Animal Breeding and Genetics: Sheep genetics and genomics

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PDST Animal Breeding and Genetics Webinar
Wednesday May 5th

PDST
Professional Development Service for Teachers | An tSeirbhís um Fhorbairt Ghairmiúil do Mhúinteoirí

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LO 4.1 d

Ram sales card

Data Quality Index

Lot: 202	Owner: [redacted] (DQI: 99%); [redacted] Breeder: [redacted]	
Animal **IE044561203423F** PXI2003423 **Foundry Dakota** DOB: 03-Feb-2020 Texel Male Twin Parentage DNA Verified	**Ancestry** GS **Greenhill Yemen Boy** HUI16069 GD **Murphys** PXE14013 **Foundry Conrad** PXI1903204 **Murphys** PXE15016 GS **Foundry Volvo** PXI14078 GD **Murphys** PXE11012	**€uroStars** 18/08/2020 **Replacement (€2.69)** Acc **66%** Rank **Top 3%** **Terminal (€1.65)** Acc **66%** Rank **Top 6%** **Lamb Survivability (0.41%)** — Top 19%, Acc 64.7% **Days to Slaughter -11.1 days** — Top 4%, Acc 75.9% **No. of Lambs Born (€0.97)** — Top 3%, Acc 69% **Daughters Milk (€1.25)** — Top 8%, Acc 71%
Comment: Scrapie Genotype-Arr/Arr		

