Plusvital

Powered by Equinome

Genetic Tests
Europe

Plusvital

Powered by Equinome

About Us

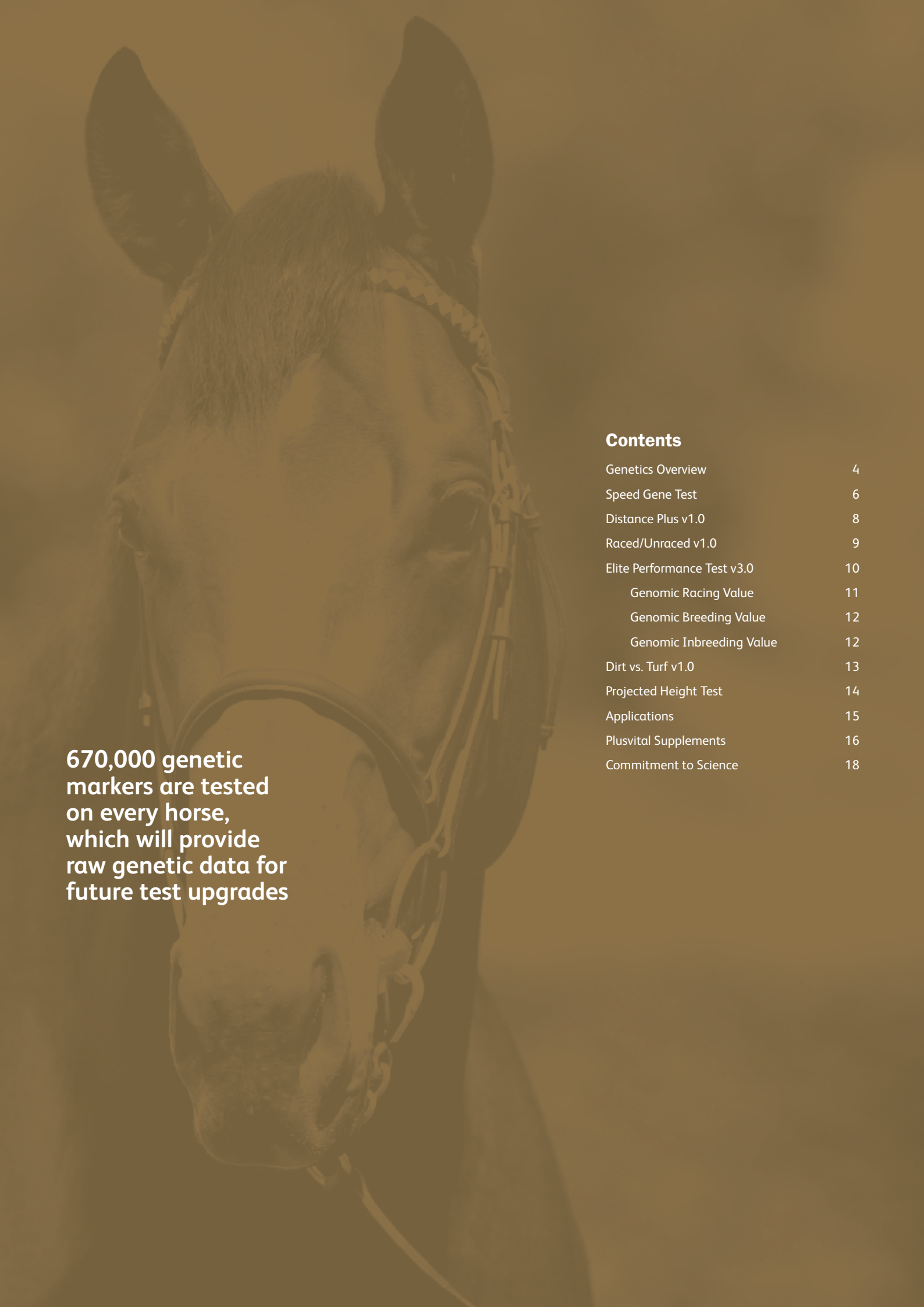
Equinome™ was launched in 2010 as a result of ground breaking research led by Assoc. Prof. Emmeline Hill at University College Dublin, which resulted in the world's first test linking athletic performance in the Thoroughbred to a genetic marker (Equinome Speed Gene Test). Since the launch, Equinome has led the introduction of genomic testing to the Thoroughbred industry

2015 saw new developments, with the acquisition of Equinome by Irish equine nutritional supplement company Plusvital. The vision of the newly-expanded company is the development of a world-leading equine science company that will deliver a broad range of integrated services in equine performance and health management, across the areas of nutrition and genetics and into the exciting emerging field of nutrigenomics.

