

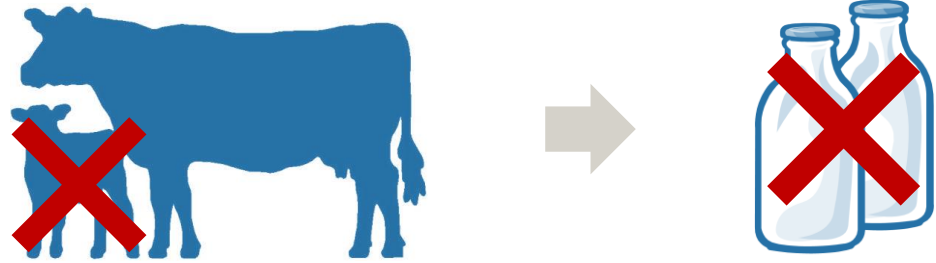
In-line milk progesterone profiles to estimate genetic parameters for atypical fertility in cows

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Fertility in dairy cows

Why fertility?

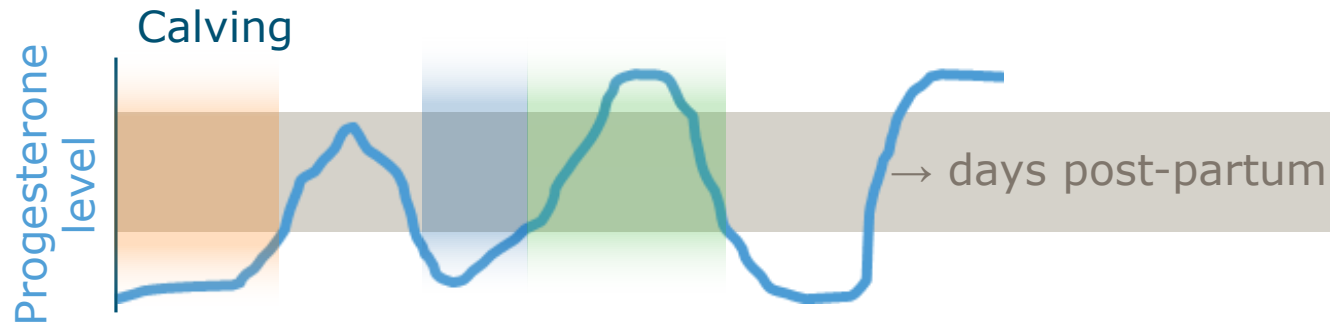


Breeding goal

- 1 calf / year
- 1 insemination / conception
- No hormonal treatment

Normal
reproductive
patterns

Normal ('typical') reproductive patterns



Commencement of luteal activity (**CLA**)

