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WORLD BREEDING FEDERATION
FOR SPORT HORSES

Breeding values explained

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Introduction

what is “best”?

Is the best performer always the best breeder?

Then its progeny will also always be the best

breeding would be boring

What makes the performance of a horse?

Phenotype = genetic predisposition + environment

Genes
- number?
- location?
- effect?

- training
- rearing
- diseases
- management
- feeding

Genetic predisposition is unknown

⇩

estimated from phenotypes

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Estimated Breeding value

N.B:

same breeding value, but different performance

same performance, but different breeding value

How much breeding value is in the phenotype?

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Phenotype = genetic predisposition + environment

heritability (h^2)

= genetics part in phenotypic differences

0 – 1 (0 – 100%)

withers height : $h^2 \sim 0.6$

sports duration: $h^2 \sim 0.1$

traits with high h^2 can be easily changed through selection

Example: calculation of breeding value

Phenotype: 178 cm

Mean : 165 cm

$h^2 = 0.67$

EBV $= h^2 * (\text{Phenotype} - \text{Mean})$

$= 0.67 * (178 - 165) = + 8.7$ cm

an *average* mare

Breeding value of offspring

EBV $= 0.5 * (EBV_{sire} + EBV_{dam})$

$= 0.5 * (8.7 + 0) = + 4.35$ cm

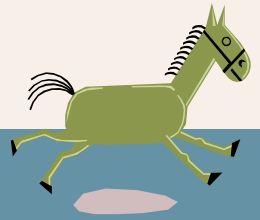
Predicted phenotype of offspring:

165 + 4.35 = 169.35 cm.

EBV based on different sources:
own performance and parents of sire

→ different quality of the estimation of breeding values

Quality of breeding values = Reliability



Reliability (= 0 – 100%)

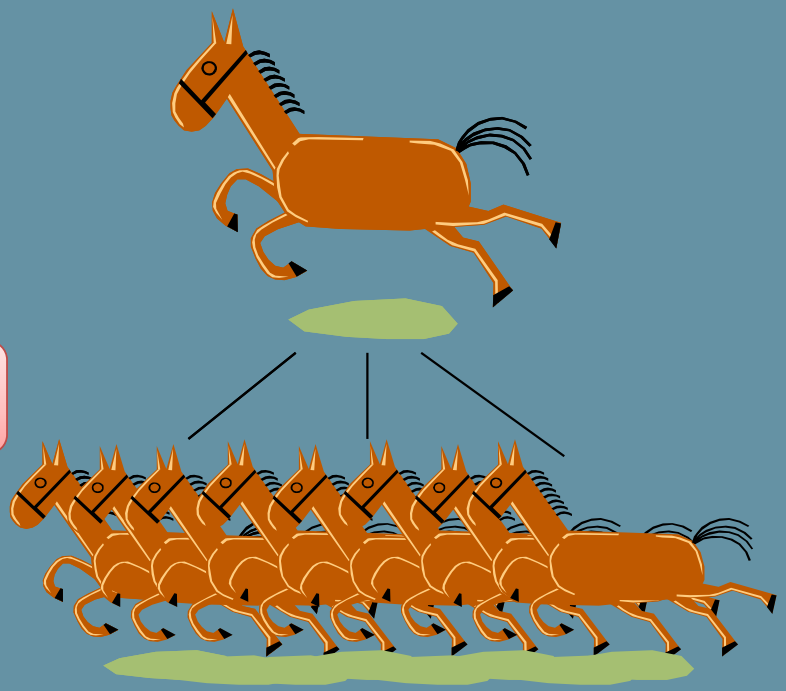
Function of:

- h^2
- relation between 'informant' and breeding candidate

the more sources the better

progeny testing!

BLUP combines all sources



downside:

you have to wait long!!

young candidates and mares don't have (large) progeny group!

