



DNA Based Breeding

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Advances in Animal Breeding Webinar

3rd March, 2021

DNA

DNA is the **same in every cell** of
your body

&

doesn't change throughout
your life



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DNA evidence proves Welsh farmer stole neighbour's cow

Updated / Wednesday, 5 Feb 2020 15:54



PC Gareth Jones, the officer who took charge of the case, said his force was "proud" of its achievement

DNA

DNA = building blocks of genes

4 different nucleotides

A – Adenine

C – Cytosine

G – Guanine

T – Thymine



What is a SNP?

99.9% of our DNA is identical – most of the differences are in the form of *SNPs*



...ACGTACGTCAATGACTTTTACGTAT...



...ACGTACGACAATGACTTTTACGTAT...

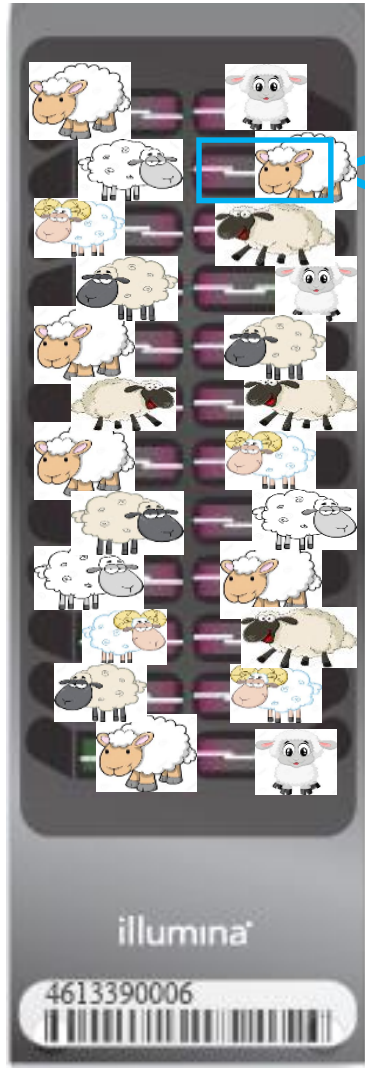
Single Nucleotide Polymorphism

Change

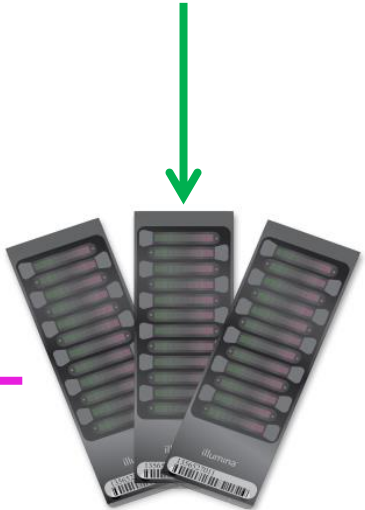
Genotyping process



Genotyping process