We are committed to scientific excellence, with an extensive research team led by Chief Science Officer Emmeline Hill, that includes world-leading experts in molecular biology, genomics, bioinformatics, computational biology, equine exercise physiology, veterinary science, statistics and nutrition.

Our research has led to the development of eight different genomic tests, which result from analysing over 48,000 genetic markers for each Thoroughbred and providing information related to elite racing and breeding potential, precocity, distance preference, surface preference, mature height prediction and genomic inbreeding.

By 2016, over 13,000 Thoroughbred horses – including more than 1,000 black-type winners – had been tested by Equinome. Owners, trainers and breeders in all the major racing regions use the genetic information provided by Equinome tests alongside traditional methods to make crucial decisions.



670,000 genetic markers are tested on every horse, which will provide raw genetic data for future test upgrades

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Every horse is made up of billions of cells. In each cell, the nucleus houses the genetic material. In a horse, this is packaged into 32 pairs of chromosomes – one of each pair is inherited from the dam and one from the sire

A chromosome is a long string of DNA, made up of four building blocks referred to as A, G, T and C. The arrangement of the letters in a gene spells out the instructions to produce a protein, which contributes to an observable trait. Any slight variation in the sequence of the letters may produce differences in the trait between individuals.

In some cases, a single gene is responsible for a single trait, while other traits may be influenced by a combination of genes.

The Speed Gene Test and Projected Height Test analyse a single gene marker to determine the result. Our other more complex tests use sophisticated machine-learning modelling to analyse over 48,000 genetic markers in search of those that influence elite performance, refine optimum distance and indicate probability to race or surface preference.

While genetics can be an important factor in an individual's success, other factors such as management, training, environment and opportunity play a large role. As a result, best practice is to use our genetic tests as additional tools to complement traditional decision-making.

> “You try to use everything that can help make up these decisions as to which races you should or shouldn’t be running in. This is a new piece of science and modern technology that has helped us to make up our minds.”

Hon Harry Herbert,
on Galileo Gold (Racing Post, 1 June 2016)
Racing Advisor, Al Shaqab

Every horse is analysed on our comprehensive platform of 670,000 genetic markers, which will allow us to give our customers the most up-to-date information about their horses’ genetic potential for performance when new and updated tests become available

Speed Gene Test

Identify sprint, mid-distance and staying types, and precocity potential with high accuracy; breed more of your desired type of horse within one season of testing

Best race distance and precocity potential can be predicted through the analysis of a specific marker within the *myostatin (MSTN)* gene, where the code contains either the DNA marker C or T. Each individual has two copies of the gene, one inherited from each parent, so there are three possible combinations of the genetic markers, C:C, C:T and T:T.

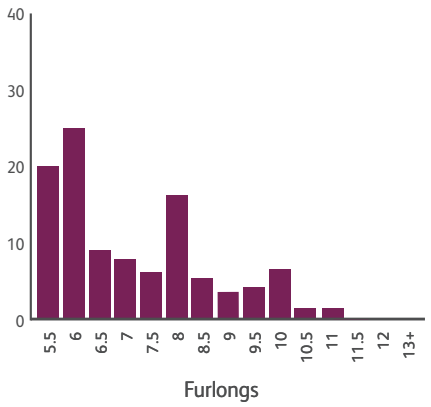
This information cannot be determined from pedigree. The mare and stallion each pass on one copy of their genetic marker (i.e. 'C' or 'T') to the foal. A C:T horse is equally likely to pass on a 'C' or 'T'. Therefore, a C:T mare bred to a C:T stallion can produce a C:C, C:T or T:T foal. This explains why full siblings can be completely different types of horse, and why race distance or precocity cannot be reliably predicted from pedigree alone.