Start cyclicity
~ 1 month

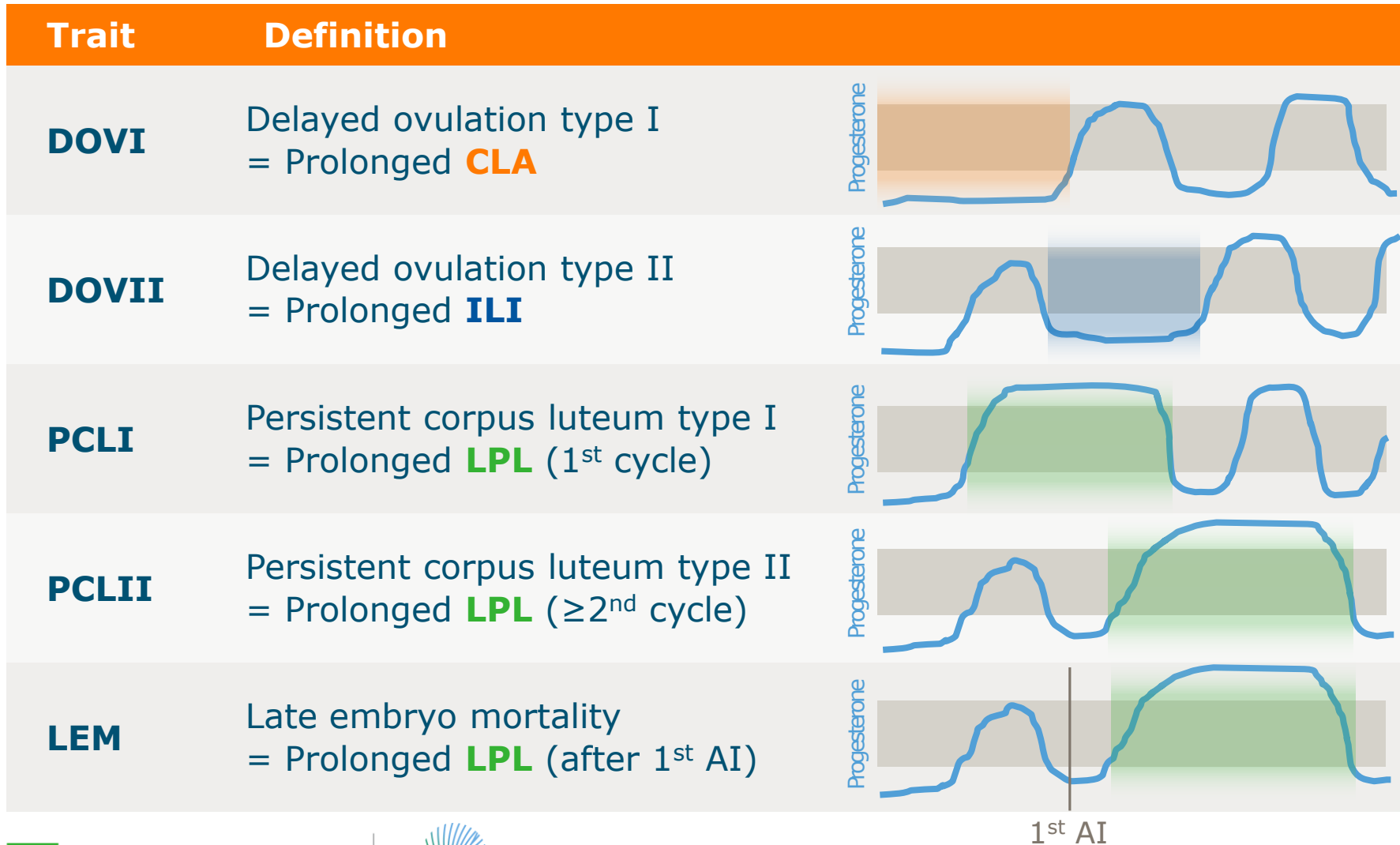
Inter-luteal interval (**ILI**)

Follicular phase
~ 1 week

Luteal phase length (**LPL**)