LO 4.1 c & 4.1 e

Irish breeding indexes

Sheep Ireland
www.sheep.ie

Replacement index





Terminal index

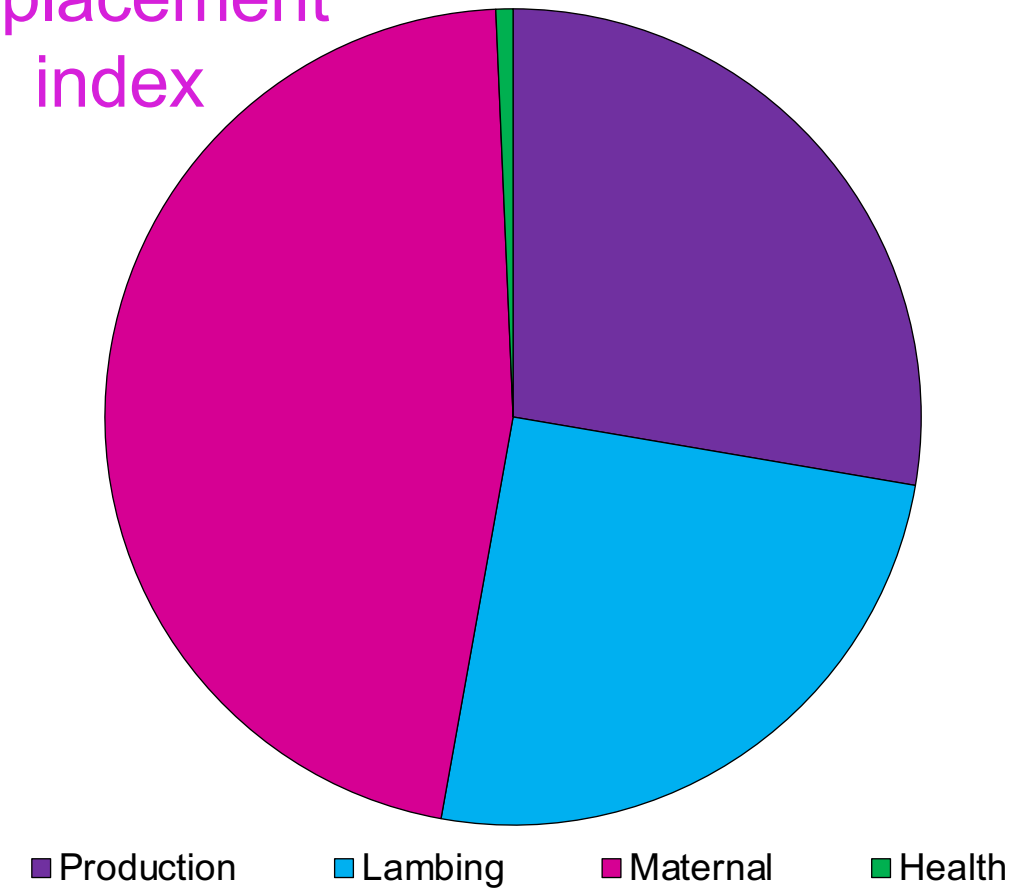


LO 4.1 c & 4.1 e

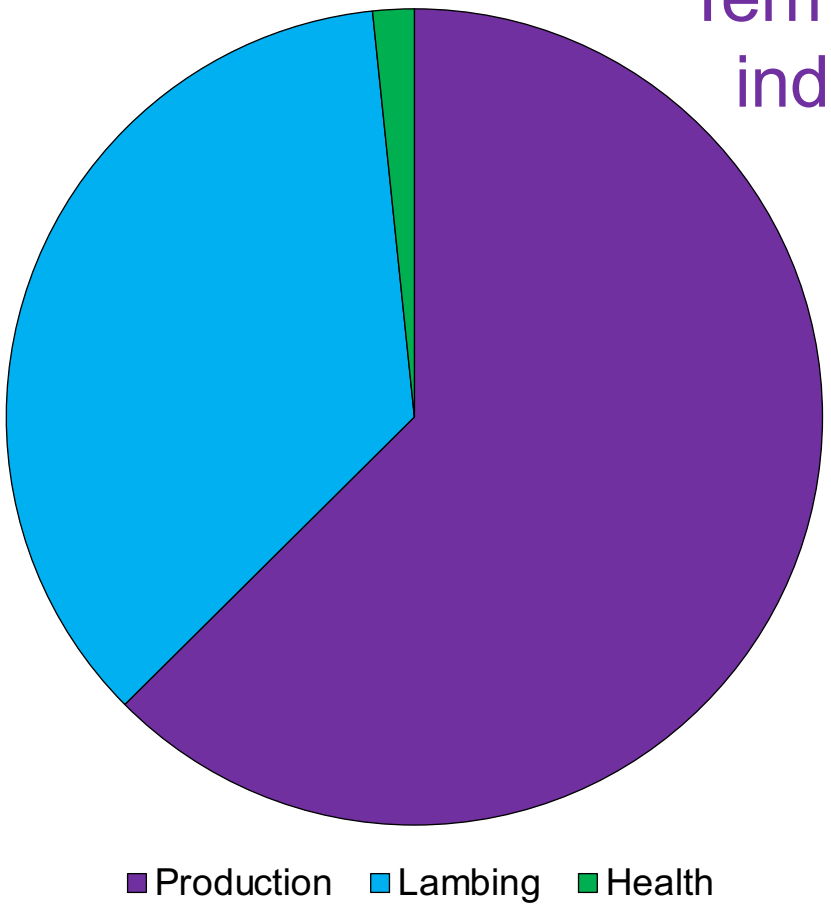
Irish breeding indexes

Sheep Ireland
www.sheep.ie

Replacement index



Terminal index



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LO 4.1 d &
LO 4.3.1 d

Investigating novel traits

Novel trait

Breeding goal

1. Socially or economically important
2. Exhibit genetic variation
