Horserace Betting Levy Board

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The genetics of tendon injury in Thoroughbreds

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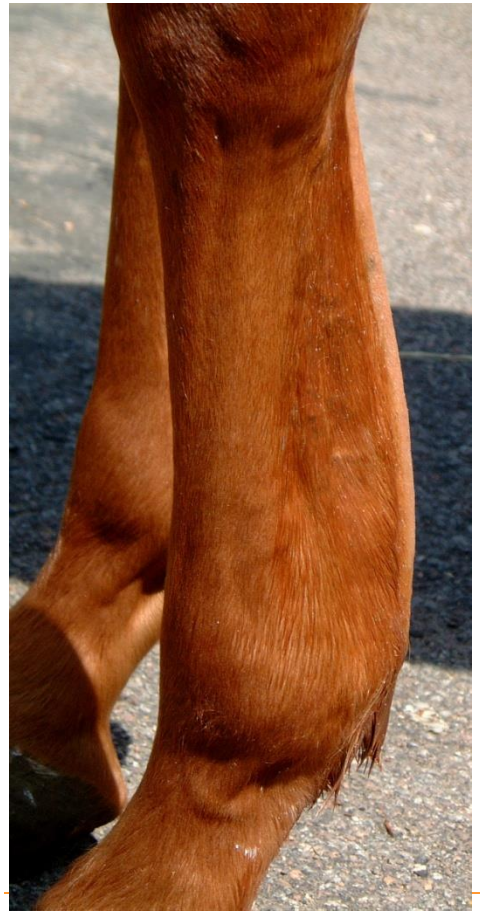
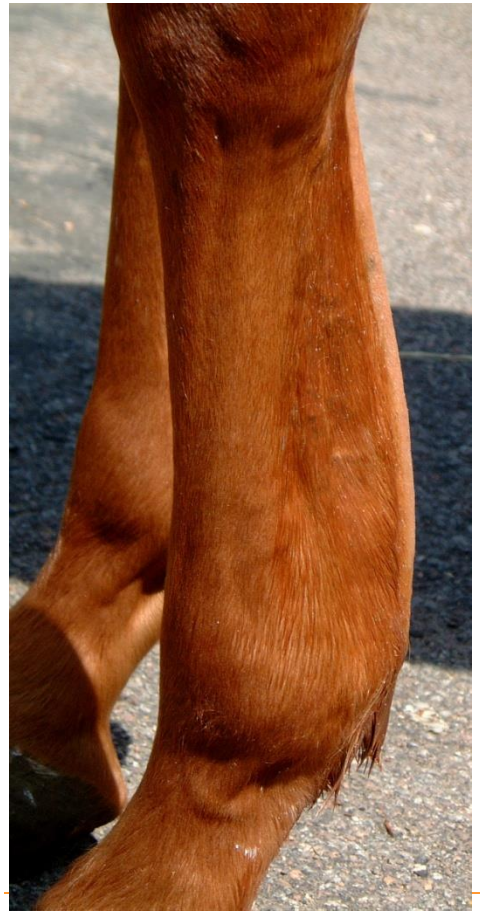
Introduction (1)



- Tendon/ligament injuries in National Hunt (NH) Thoroughbred (TB) racehorses in training are common and most involve the Superficial Digital Flexor Tendon (SDFT) of the forelimb (Ely *et al*., 2009).
- Injuries have welfare and economic implications for the racing industry.
- Biology of SDFT injuries is unclear and treatments are often unsuccessful.

Introduction (2)



- Prevention is important: this can be by identification and modification of risk factors.
- Risk factors include: gender, age, exercise regimen, trainer, track surface.
- **Is genetic background a risk factor?**

Aim of study

The aim of the study was:

- **To establish the association between variants in specific candidate genes and risk of tendon injury in NH racehorses in training.**

Objectives

The objectives of the study were:

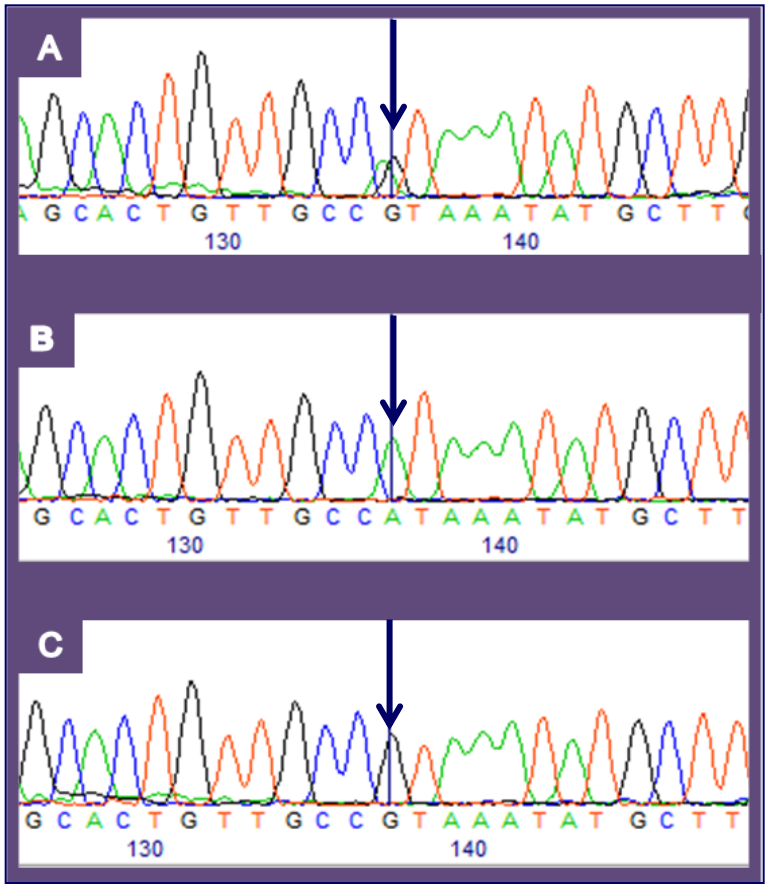
- To identify genetic variation in candidate genes for tendon injury.
- To establish the association between genetic profile and risk of tendon injury in NH horses.
- To establish whether the candidate gene variants are associated with changes in tendon function.

What was done (1)

- DNA sequence from six NH TBs was used to detect locations where genetic variation occurred. These areas are known as SNPs.

This is a computer snapshot of 6 DNA sequences - the colours identify areas where the profiles are different in 2 of the horses

What was done (2): Identifying genetic differences between horses



- These are DNA sequences for 3 horses
- Each peak is part of genetic code (G, T, A, C)
- Arrows show where code differs = **a SNP**

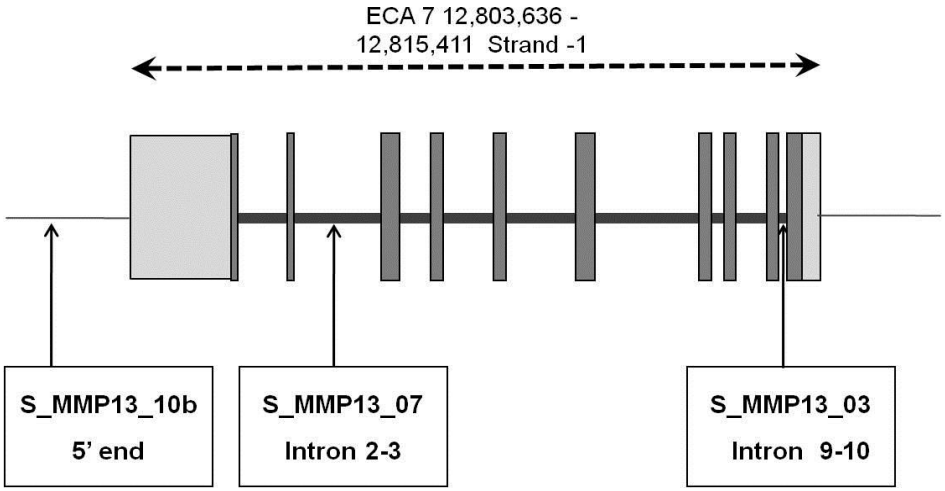
- Horse A: One black peak(G)
  One green peak(A)
  Heterozygous (genes different) for G and A

- Horse B: Single green peak (A) at same position
  Homozygous (genes identical) for A

- Horse C: Single black peak (G) at same position
  Homozygous (genes identical) for G

What was done (3)