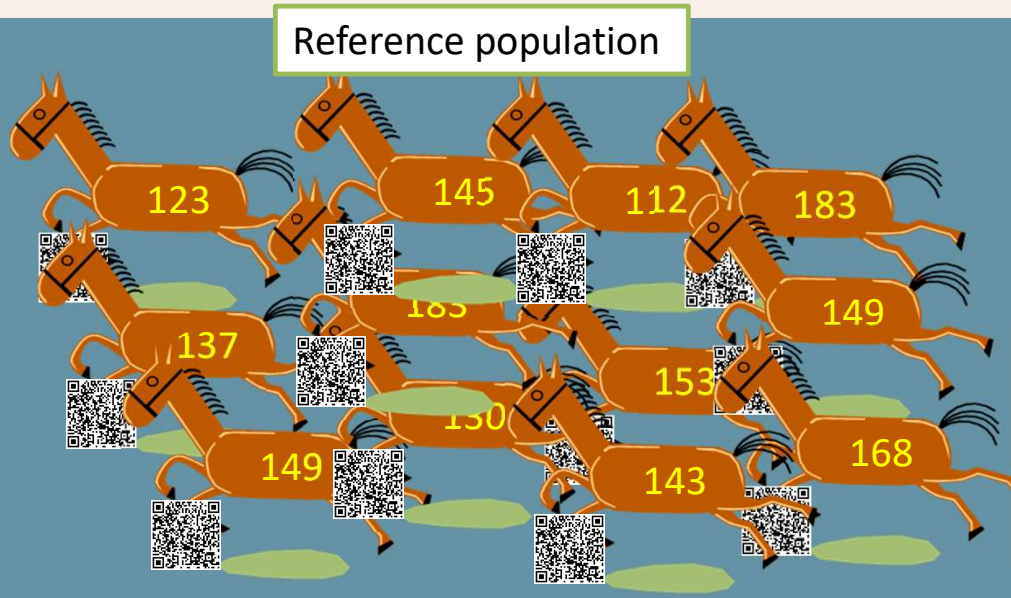
Genomic breeding values: the concept

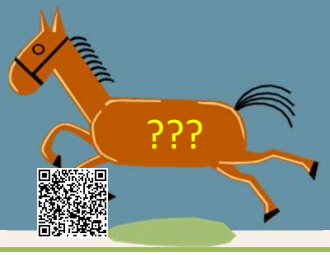
DNA-profile ~~ QR-code

- Computer can read the differences
- DNA-differences linked to performance differences

reference population

DNA and phenotypes



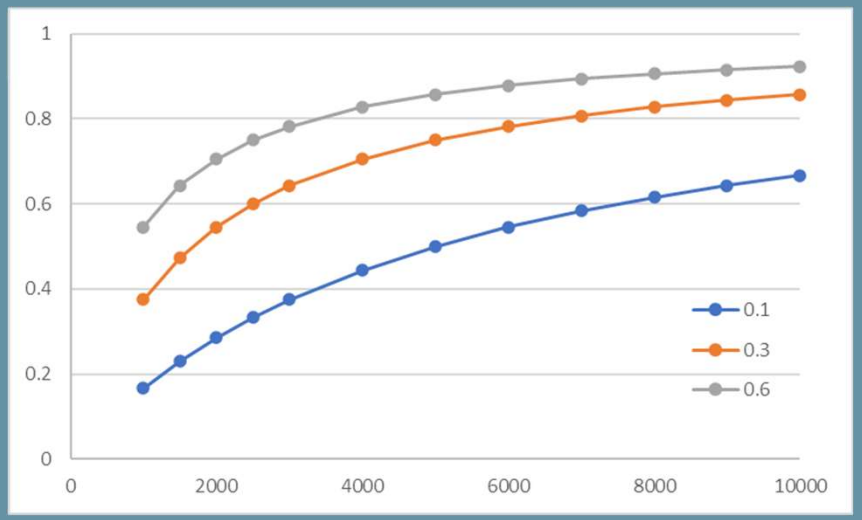


Selection candidate

Advantages of genomic breeding values

- BVs with same (high) reliability to **all** horses
- Independent of own performance
- Also for mares (with only few progeny)
- Also to young foals

Reliability depends on size of reference population



eg when h2 = 0.3 and n=4000
→ reliability = 70%,
→ equals measuring 30 progeny
→ to **each** selection candidate and **each round of selection!**

Summary

BVs summarizes what superiority a horse will pass on to its progeny

Predicts the performance of its progeny

Quality of this prediction is dependent on the reliability of the BV

the more (phenotypic) sources the better

Genomic breeding values enables that all collected phenotypes will be usable to all horses

Reliability will depend on size of the reference population.

Thank you for your attention!!

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