3. Easily measureable on a large scale

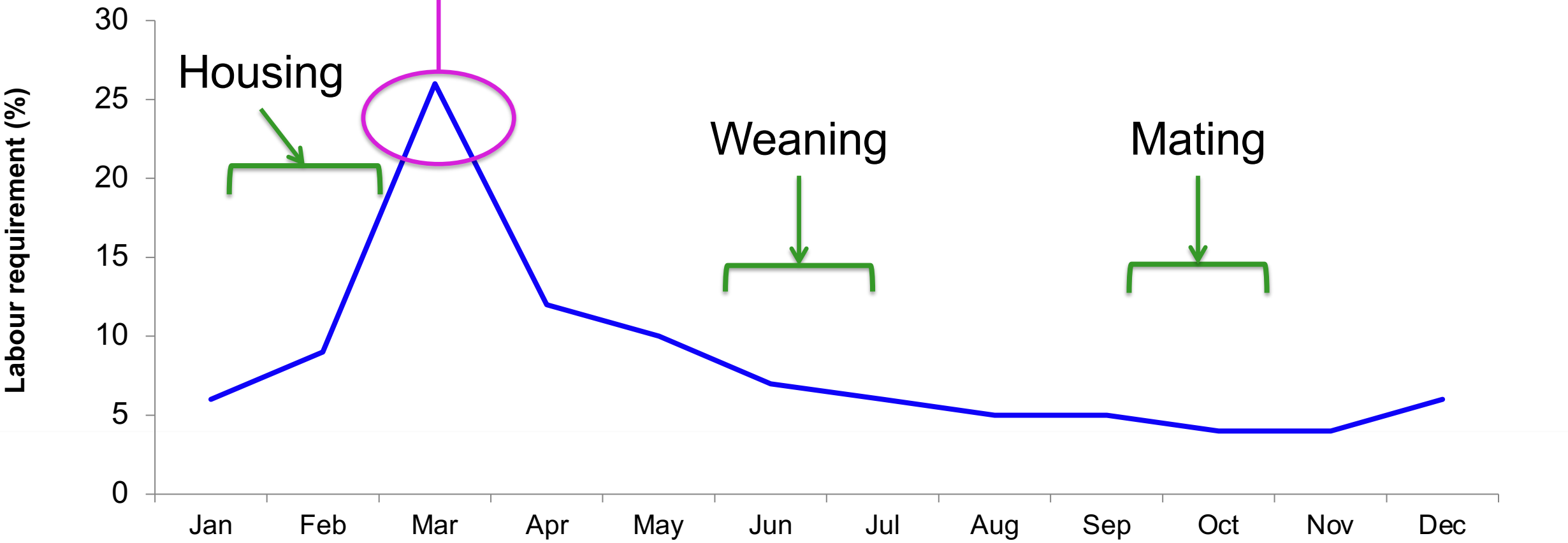
LO 4.1 d & 4.3 e

Ewe mothering ability

Scored based on the attentive behaviour of the ewe towards her lambs

1	2	3	4	5
Very poor	Poor	Average	Good	Very good
No interest in lambs		Moderately attentive but not protective		Very attentive & protective

Labour requirement



Alan Bohan TLPM

LO:4.1 d

What is heritability?

…the amount of variation seen in the trait that is due to the genetics of the animal …