Luteal phase
~ 2 weeks

'Atypical' reproductive patterns

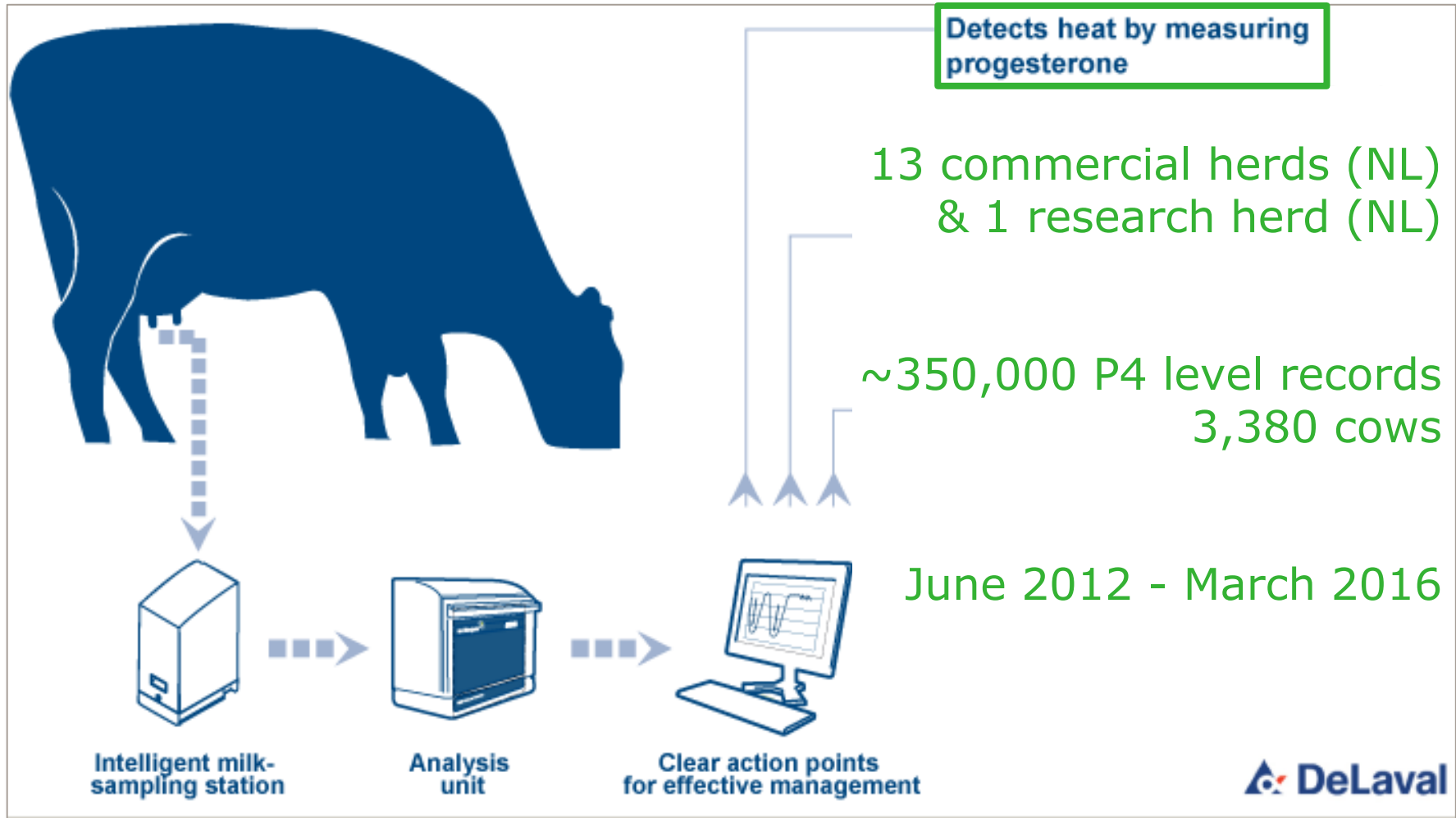


Objective

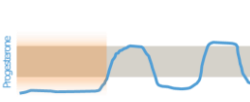
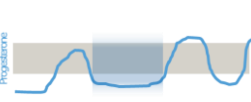
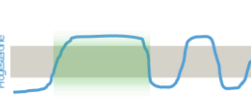
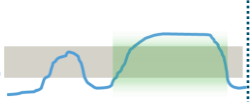
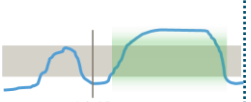

Investigate atypical reproductive patterns for a large number of cows

- Frequency of atypical patterns on different farms?
- Heritability of atypical fertility traits?
- Genetic correlation with milk production?

Herd Navigator™

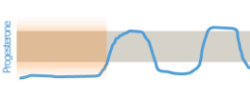
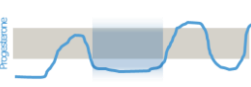

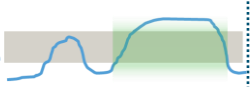
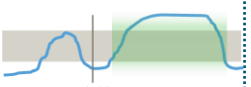


Frequency atypical patterns (1)

						
	DOVI	DOVII	PCLI	PCLII	LEM	Total
Freq.	0.17	0.16	0.18	0.13	0.16	0.44

≥ 1 atypical pattern in 44% of lactations

Frequency atypical patterns (2)

