(Co)variances between anogenital distance and fertility in Holstein-Friesian dairy cattle

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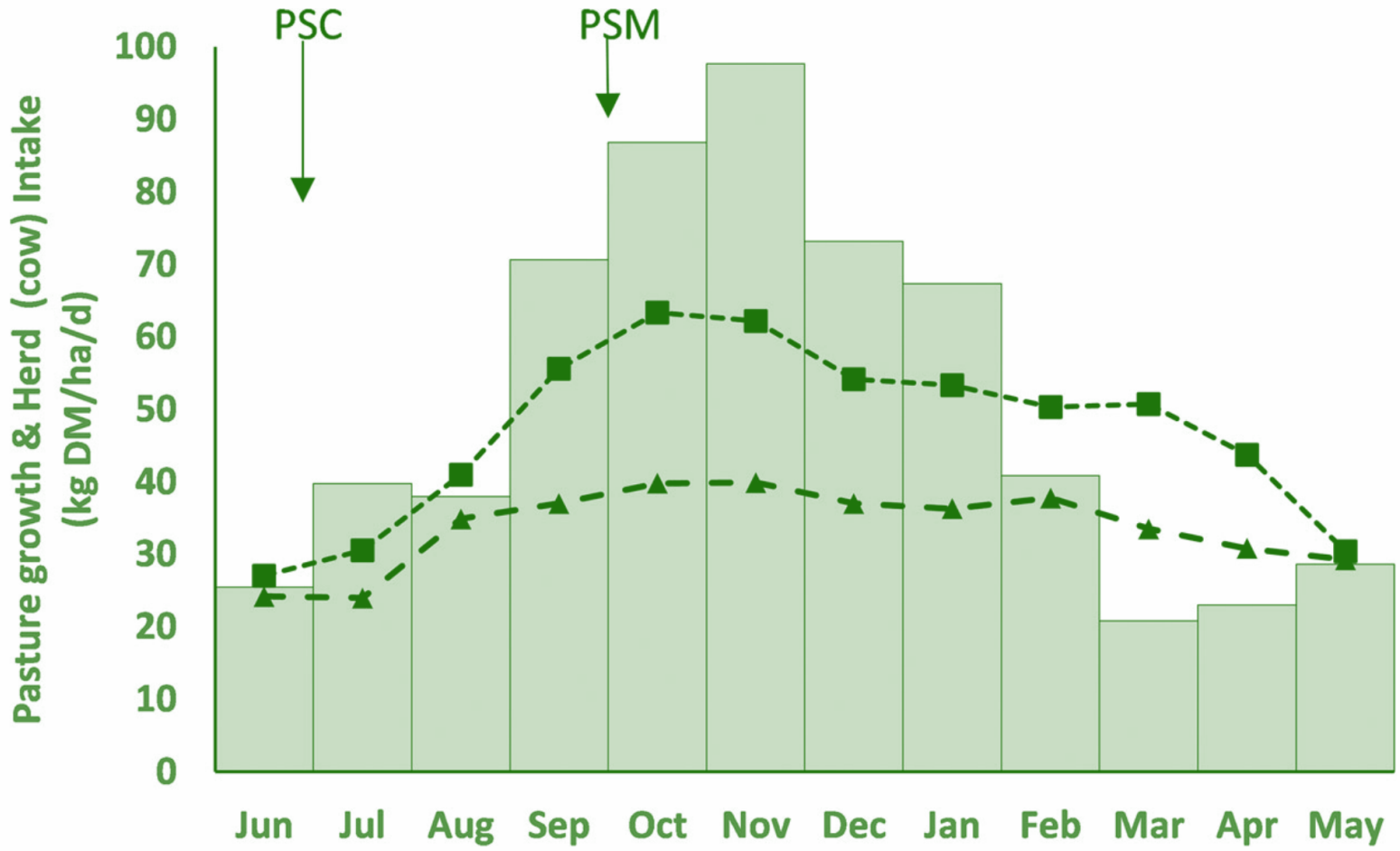

Figure 1. Daily pasture growth rate (vertical bars; kg DM/ha/d) and per ha DMI of dairy cows at 2 stocking rates, 2.2 (▲), and 4.3 (■) cows/ha. PSC = Planned start of calving, PSM = planned start of mating.