Best Race Distance for individuals in Europe only

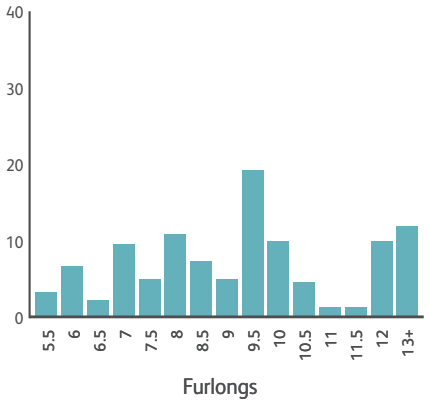
Genetic Type (MSTN gene)	Best Race Distance	Precocity	Breeding Potential
C:C	90 % had best race distance of 1 mile or less 2 % had best race distance of 10f or more	Average age at first win: 32 months	Can only produce C:C or C:T type horses
C:T	78 % had best race distance of 7-12f 53 % had best race distance of 10f or more	Average age at first win: 35 months	Can produce C:C, C:T or T:T type horses
T:T	8 % had best race distance of less than 1 mile 81 % had best race distance of 10f or more	Average age at first win: 40 months	Can only produce C:T or T:T type horses

Best Race Distance – 463 winners in Europe

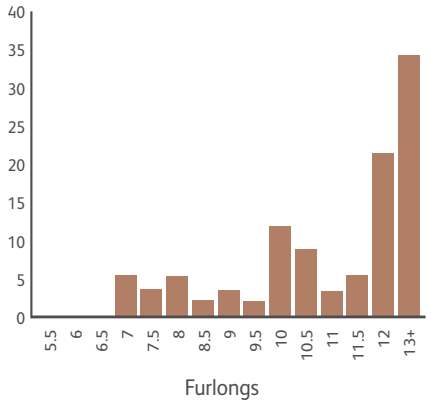
Best Race Distance: C:C



Best Race Distance: C:T



Best Race Distance: T:T



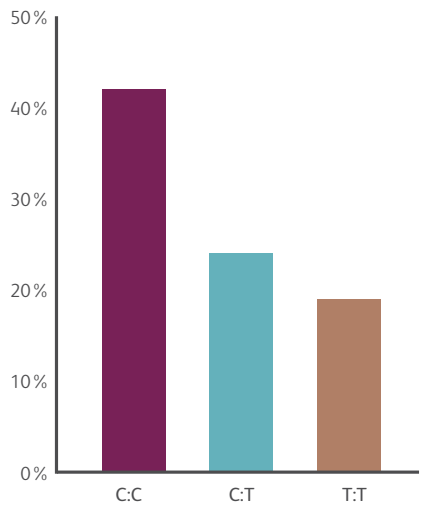
Case Study - Australasia

Pre-Sale testing at major Australian Yearling Sales

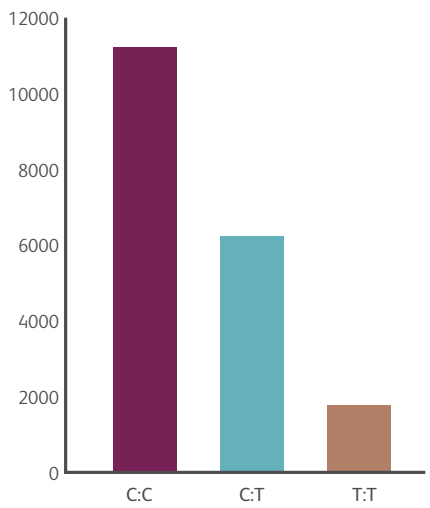
- Two-year-old race records were analysed for 590 individuals submitted for pre-sale testing in Australia as yearlings in 2014. The Speed Gene Test was highly predictive of how they subsequently performed as two-year-olds.
- Over 8 times more C:C than T:T individuals had started in a race in their two-year-old year.
- These faster-maturing individuals earned twice as much per start as two-year-olds, than T:T individuals and this trend continued into their three-year-old season.
- C:C and C:T individuals also achieved higher win or place strike rates. T:T individuals are expected to have greater racing opportunities as three-year-olds and older.

Speed Gene Type	% of Total	Win or Place/Starts (2yr only)	Earnings/Start (2yr only)
C:C	55 %	42 %	AU$ 11,218
C:T	39 %	24 %	AU$ 6,243
T:T	6 %	19 %	AU$ 1,782

Win or Place/Start:
Two-year-old Season



Earnings/Start (AU$):
Two-year-old Season



"I have found the Speed Gene Test can provide me with more certainty in identifying at an early stage the precocious sprint types that excel as two-year-olds from later-maturing individuals that will perform best over distances greater than one mile as three-year-olds. In my experience, optimum distance does not always match with pedigree or physical type and genetics can help in this instance."