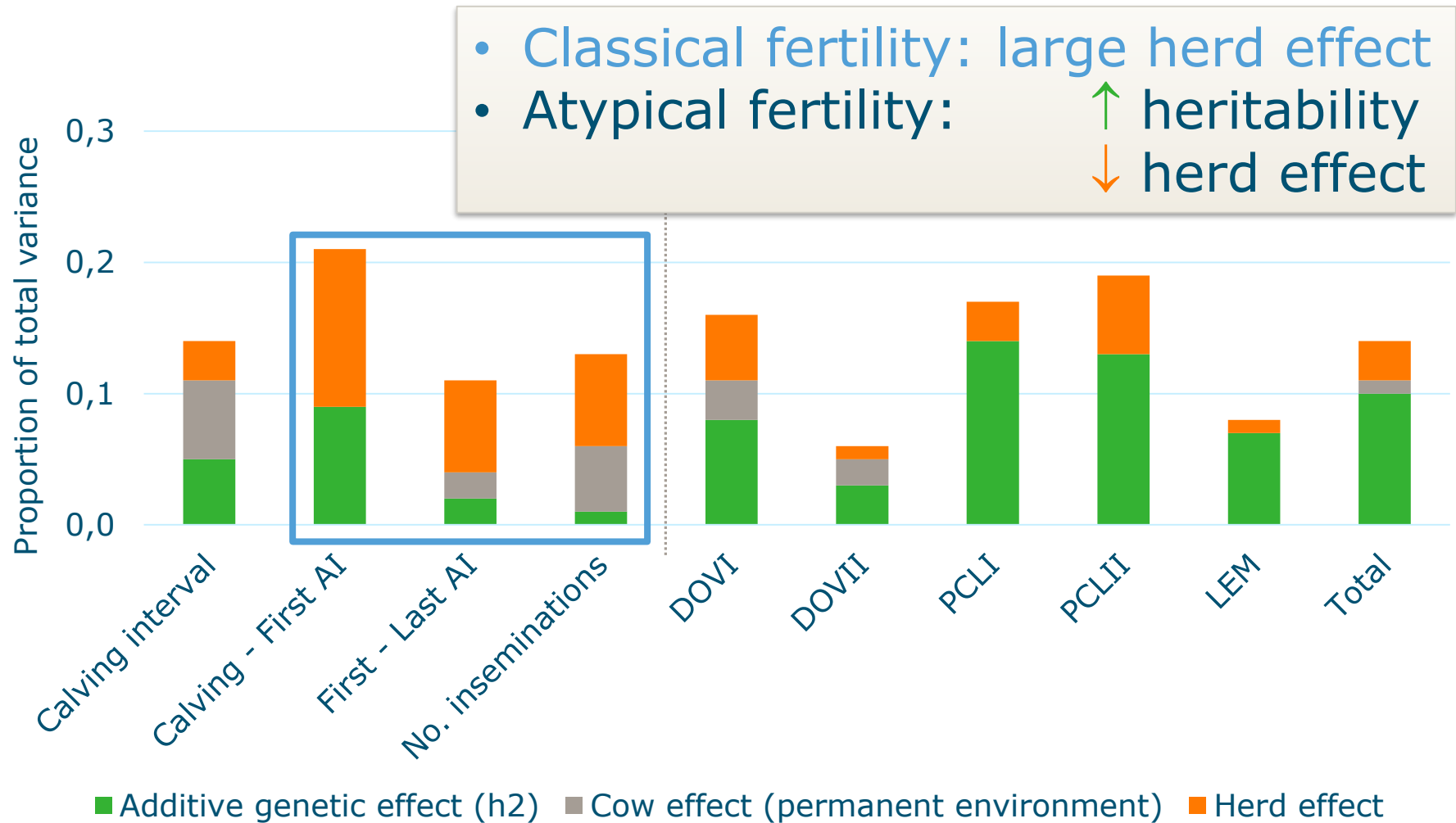
						
	DOVI	DOVII	PCLI	PCLII	LEM	Total
Freq.	0.17	0.16	0.18	0.13	0.16	0.44
Herd A	0.14	0.21	0.05	0.01	0.16	0.28
Herd B	0.13	0.15	0.17	0.08	0.11	0.37
Herd C						0.37
Herd D						0.38
Herd E						0.39
Herd F						0.43
Herd G						0.43
Herd H						0.44
Herd I	0.22	0.11	0.14	0.19	0.59	0.46
Herd J						0.50
Herd K						0.50
Herd L	0.22	0.19	0.20	0.10	0.15	0.52
Herd M	0.24	0.23	0.19	0.05	0.08	0.55
Herd N	0.22	0.17	0.26	0.20	0.13	0.55

