

Genes and athletic performance in Thoroughbred horses

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Equinome, a leading equine genomics company, has announced the publication of four scientific papers by Equinome and University College Dublin researchers which describe significant advances in the understanding of the genes that contribute to athletic performance in Thoroughbred horses.

These include a new and enhanced validation of The Equinome Speed [Gene Test](#), the identification of previously unknown genomic regions crucial to Thoroughbred performance and the differing responses of key metabolic [genes](#) to exercise in racehorses.

Equinome, a University College Dublin spin-out company co-founded in

2009 by Dr. Emmeline Hill and Jim Bolger, is headquartered in NovaUCD, the University's Innovation and Technology Transfer Centre.

A study by Equinome and UCD School of Agriculture, Food Science and Veterinary Medicine researchers, recently published in the peer-reviewed scientific journal *BMC Genomics* represents a major breakthrough, demonstrating that the genetic marker used in The Equinome Speed Gene Test to identify the optimum racing distance for individual Thoroughbred horses is the most powerful indicator of its type.

Using recently developed technologies that allow screening of thousands of [genetic markers](#) across the equine genome, a detailed study was undertaken to assess the statistical and predictive power of the genetic variant in the myostatin gene (MSTN) which UCD and Equinome scientists had previously identified as being very strongly associated with race distance aptitude in Thoroughbreds.

In the world's first published genome-wide association study (GWAS) for a specific performance trait in any athletic species, the segment of chromosome 18 encompassing the gene encoding myostatin was identified as the genomic region with the strongest association with best race distance. Analysis of genetic markers located in this region subsequently confirmed that the Equinome Speed Gene Test is the superior genetic marker for the prediction of distance aptitude in racehorses.

In a separate development, a scientific paper published this week by researchers at the Japanese Laboratory of Racing Chemistry (LRC) in Animal Genetics identified the region encompassing the myostatin gene to be highly associated with racing performance in Japanese Thoroughbreds. The study found three genetic markers associated with lifetime earnings and performance ranks, as determined by the Japan

Racing Association (JRA) in Japan.

One of these is the marker that is used in the Equinome Speed Gene Test. The relationship with elite performance parameters may be explained by the particular requirement in Japan for horses to have performed optimally over short distances as two-year-olds in order to progress to the more valuable races as three-year-olds.

According to the lead author of the LRC's paper, Dr. Teruaki Tozaki, "It is expected that the three genetic markers may be included as genetic diagnostic markers for racing performance measures. Importantly, our study supports the research by University College Dublin's Dr. Emmeline Hill published earlier this year that identified a genetic marker in myostatin as a predictor of best race distance."

Commenting on the findings of this paper, Dr. Emmeline Hill, co-founder and Chairman of Equinome, said, "Independent validation of scientific studies is crucial to the integrity of the development of genetic tests that will have real value in breeding, racing and selection decisions. The study by Dr. Teruaki and colleagues at the LRC is a thorough and robust study that has further contributed to the scientific merit of the Equinome Speed Gene Test."

Other important research findings were also published this week by Equinome and UCD scientists in three separate papers in *Animal Genetics* and the *Equine Veterinary Journal*.

One provides the first scientific evidence for associations between genetic variants in nuclear-encoded genes and athletic ability, including variants in the PDK4 gene that were strongly associated with elite racing performance in Thoroughbreds.

Another study examined the role of molecular signalling pathways in the

physical response of skeletal muscle under various levels of activity, which demonstrated that specific sets of genes are central to performance in [horses](#) racing at different distances that entail different physiological and metabolic demands.

The third paper examined important metabolic genes for associations with racecourse performance in Thoroughbreds. This study identified an important role for one of these genes in racecourse performance and highlighted the requirement for rigorous statistical validation of newly discovered genetic markers in the Thoroughbred population.

According to Dr. Hill, “The ongoing, rapid developments in genomics technology are facilitating the identification of the key genetic variants that contribute to the athletic phenotype. Importantly, we have confirmed the importance of the Equinome Speed Gene Test marker in the context of the entire genome and have shown that the genetic marker used in our test is fifteen times more powerful in determining optimum racing distance than the next most sensitive marker.” She added, “As well as this, our new findings will be central to the development of future tests for elite performance ability, which we plan to launch in 2011.”

Provided by University College Dublin

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