Mikel Delzangles,
Trainer, France
Group 1-winning trainer

Distance Plus v1.0 NEW

Refine optimum race distance through analysis of a more complex range of genetic markers

The Speed Gene is the most important contributor to best race distance, accounting for almost 50% of the genetic variation on its own. However, refining the best race distance requires a more complex arrangement of genetic markers. This test adds thousands of additional genetic markers to refine the distance range prediction, separating horses into short or long C:C, C:T or T:T.

Due to different environments, racing conditions and training methods when moving from one racing region to another, we examine different genetic arrangements to predict best race distance in four of the major global racing regions. Therefore, the same horse could potentially be a "C:C-short" in Australia/New Zealand but a "C:C-long" in Europe due to different suitability for the different regions.

"The introduction of genetic know-how to breeding will dramatically change the face of the bloodstock industry. We have begun and intend to continue to utilise this highly valuable tool to fine-tune decision making in our operation. This will fundamentally change the way we will have to think about breeding in the future."

John O'Connor,
Managing Director,
Ballylinch Stud, Ireland
Irish Breeder of the Year, 2014

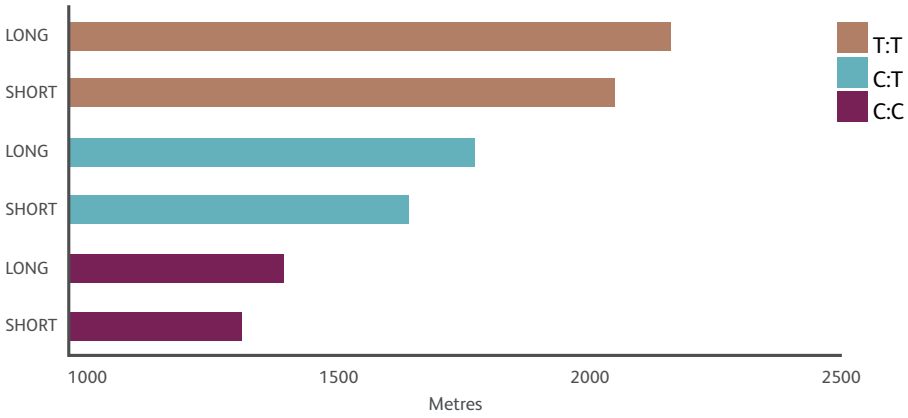
Distance Plus Score

	Average Best Race Distance (European Black-Type only – 463 horses)	Average Best Race Distance (Global winners only – 2254 horses)
C:C-short	1340m	1339m
C:C-long	1448m	1500m
C:T-short	1702m	1720m
C:T-long	1821m	1865m
T:T-short	2178m	2042m
T:T-long	2334m	2306m

"I have seen examples within my own horses which demonstrate how the [Speed Gene] genetic test result can be a more accurate indicator of the optimum distance for an individual than pedigree alone."

John Hammond,
Trainer, France
Group 1-winning trainer

Average Best Race Distance
463 Black-Type Horses (Europe only)