Atypical patterns shown in all herds

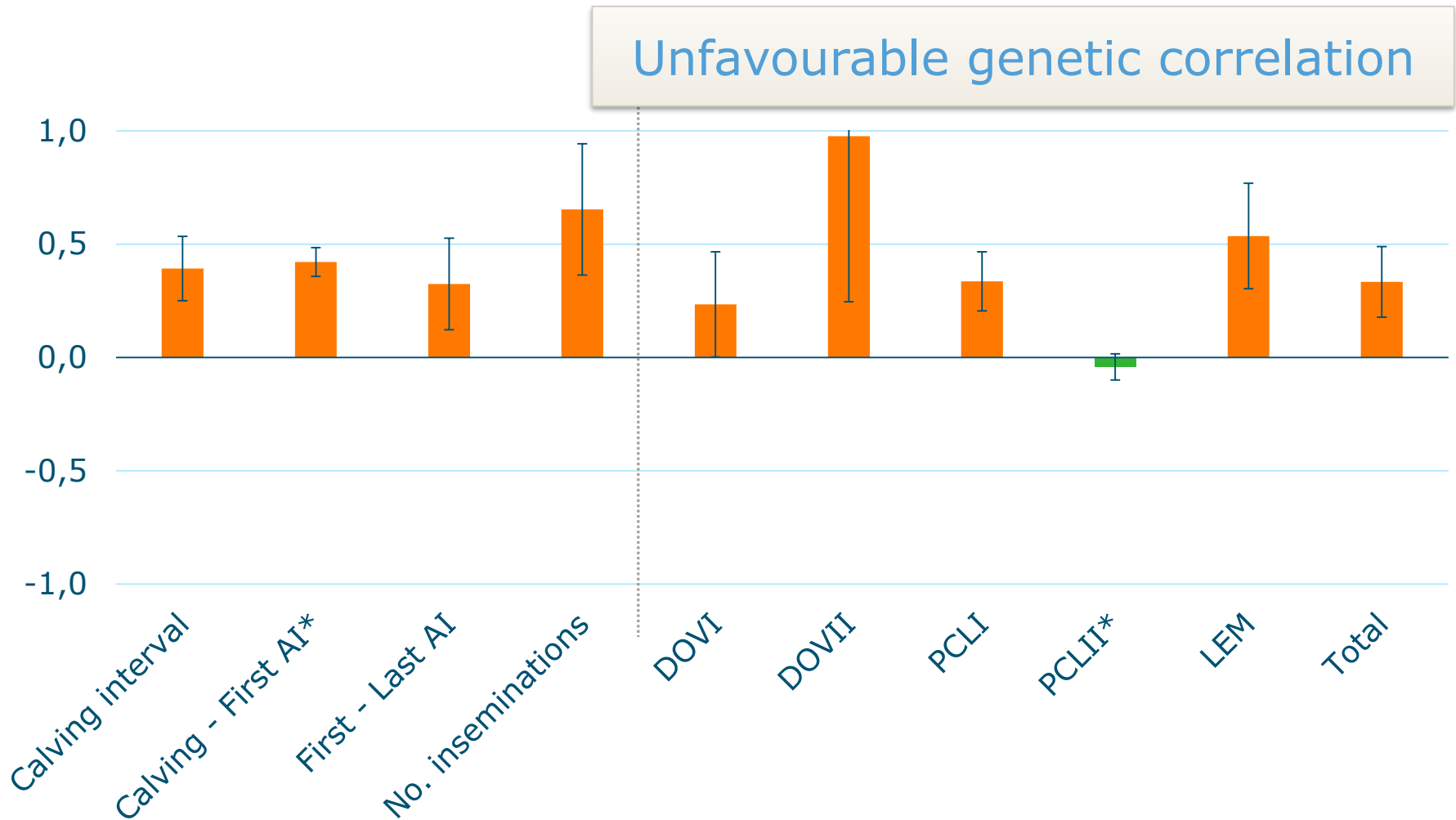
- 28% of lactations atypical in the best herd
- $\geq 50\%$ of lactations atypical in 5 out of 14 herds

Large differences between herds

Proportion of total variance explained



Genetic correlation with milk yield



Classical fertility vs. Atypical fertility traits

Classical

High number of records

Unfavourable genetic correlation with milk yield

Management bias

Low heritability

Atypical

Lower number of records

Unfavourable genetic correlation with milk yield

Less management bias

Higher heritability

Take home messages



Atypical patterns shown in all herds

- 28% - 55% of lactations
- Large variation

Breeding for atypical fertility traits is promising if enough records available

- Heritability up to 14%
- Less bias by management

Thresholds atypical fertility

All trait records excl. outliers
($> \text{mean} + 3 \cdot \text{sd}$)

Trait	Definition	Threshold (mean + sd of "typical" data)
DOVI	Delayed ovulation type I	CLA ≥ 58 days
DOVII	Delayed ovulation type II	ILI ≥ 16 days
PCLI	Persistent corpus luteum type I	LPL (1 st cycle) ≥ 20 days
PCLII	Persistent corpus luteum type II	LPL ($\geq 2^{\text{nd}}$ cycle) ≥ 20 days
LEM	Late embryo mortality	LPL (after 1 st AI) ≥ 20 days

Genetic analyses

Linear mixed model in ASReml 4.1

Atypical fertility traits: probit-link function

Fixed effects

- Intercept
- Parity class
- Parity class x Calving age
- Year-Season
- Proportion of non-HF genes (5 effects)

Random effects

- Additive genetic
 - Pedigree: 31,849 animals
- Permanent environment
 - Cow effect (excl. additive genetic)
- Herd