(Macdonald and Roche, 2023)

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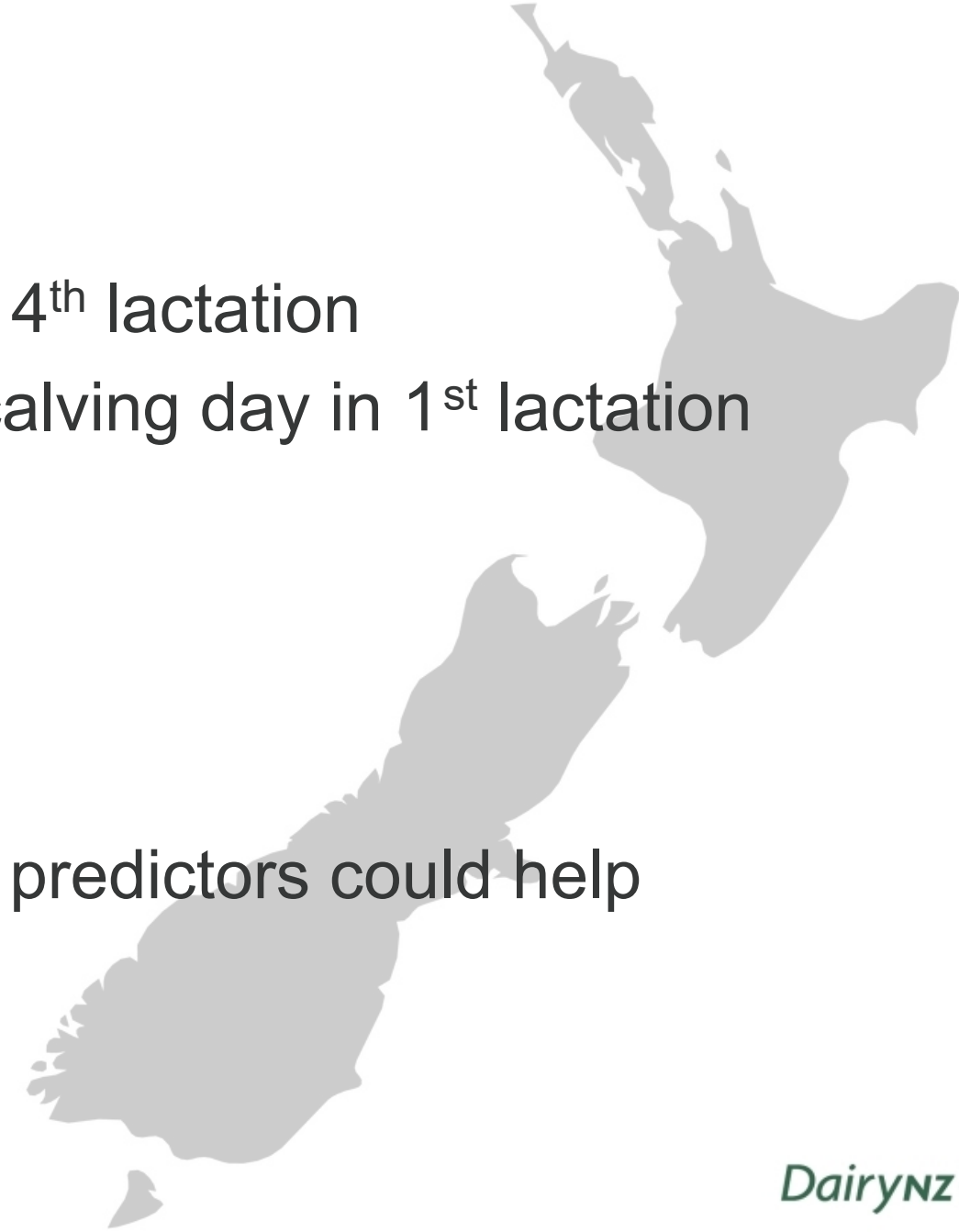
NZ Fertility EBVs