Example – birthweight

Heritability based on animal's own genetics

↓

Direct heritability

Heritability based on the dam's genetics

↓

Maternal heritability

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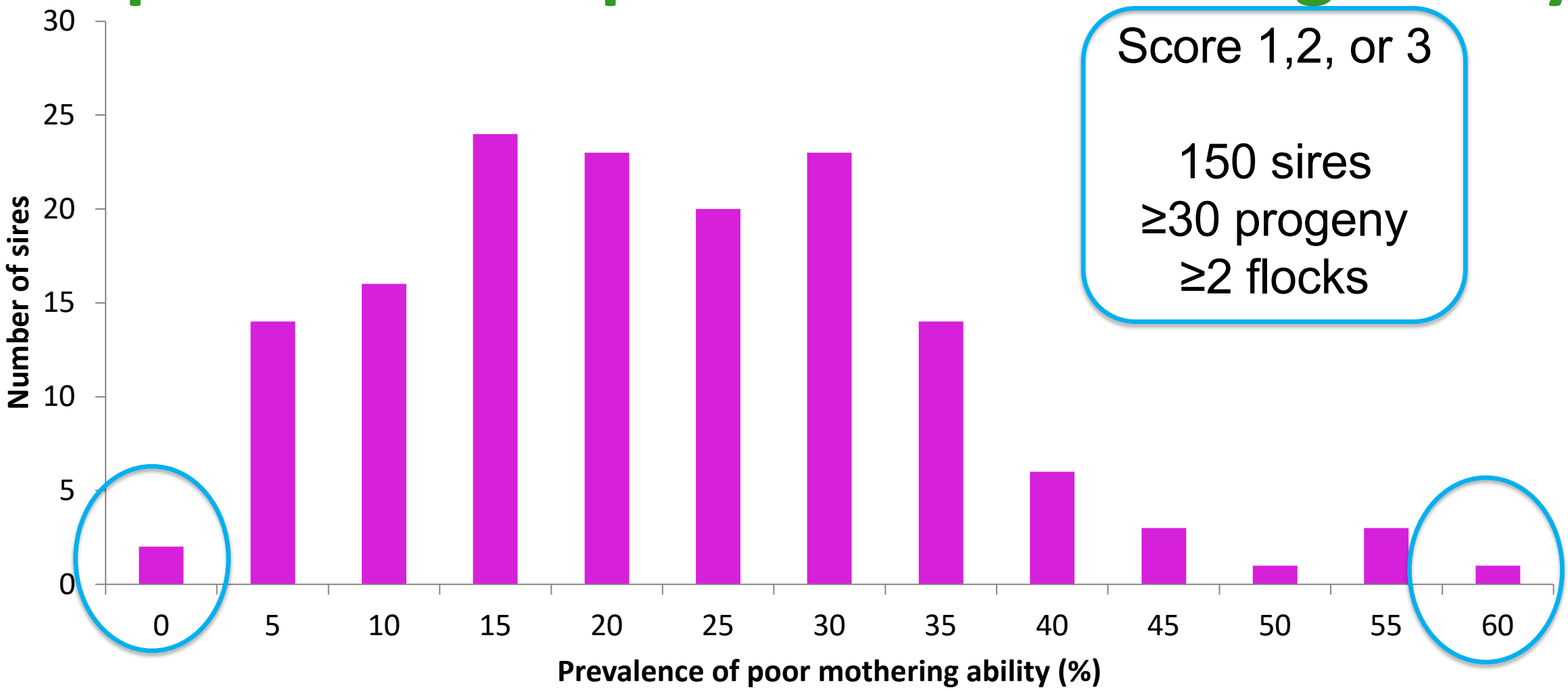
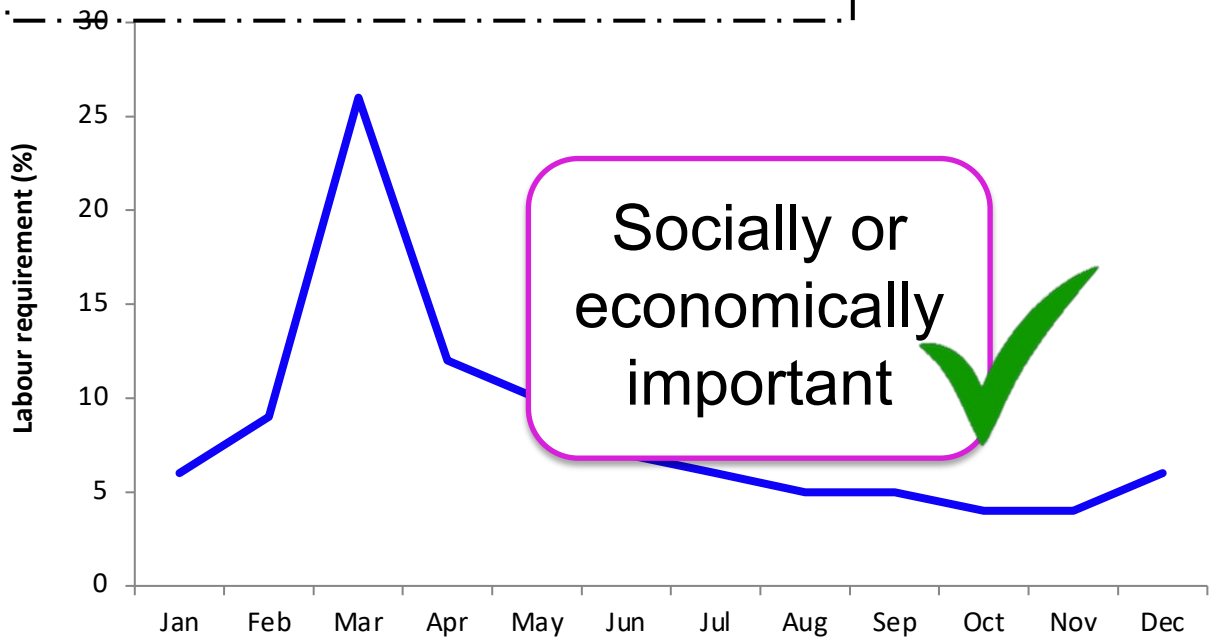
Sire prevalence – poor ewe mothering ability



