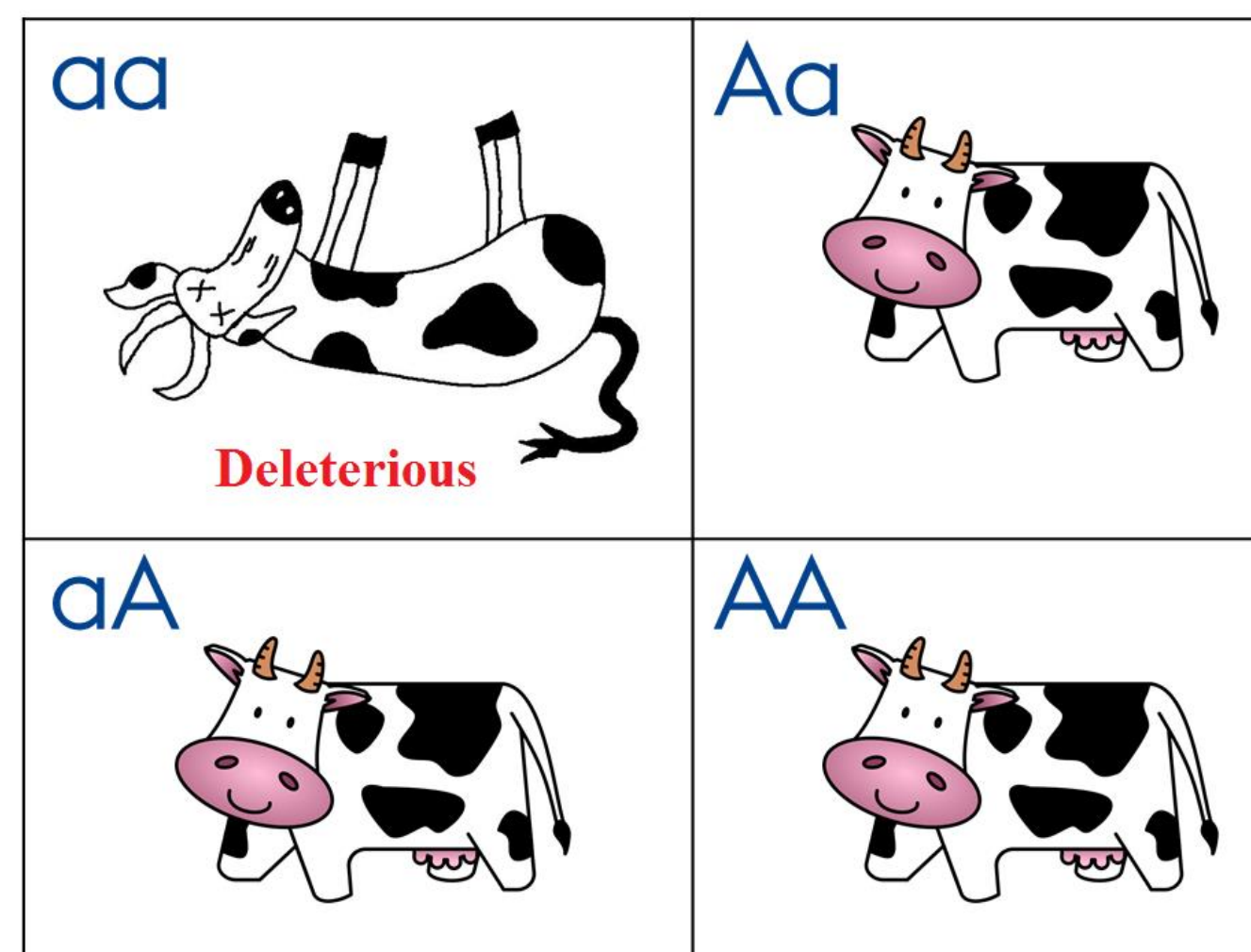


Haplotypes responsible for prenatal death detected in cattle

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Objective: Identify recessive lethal haplotype for prenatal death in three cattle breeds



Haplotypes common in the population but never occur as homozygous state in live animals

- Bovine 50K data
 - Holstein 26,312
 - RDC 19,309
 - Jersey 4,291
- Number of recessive lethal candidate haplotypes
 - Danish Holstein (DH) 9
 - Nordic Red (RDC) 16
 - Danish Jersey (DJ) 11



Haplotype carrier status of bulls explained variance for non-return rate (NRR)

- Insemination records
 - DH 2,402,533
 - Danish Red (DR) 473,608
 - Finnish Ayrshire (FA) 1,316,455
 - DJ 728,938
- Test for combined effect of detected haplotypes on NRR using likelihood ratio test
 - Reduced Model
 - $y = p + t + u + e$
 - y: NRR at 35, 56, 100, 150 days
 - p: parity
 - t: insemination month and year
 - u: maternal grandsire, random effect, $N(0, A\sigma_e^2)$
 - Full model
 - $y = p + t + m + u + e$
 - m: carrier status of the bull and maternal grandsire for all haplotype
- Results - Carrier status of bull and maternal grandsire explain variance for the NRR (P-value from likelihood ratio test)