- Target trait: Calving date in 2nd ,3rd, 4th lactation
- Predictors: 3-week breeding rate, calving day in 1st lactation
  - Timing limitations
  - Low heritability (>5%)
- Genomic selection and early-in-life predictors could help



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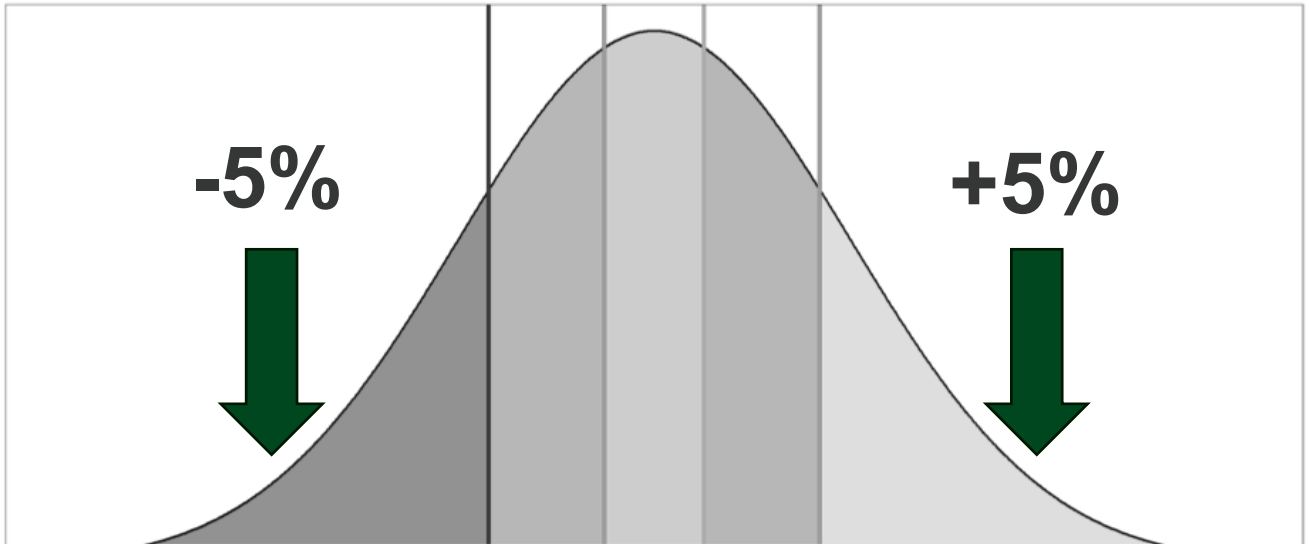
Fertility BV research herd



(Meier et al., 2021b; a)

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TOXICOLOGICAL SCIENCES 96(2), 335–345 (2007)
doi:10.1093/toxsci/kfm002
Advance Access publication January 11, 2007

Prenatal Testosterone Exposure
Anogenital Distance, Nipple Develo
Morphology in Female

Andrew K. Hotchkiss *,†,‡ Christy S. Lambright † Joseph >

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The relationship between anogenital di
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Human Repr
Advanced Acces

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Characterization of anogenital distance and its relationship to fertility in lactating Holstein cows

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‡Teagasc, Animal and Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork, Ireland P61 C996

a biomarker for prenatal hormonal environment

ers

al Research Institute,

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Anogenital Distance

- Distance between the anus and the clitoris
- Relatively simple to measure
- Expressed early-in-life