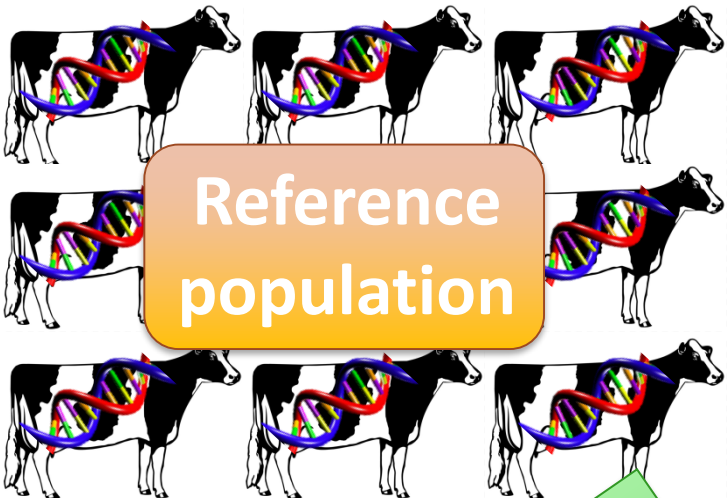
Genotyping process



Decision support tools



Genomic selection



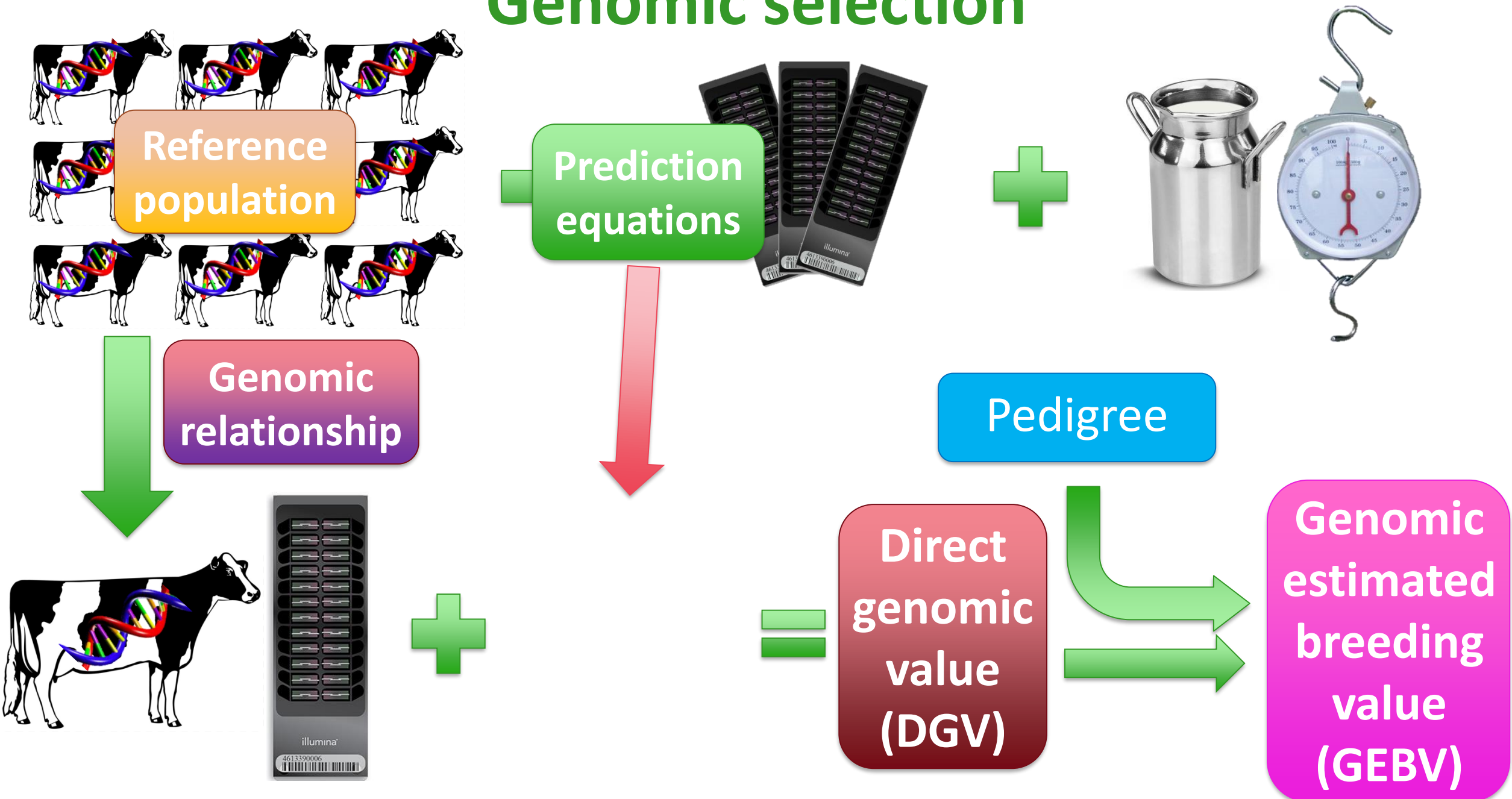
Association between SNPs and phenotypes

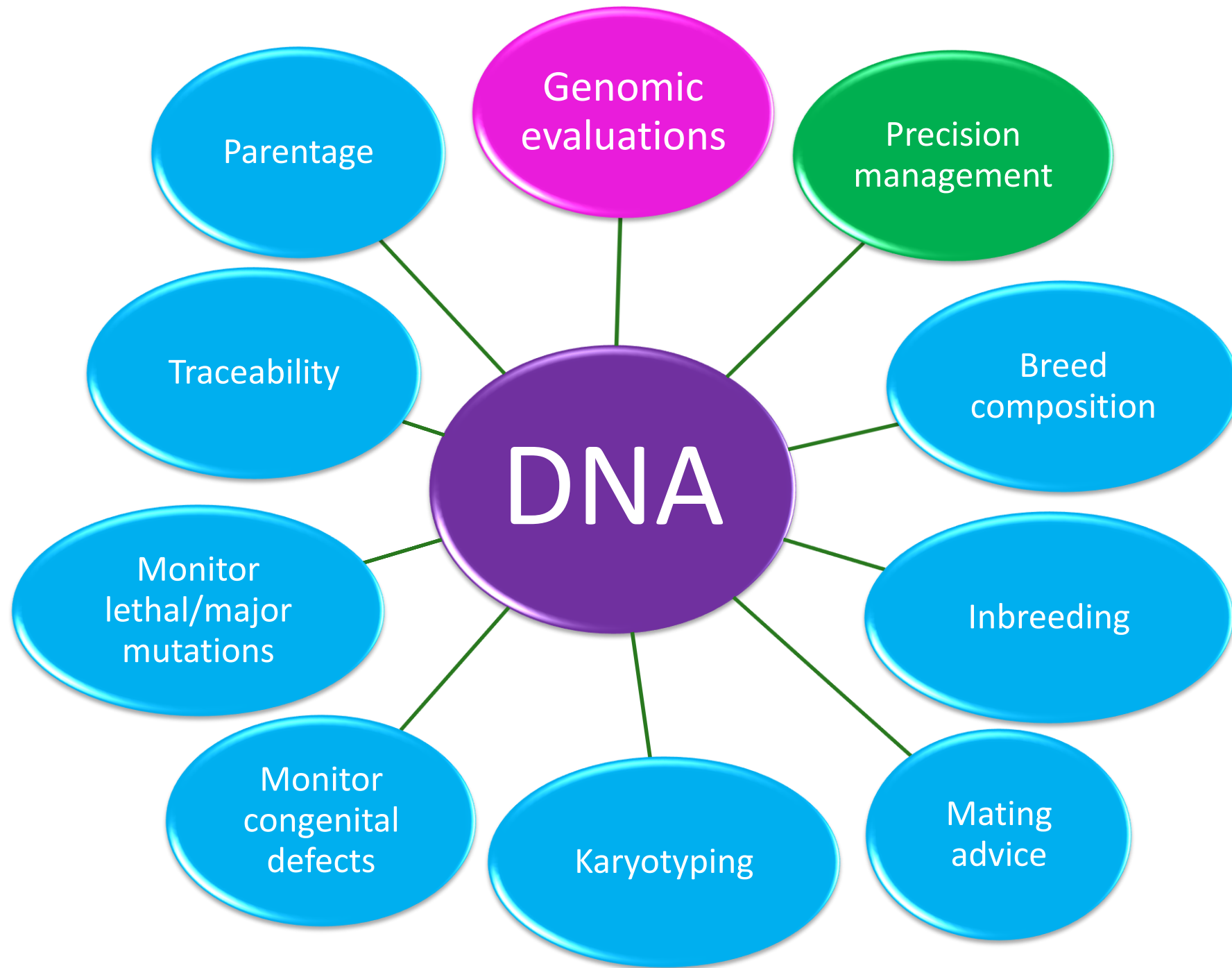
SNP	Milk	Fertility
1	+5	-0.6
2	-1.3	+0.9
3	-4.7	+0.2
4	+20	-0.4
5	+12.3	-0.6
⋮		
n	-32	+1.1



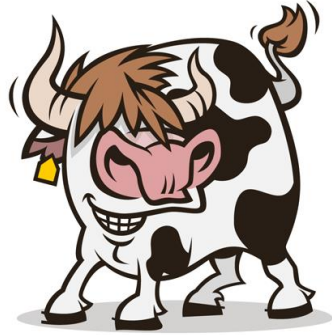
Prediction equations

Genomic selection





Determining Parentage



.....TCACCGCTGAG.....

