The role of myostatin on the conformation and gaits of the Icelandic horse


The Icelandic Horse
- Robust, compact and muscular horse with sloping croup and long, thick mane and tail
- Traditionally used for long distance riding and as pack horses
- No introduction of genetic material since 900 AD in the Icelandic population
- Additional gaits: tölt and pace, two highly selected traits within this breed

The Icelandic horse
- Conformation
  - Complex trait
  - Influenced by many genes
  - Scored subjectively
  - Large environmental effect
  - Genetic background: $0.15 < h^2 < 0.67$

Myostatin
- Recent studies have shown the influence of myostatin (MSTN) on racing performance and body composition
- ECA 18, reverse strand, 66,490208 - 66,495,180
- Repressor in development and regulation of differentiation and growth of skeletal muscle
- Loss-of-function mutations in dogs, cattle, sheep, mice, and humans
- In horses regulatory variants can lead to differences in skeletal muscle mass
- Role in the development of adipocytes and osteocytes
- Regulation of energy homeostasis

Objective
- Investigate the influence of MSTN variants on specific conformation and performance traits in a non-racing breed
Material & Methods

EBVs for 16 traits of 195 Icelandic horses were available
Accuracy ≥ 70%
11 conformation and 5 performance traits

Results & Discussion

Frequency of the C allele for SNP PR3737 = 0.01
Previously associated with fast twitching muscle
→ traditional use as mounts over long distances and pack animals

Results & Discussion

High intensity of carrying adult riders → strength and stamina
Effect on locomotion through influence of MSTN on conformation and muscle development
Effect on muscle fibre type may play a supporting role

Results & Discussion

Genotype GG poorer scores than homozygous AA
Also found in Italian Heavy Draft horses

Results & Discussion

Suggests favourable effect on form as well as function
→ Balance between visual standards and capability of sustaining speed with a rider
Results & Discussion

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Possibly through known effect of MSTN on non-muscle cells

Heavily muscled horse → appearance of more clearly separated front legs

Influence in Icelandic horses on use of horse for riding or meat production

G allele had positive effect on fleshiness in Italian Heavy Draft horses

Conclusion

MSTN may play a role in the complex background of several breeding goal traits in the Icelandic horse

Further analysis in non-racing breeds to decipher specific mechanisms by which the different variants influence conformation and riding ability in horses.

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