LO:4.1 d & Cross Cutting
Theme: Sustainability

Breeding goal



Socially or economically important

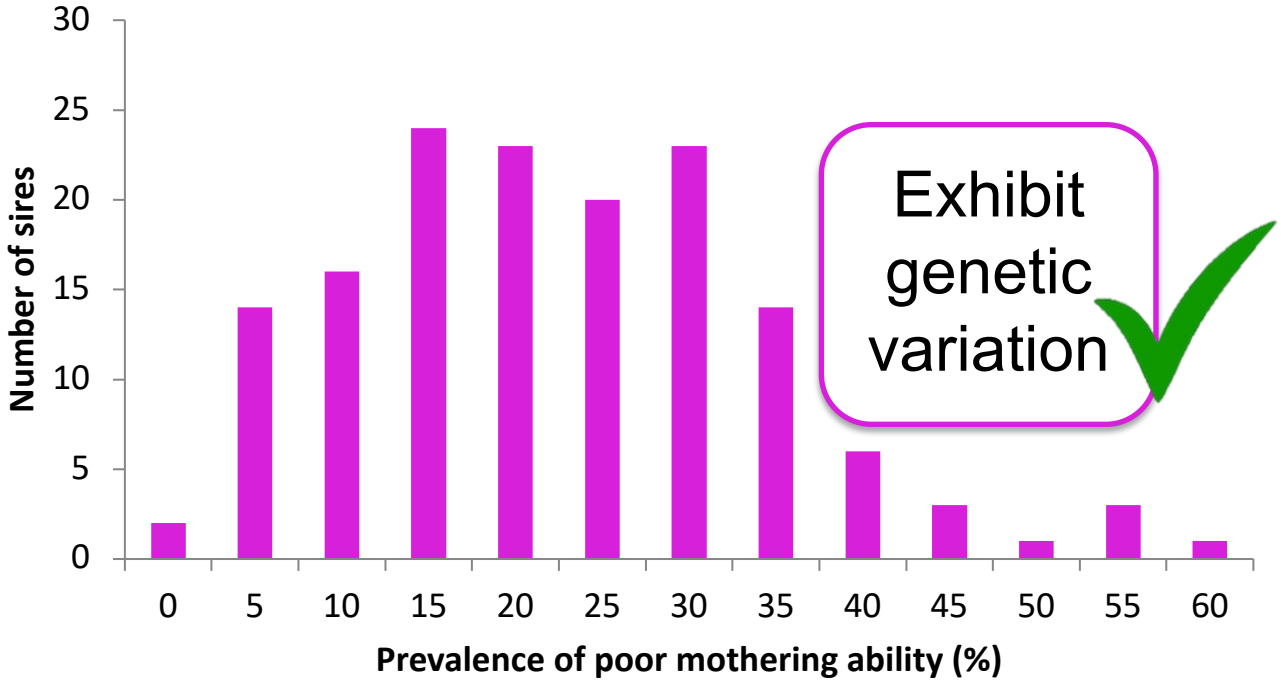


Exhibit genetic variation

Data → Mothering ability → 21,826

Easily measureable on a large scale

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DNA

4 different nucleotides

A – Adenine

C – Cytosine

G – Guanine

T – Thymine

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DNA evidence proves Welsh farmer stole neighbour's cow

