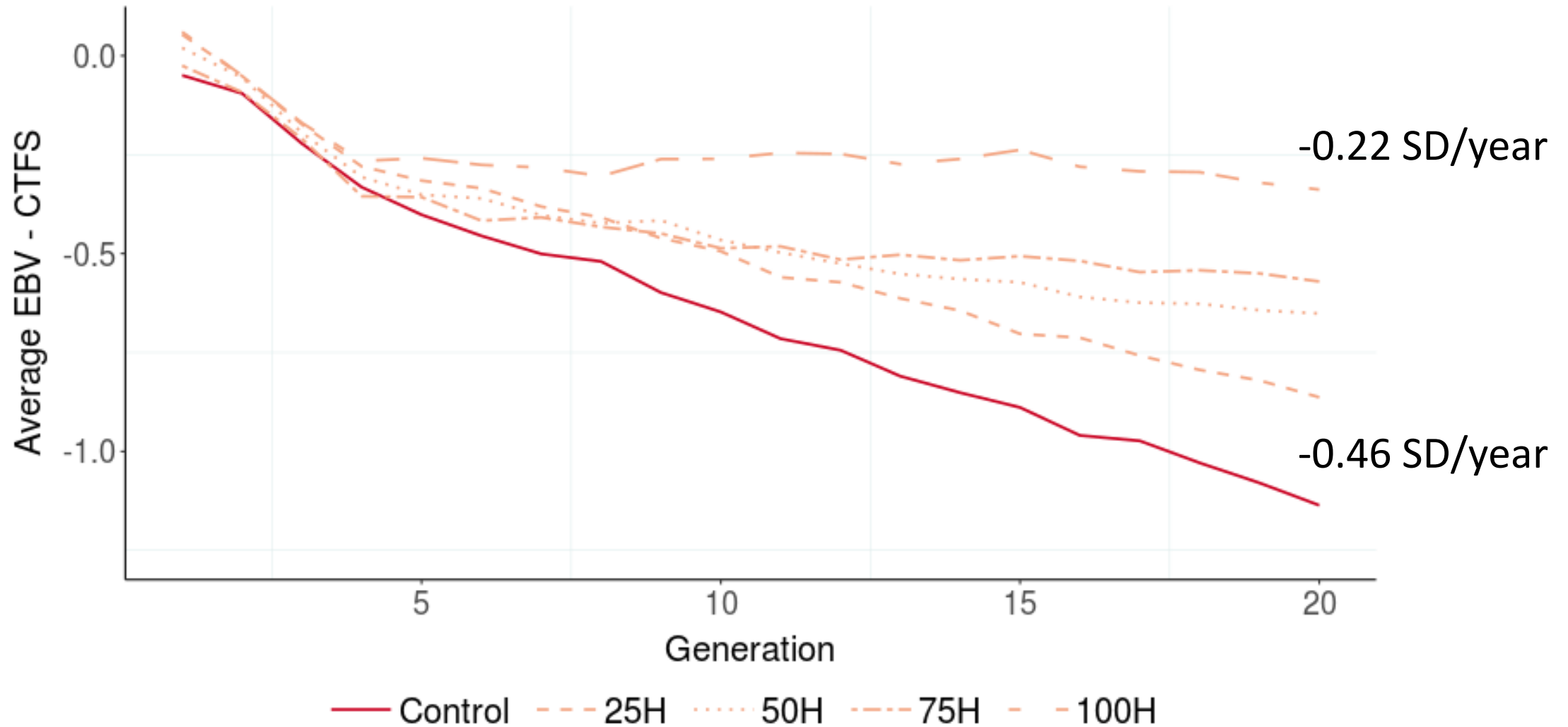




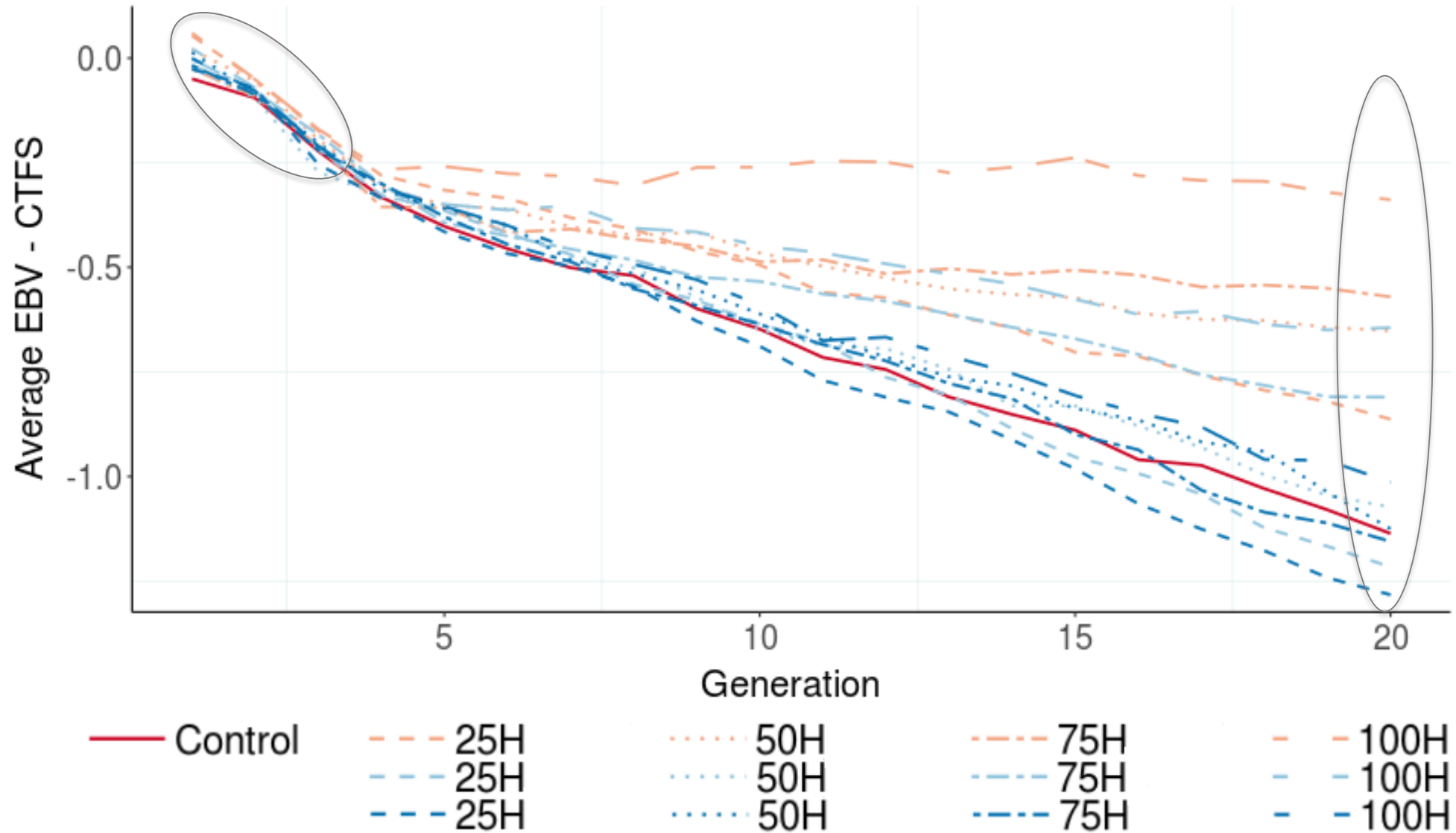
# Genetic Trend



# Genetic Trend



# Genetic Trend



# Summary

- All parameters changed unfavorably and proportionally to the increased use of timed AI
- Long-term effect on genetic trends
- Methods for adjustment should be considered (data)

# Next Steps

- Test different models to accommodate hormonal synchronized cows
- Conduct analysis with real data
- Impact of including cows in the training population

# Acknowledgements



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