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Fertility traits (1st lactation)	'Short' <102 mm	'Long' ≥102 mm
Number (n)	296	171
Pregnant at 6 weeks	55%	38%
Final pregnancy rate	77%	64%
Start of mating to conception	25 d	47 d

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Investigating anogenital distance and antral follicle count as novel markers of fertility within a herd of cows with positive or negative genetic merit for fertility traits

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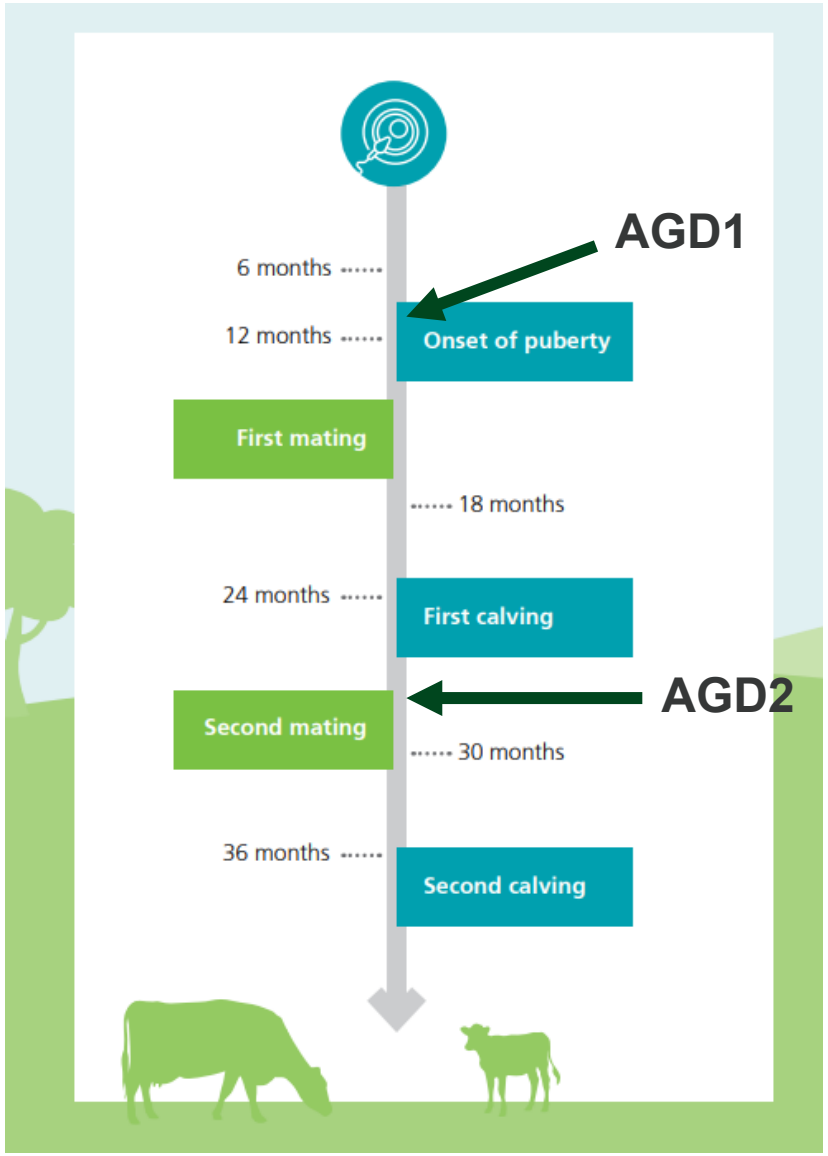
Scale-Up trials



5,010 animals - 54 farms

- Puberty traits (2019)
- First lactation (2020/21)
- Second lactation (2021/22)