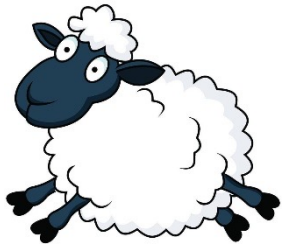
Updated / Wednesday, 5 Feb 2020 15:54

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

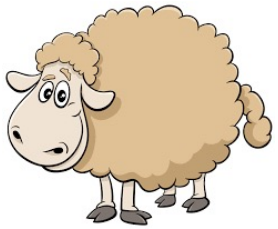
LO:4.1 d

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

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Genotyping process

NEOGEN®

WEATHERBYS
SCIENTIFIC

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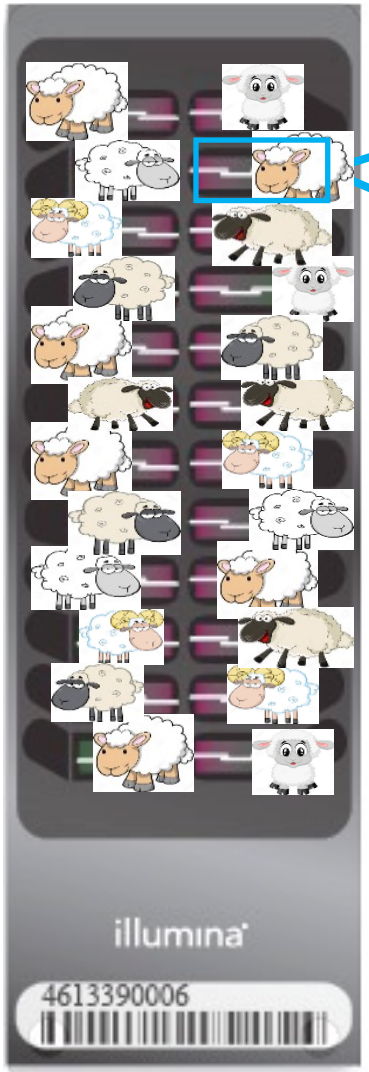
LO:4.1 d

Genotyping process



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Genotyping process

NEOGEN®

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National database

Decision support tools

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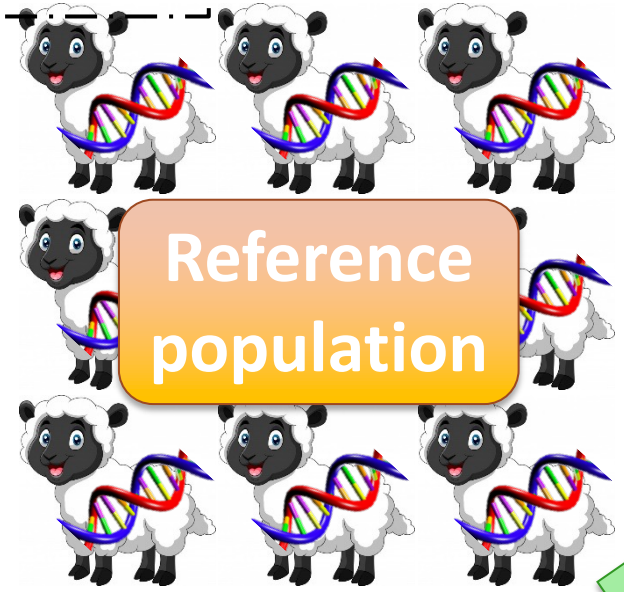
Genomic selection



