



NEWS AND DEVELOPMENTS

...making genetic advances

THOROUGHbred GENETICS IDENTIFIES PERFORMANCE GENES IN RACEHORSES AND PUBLISHES GROUND-BREAKING RESEARCH

Thoroughbred Genetics has published the ground-breaking genetic results of its **1stBlood[®]** project which could have enormous implications for the way thoroughbred racehorses are bred, trained and raced. The company has published the results of the six-year study in the international peer-reviewed journal, *Mitochondrion*. [It is the first proof that there is an association between genes and their role in the individual performances of racehorses.](#) The publication is currently available on the journal's website and will be available in printed format in April. The pre-printed version can be downloaded in pdf format from the Thoroughbred Genetics website.

In the largest published equine genetics study of its kind, Dr Stephen Harrison and Mr Juan Luis Turrion-Gomez, detected variations in the DNA sequences of eight athletically-important genes in DNA samples, taken from 1000 thoroughbred racehorses, including classic winners. Each thoroughbred breeding line possesses different variant combinations of these performance-related genes. Each combination gives a horse a different racing aptitude, ie, one horse may possess the gene combination of a sprinter, while another horse will have a combination best suited to a distance of 1½ miles. These gene combinations form part of a group that is inherited solely from the dam on a molecule called mitochondrial DNA. The genes contribute to biochemical systems involved in energy release and respiration in the muscles and have a direct impact on the optimum performance of a racehorse. Thoroughbred Genetics' **1stBlood[®]** data is unique and this information cannot be derived through traditional pedigree analysis.

Dr Harrison and his team have been able to identify the genetic types of all big race winners in the major racing nations going back over the last 100 years.

In the *Mitochondrion* study, trends observed for the genetic types of winners of 21 of the UK's premier races indicate significant leanings of certain genetic types and carriers of specific gene variants to perform well over specific distances. For instance, a potential Derby winner (1½ miles) is more likely to be of a different genetic type to a 2000 Guineas (1 mile) winner. The **1stBlood[®]** data also shows that over the last 100 years, the highest percentage of Derby, Guineas or other premier race winners comes from a particular genetic type suited to the respective distance and sometimes the racecourse itself. Dr Harrison says: "We anticipate that the data will help trainers identify from day one, optimum running distances for horses, develop appropriate training regimes and target specific races which will suit the horses' individual genetic profiles."

The study has also allowed the team to make genetic corrections to historical errors in the thoroughbred studbook. By identifying genetic types, over half of all recognized female family lines, are shown to have been incorrectly recorded to some degree, some errors appearing to be as recent as the late 1970s (before genetic parentage testing). This is alarmingly more so than first thought. Dr Harrison: "This means that we can more accurately assess which versions of these important genes particular horses will carry and tailor their breeding and racing careers to make the most of their genetic capability."

Thoroughbred Genetics has constructed genetic databases which, when used in conjunction with their complementary **mPOWER[®]** DNA tests, will vastly improve the ways in which breeders co-ordinate the mating of stallions and mares through the better matching of stamina components. Certainly, it is also clear that there are positive and negative interactions between certain sires and mares of particular genetic types.

The study has also thrown up interesting results regarding the effectiveness of the different genetic types at various racing ages and the relationships of the genes studied in the publication to other similar genes involved in muscular energy release.

"Breeding racehorses is a high risk, multi-million dollar industry. A high percentage of racehorse breeders fail to recoup their investments. Many foals produced are bred inappropriately and fetch poor prices at sales. A large proportion fail to reach the racecourse and the vast majority never win a race. With an estimated global expenditure of \$3bn on stud fees annually and individual stallion fees running as high as \$600k, this is an expensive and precarious business. The odds have for too long been stacked against the breeder, so use of advanced genetics techniques to modernize traditionally-based breeding programmes can narrow down the quest to produce a truly brilliant horse. Racehorse breeding has effectively been fast-forwarded 300 years into the 21st century.

"These findings are only the tip of the iceberg. They form part of a larger study which has allowed Thoroughbred Genetics to develop genetic databases covering national racing in the USA and Australia, which vary in their racing requirements from Europe."