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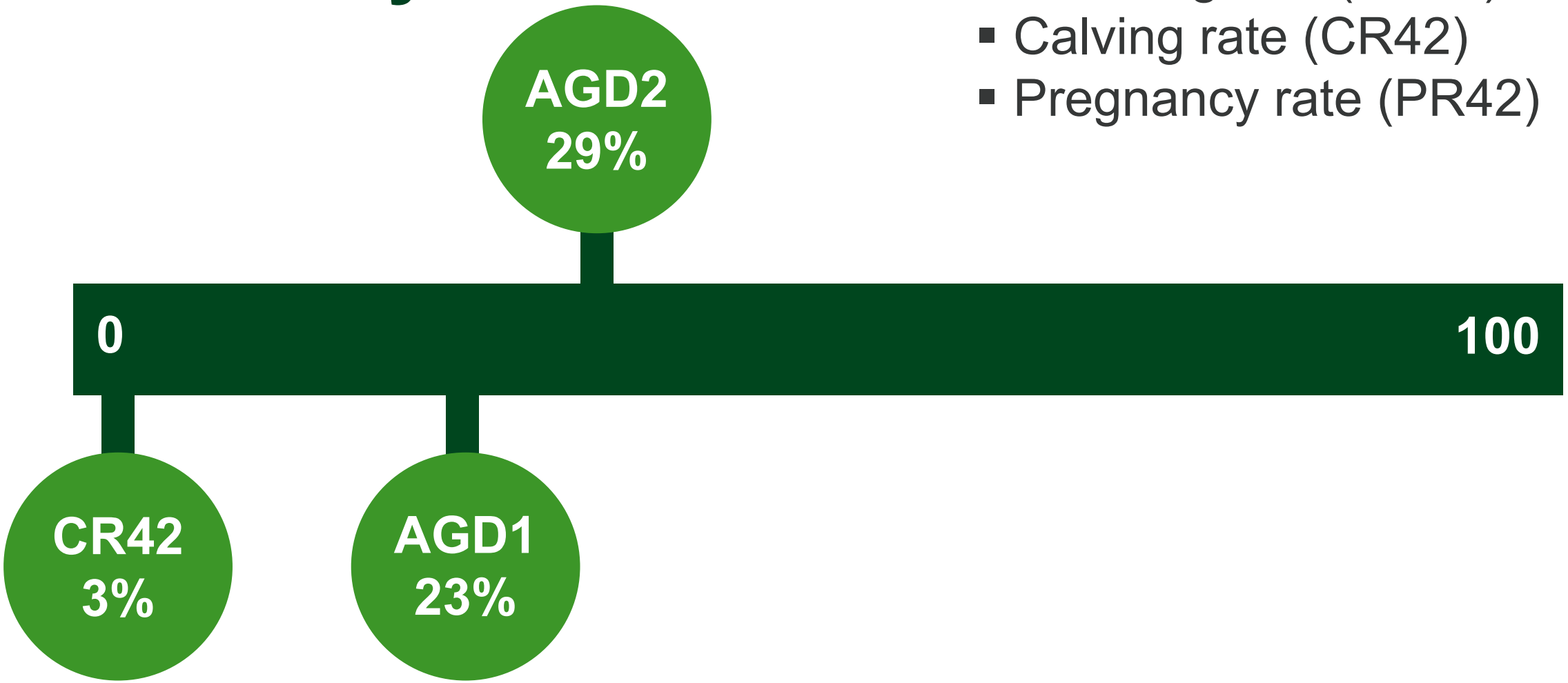
Research questions

- What is the heritability of AGD?
- What are the genetic correlations between these traits and key fertility traits?
  - Presented for breeding; PB21
  - Calving rate; CR42
  - Pregnancy rate; PR42
- Do these parameters depend on age?