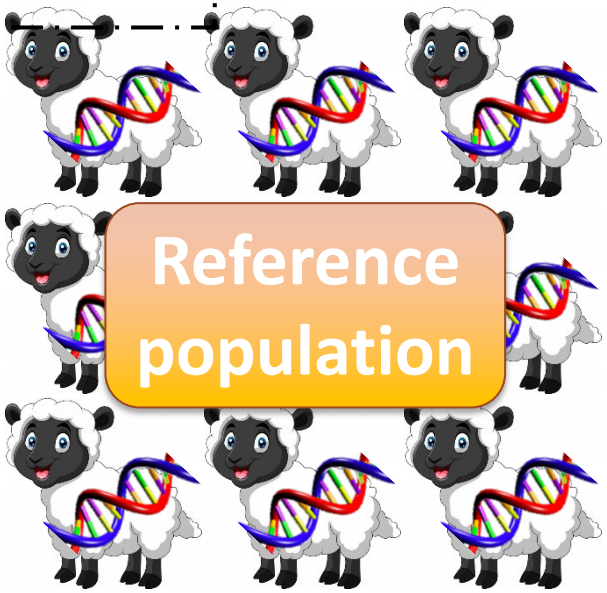
Association between SNPs and phenotypes

SNP	Weight	Lameness
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

LO:4.1 d

Genomic selection



Reference population

Genomic relationship

+

Prediction equations

+

+

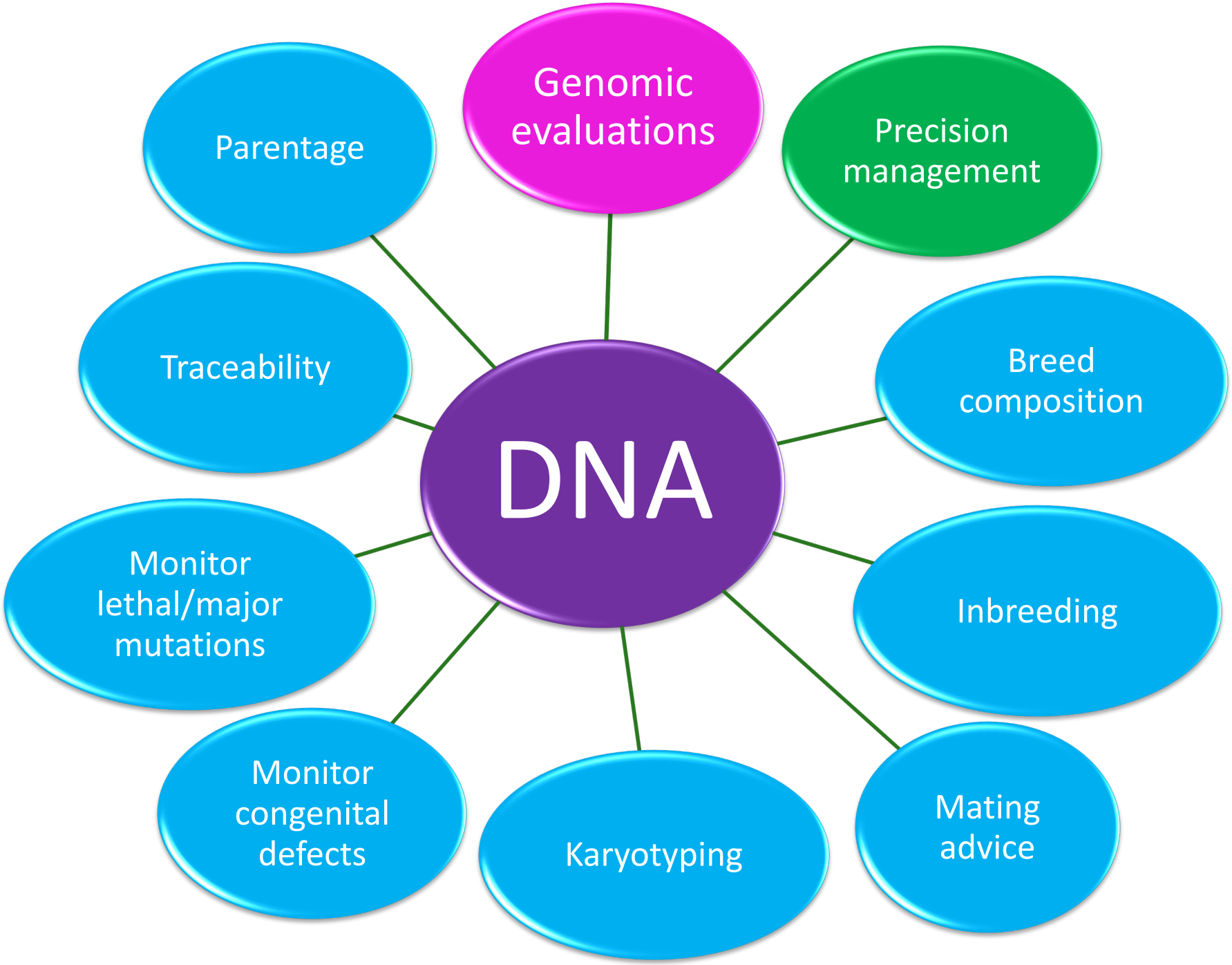
Pedigree

=

Direct genomic value (DGV)

Genomic estimated breeding value (GEBV)

LO:4.1 d


DNA
Parentage
Genomic evaluations
Precision management
Traceability
Breed composition
Monitor lethal/major mutations
Inbreeding
Monitor congenital defects
Karyotyping
Mating advice

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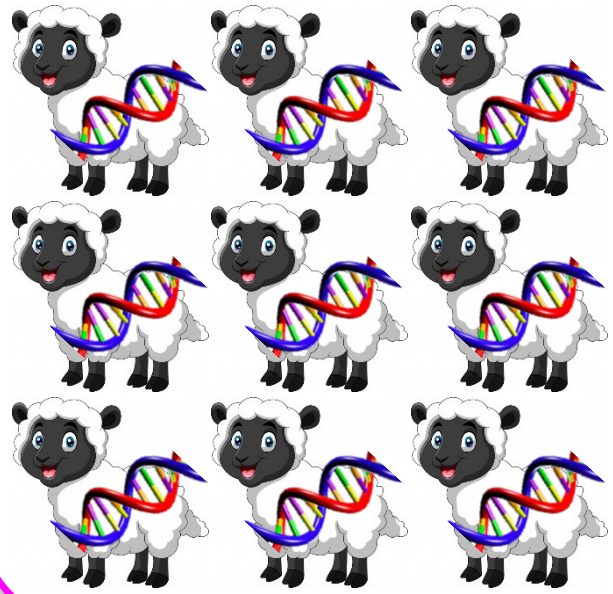
Summary