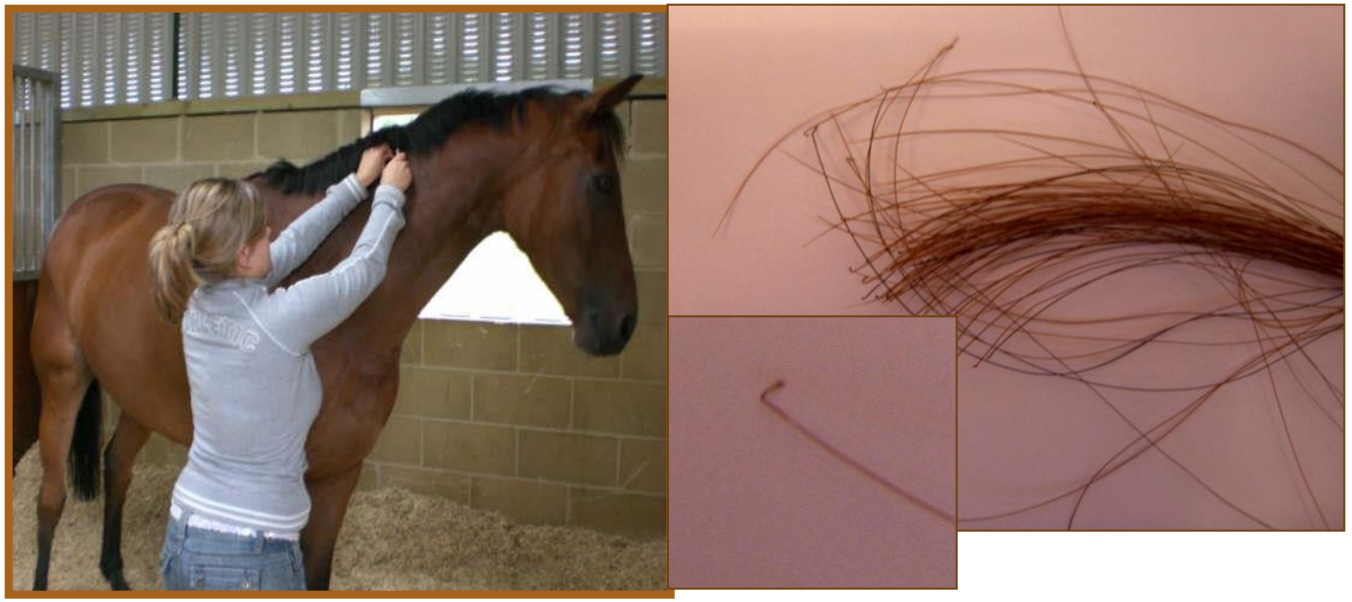
- We looked at 7 candidate genes of importance to the structure/function of tendon *(*tenascin type C *(TNC),* collagen type 5 alpha1 (*COL5A1),* matrix metalloproteinase type 3 (*MMP3),* fibromodulin, (*FMOD*), collagen type 1 alpha 1 (*COL1A1*), cartilage oligomeric matrix protein (*COMP*) and matrix metalloproteinase type 13 (*MMP13*).



Position of SNP assays for *MMP13*

What was done (4)

- DNA was extracted from samples of blood or mane hair from NH TB racehorses in training including 270 confirmed cases of SDFT injury and 270 yard-matched control horses.



What was found

- A SNP in the *TNC* gene was associated with significantly *lower* odds of SDFT injury and a SNP in *COL5A1* significantly *increased* the odds of sustaining a SDFT injury.

- Both these genes could play an important role in the pathobiology of SDFT injuries.

- We also obtained preliminary evidence that several other genomic regions should be investigated for their potential influence upon SDFT injuries in the TB.

Benefits for the Thoroughbred

- This project is the first to demonstrate that the risk of SDFT injury in a population of UK NH Thoroughbred racehorses has a genetic basis.

- Long-term, this could:

  (i) lead to the development of novel methods of identifying animals at increased risk of SDF injury;

  (ii) improve our understanding of the biological mechanisms that underlie tendon injuries;

  (iii) result in new options for treatment.

Publication of research

- This research project has been published in the Equine Veterinary Journal (EVJ) on the Wiley Online Library

- Follow this link to view the article: http://onlinelibrary.wiley.com/doi/10.1111/evj.12134/abstract

Find out more about tendon and ligament injuries in racehorses

- PD Clegg, Musculoskeletal disease and injury, now and in the future.
- Part 2: Tendon and ligament injuries http://onlinelibrary.wiley.com/doi/10.1111/j.2042-3306.2012.00563.x/full