Heritability

- Anogenital Distance (AGD)
- Breeding rate (BR21)
- Calving rate (CR42)
- Pregnancy rate (PR42)



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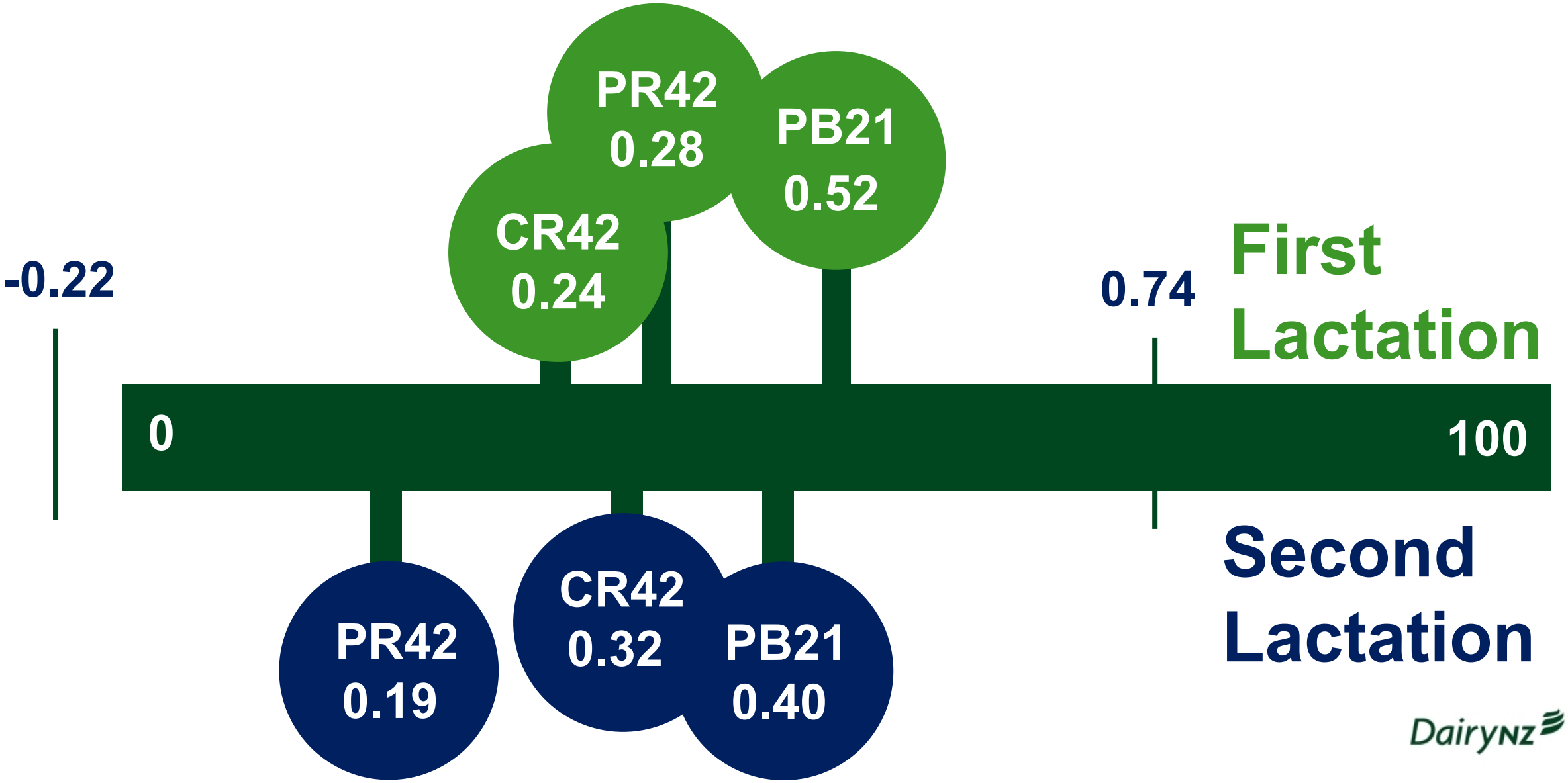
Genetic Correlations – AGD1 (11 months)