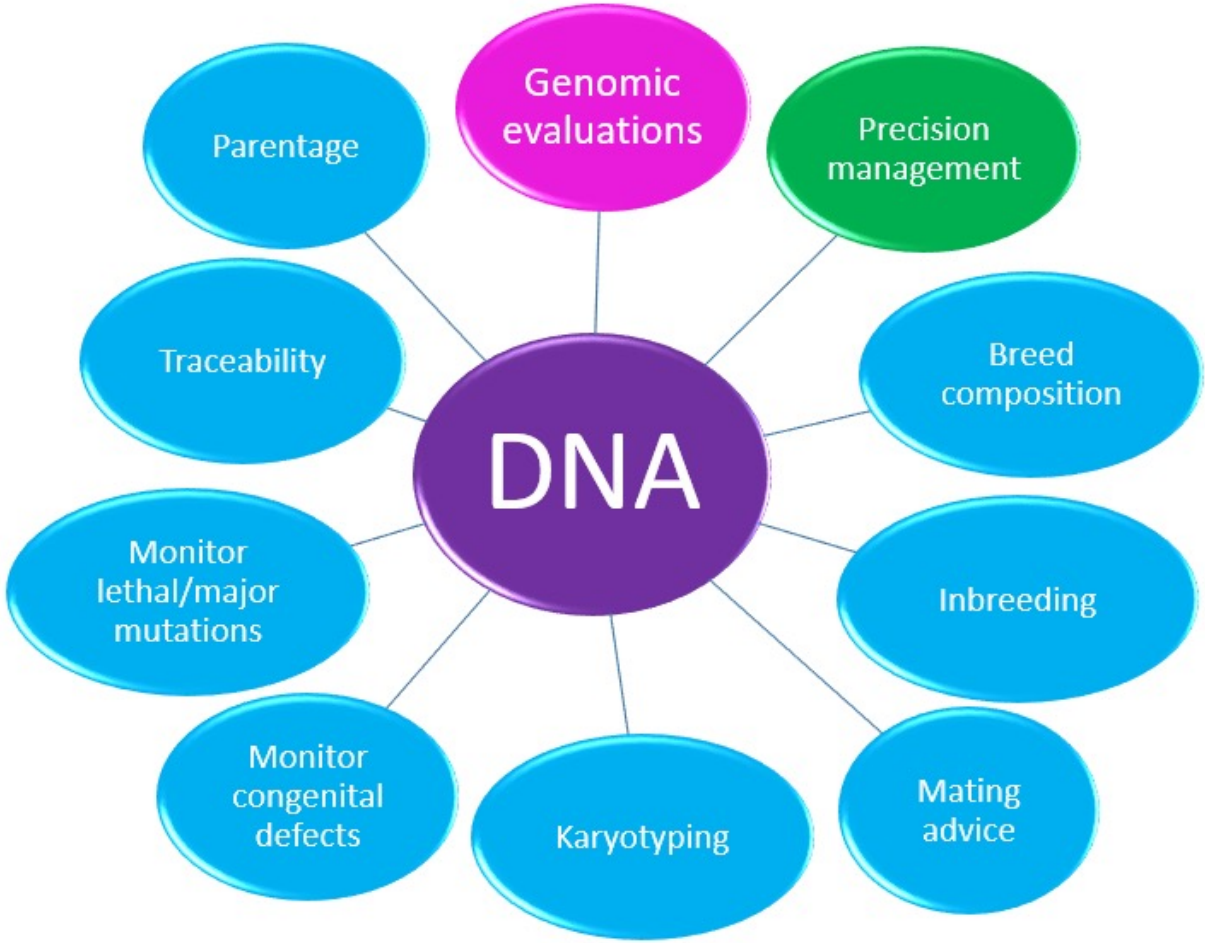
Novel trait → 

→ Breeding goal

1. Socially or economically important ✓
2. Exhibit genetic variation ✓
3. Easily measureable on a large scale ✓

Reference population





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