Breed	NRR35	NRR56	NRR100	NRR150
DH	9.98e-63	0	1	0
DR	0	0	0	0
FA	1	0	0	0
DJ	0	3.92e-205	0	0

Putative recessive lethal haplotypes validated with insemination records

- Recessive gene action confirmed from carrier sire by carrier dam mating
 - Carrier sire by carrier dam mating leads to extra failure rate (Figure 1)
- Number of recessive lethal candidate Haplotypes validated
 - DH 3
 - RDC 11
 - DJ 5
- Some haplotype did not show high insemination failure
 - False positive
 - Responsible for late embryonic death or stillbirth

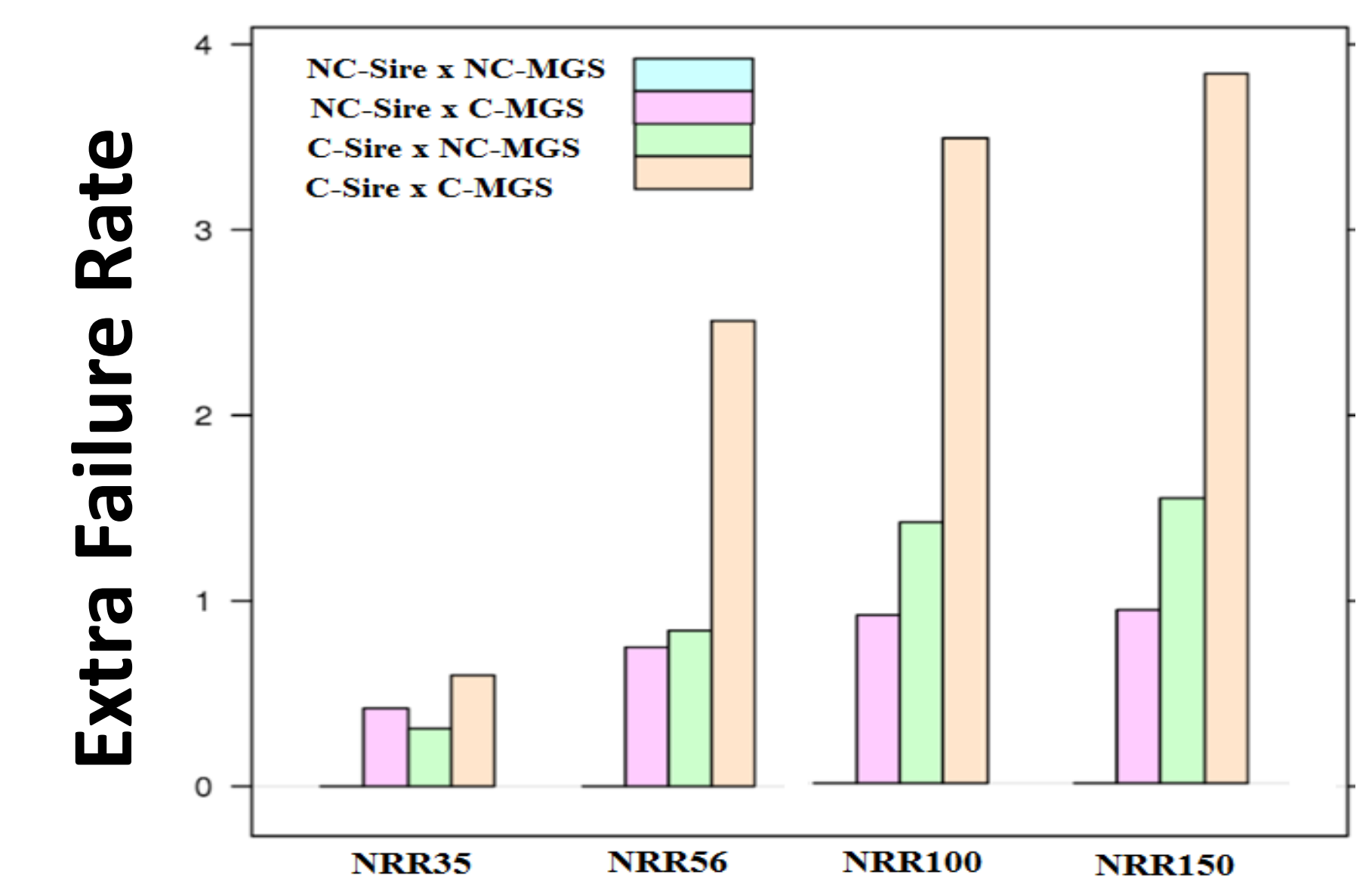


Figure 1 Extra insemination failure form Carrier Sire by Daughter of Carrier MGS mating