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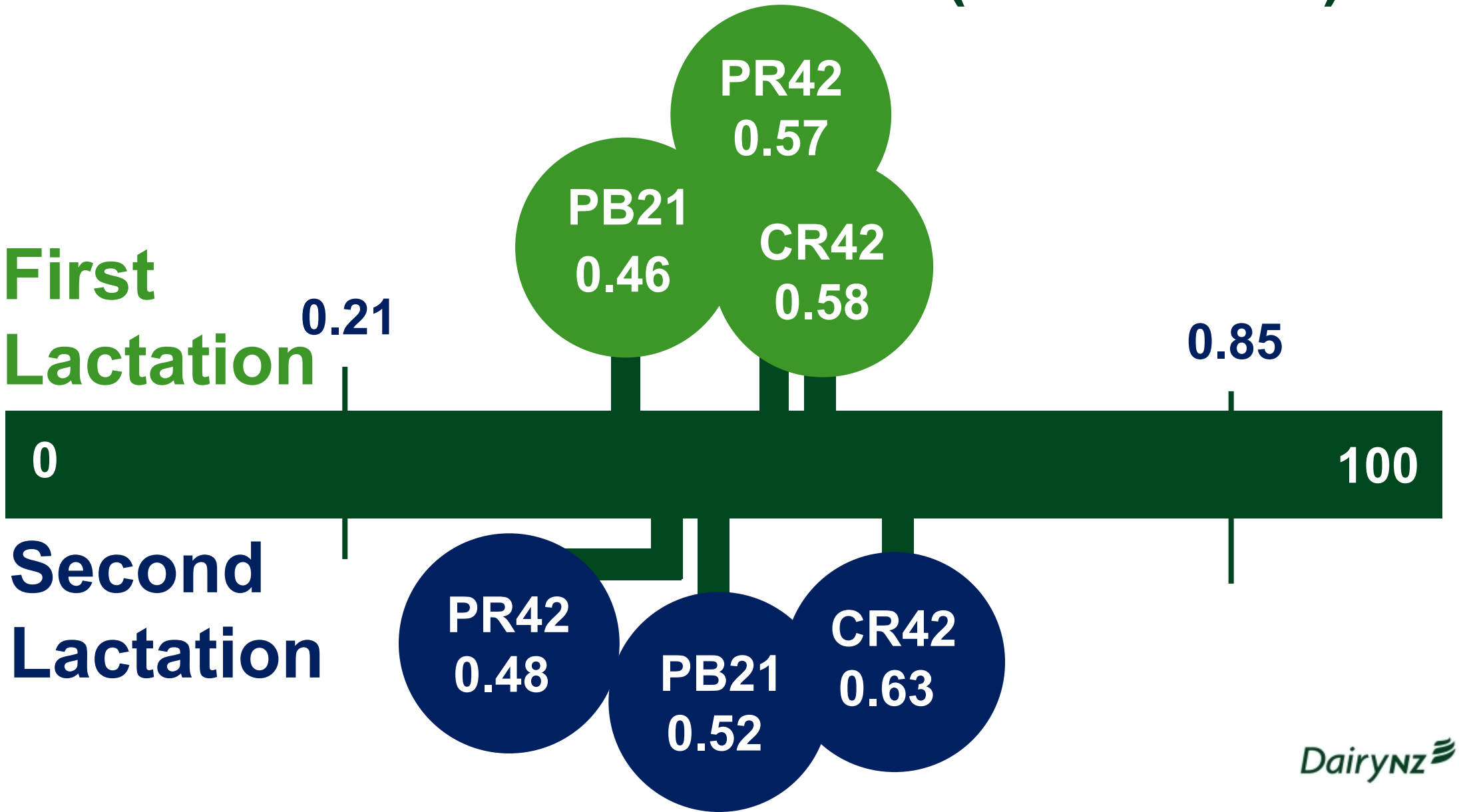
Genetic Correlations – AGD2 (29 months)



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Genetic Correlations – AGD1 and AGD2