.....CAGATAGGATT.....



.....CAGATAGGATT.....

.....GTTAGCCTGTCA



The breeders equation

$$\Delta G = \frac{i \cdot r \cdot \sigma_a}{L}$$

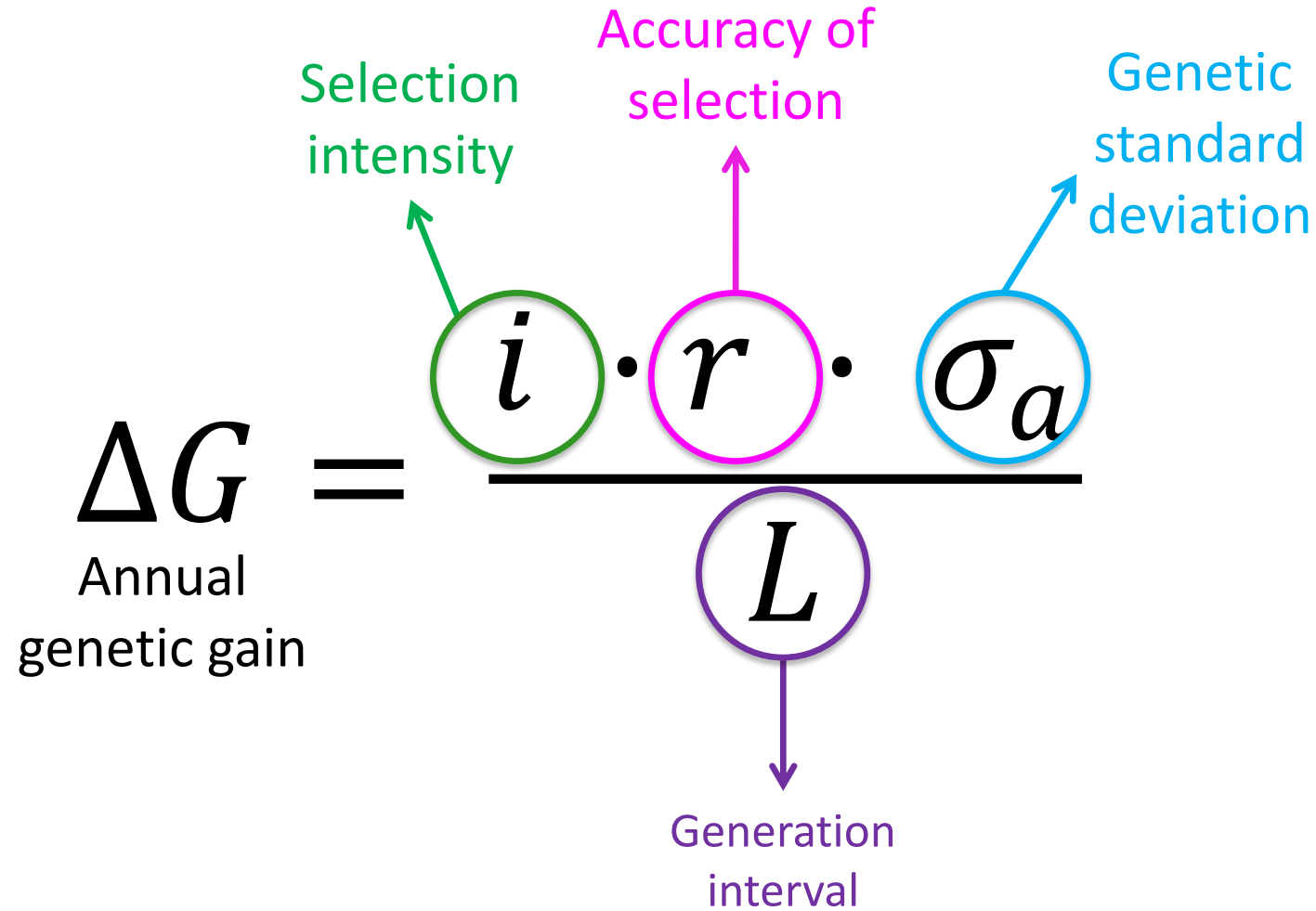
ΔG
Annual genetic gain