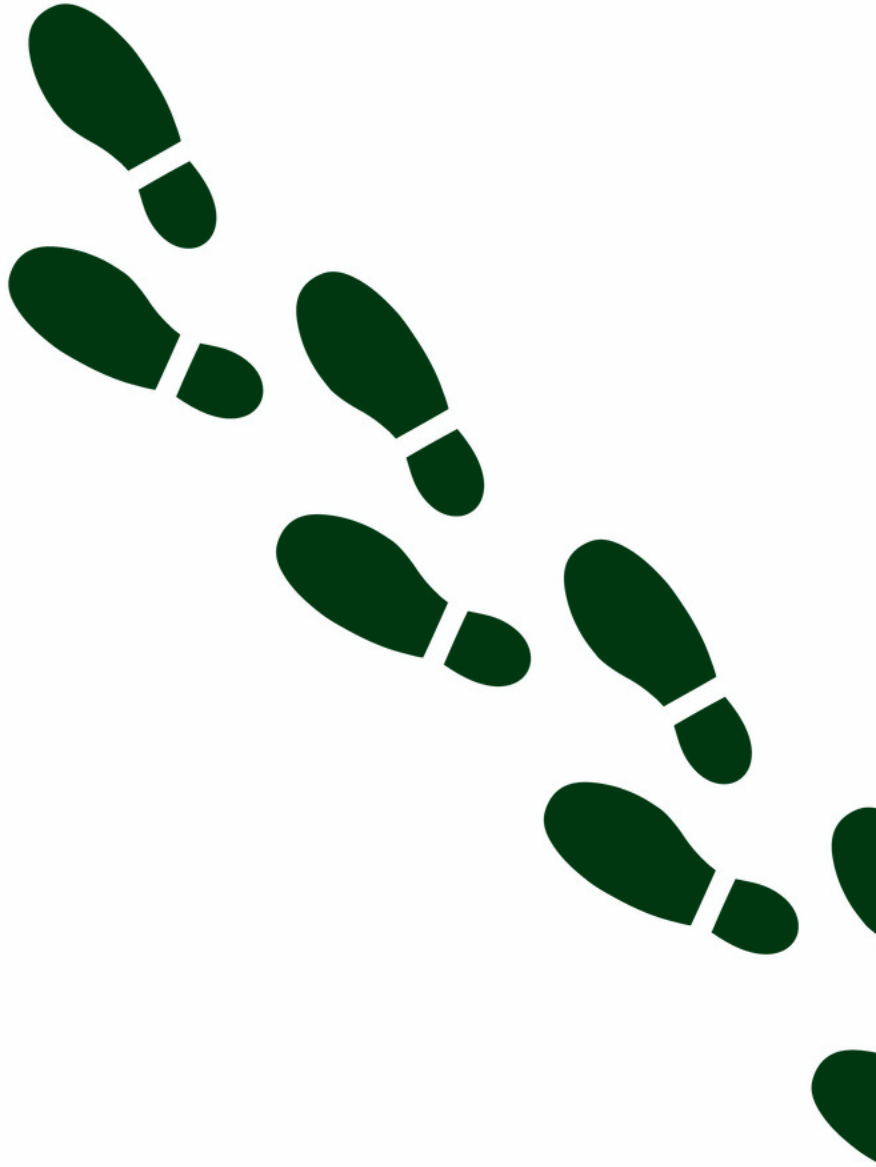
- Body Weight, Length, Height

Things are looking good!

- ✓ **Can** measure early in life
- ✓ **Moderate heritability**
- ✓ Changing AGD via selection **should** improve fertility

Next steps

- Repeat analysis in a Jersey cohort
- Measure in bulls
- Develop a plan for large scale measures
  - AI bulls?
  - New-born calves?



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Genome-Wide Association Study of anogenital distance and its (co)variances with fertility in growing and lactating Holstein-Friesian dairy cattle

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