i Selection intensity

r Accuracy of selection

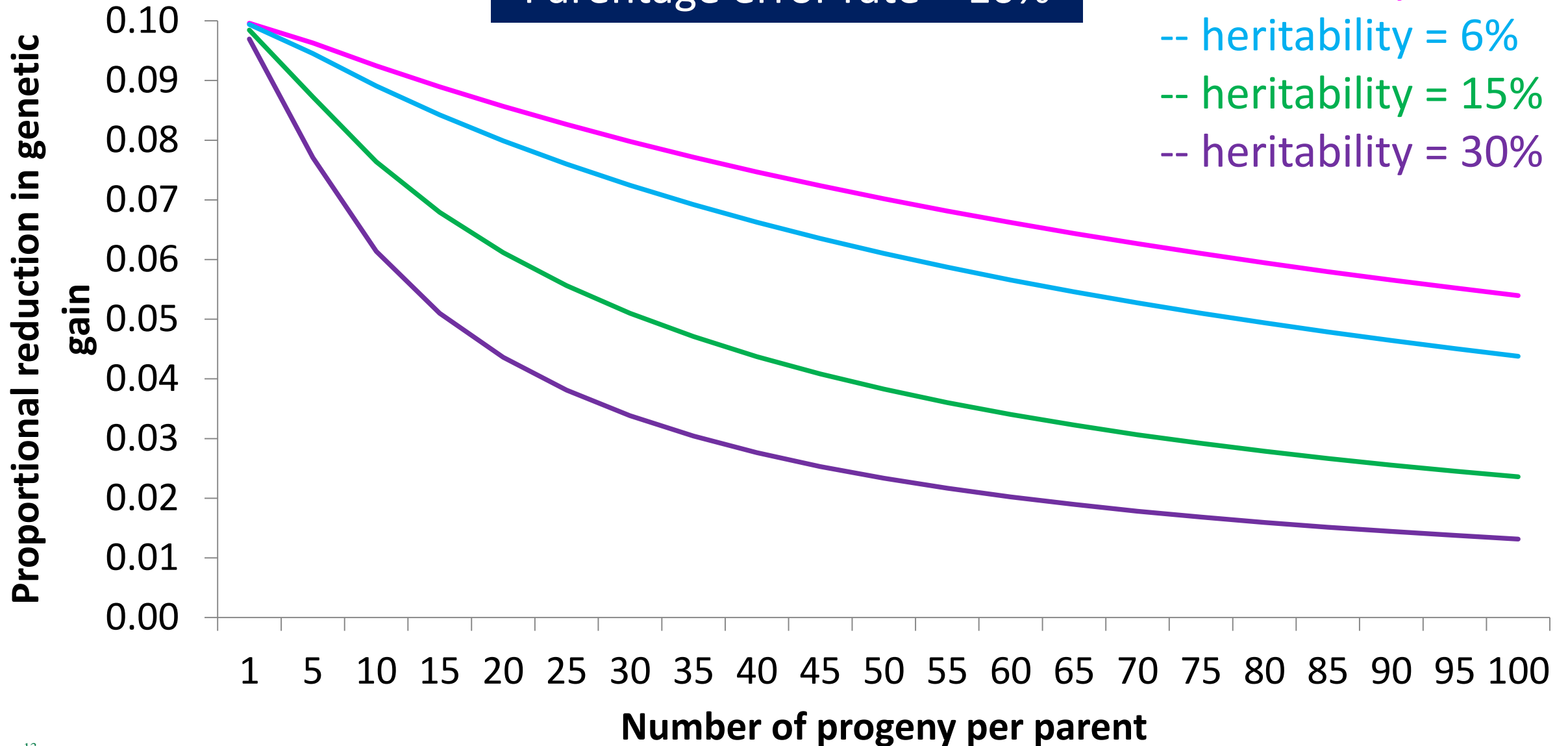
σ_a Genetic standard deviation

L Generation interval



The breeders equation

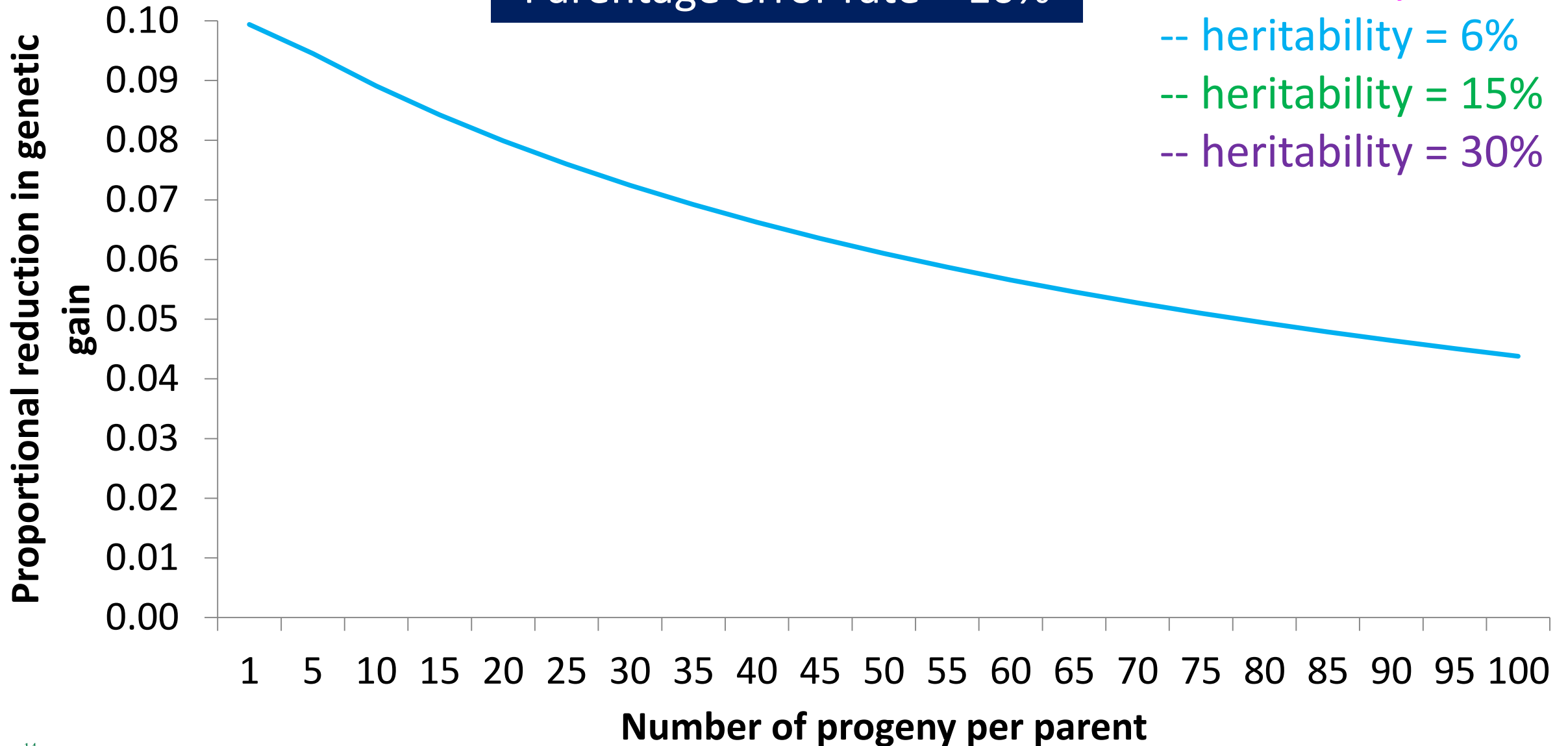
Parentage error rate = 10%



The breeders equation

Parentage error rate = 10%

- heritability = 4%
- heritability = 6%
- heritability = 15%
- heritability = 30%



Summary



Reference population