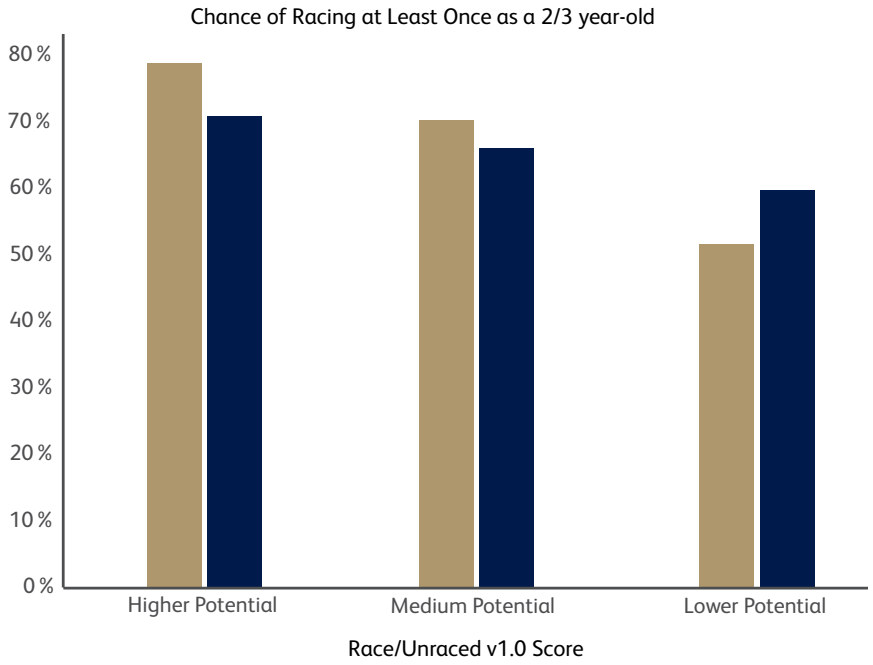


Raced/Unraced v1.0 NEW

Identify foals with the greatest potential to have a racecourse start as a two or three-year-old

It has been estimated that as many as 30-40 % of Thoroughbred foals never make it to the racecourse. Raced/Unraced v1.0 identifies those horses with the greatest potential to have a racecourse start in their two-year-old or three-year-old season. It is understood that there are multiple reasons as to why an individual might never make it to the racecourse. We have also identified genetic contributions that may underpin these traits.

The test was developed using over 4,000 horses from all major race regions and over 48,000 genetic markers. Horses are ranked as Higher Potential, Medium Potential or Lower Potential for a racecourse start.



Male
Female

Higher Potential males have a 1.6x (60 %) greater chance of having a start in their two or three-year-old season than Lower Potential

Higher Potential females have a 1.2x (20 %) greater chance of having a start in their two or three-year-old season than Lower Potential

Case Study - Europe

120+ horses from a leading UK training yard

- Horses with a Lower Potential score were approximately two times more likely not to have had a start as a two or three-year-old than horses with a Higher Potential score
- 12 % of the horses with a Higher Potential score failed to start as a two or three-year-old
- 23 % of the horses with a Lower Potential score started as a two or three-year-old

Raced/Unraced v1.0 score	% of Population	% Raced (as 2 or 3-year-old)	% Unraced (as 2 or 3-year-old)
Higher Potential	40 %	88 %	12 %
Medium Potential	36 %	76 %	24 %
Lower Potential	24 %	77 %	23 %

Elite Performance Test v3.0 NEW

Achieve higher strike rates by identifying the highest genetic potential for elite breeding and racecourse success through analysis of 48,000+ markers

The Elite Performance Test v3.0 is the most comprehensive method of predicting genetic potential for elite racing and breeding performance. Elite success depends on inheriting the optimal combination of genetic markers and being given every chance to maximise this genetic potential.

Genetics contributes up to 40 % of the variation in performance ability. This test provides a greater understanding of an individual's strengths and weaknesses and could help to inform management practices to give every individual the best chance of success. The test provides three outputs, Genomic Racing Value, Genomic Breeding Value and Genomic Inbreeding Value.

670,000
genetic markers analysed

4,000+
horses used in development

48,000+
genetic markers used in test

803
Horses used that won or placed at Group/Listed level in all major racing regions (except Japan)

Regional differences between Europe, North America, Australasia and South Africa were accounted for in the test development.

"Woodside Park Stud were very pleased with the price for one of their yearlings that had an excellent genetic score, which achieved a premium that well exceeded their expectations in advance of the sale and said "We are glad that we had the tests done as I'm sure it helped us get that little bit extra on our colt."

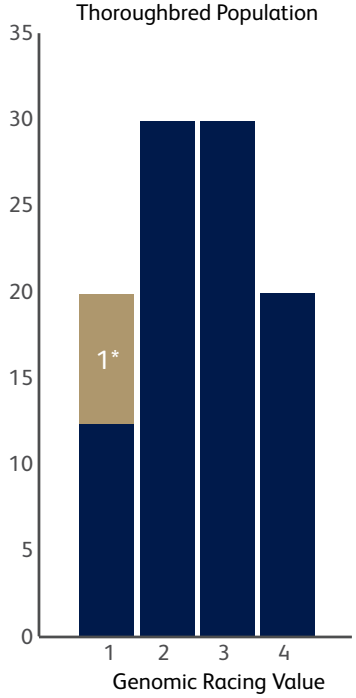
Murray Tillet, General Manager, Woodside Park Stud, Australia
Home of Written Tycoon and Zoustar

Genomic Racing Value

A Genomic Racing Value (GRV) of 1–4 is assigned to each horse. A Class 1 horse has the greatest potential to be an elite racehorse, while a Class 4 horse has the lowest potential

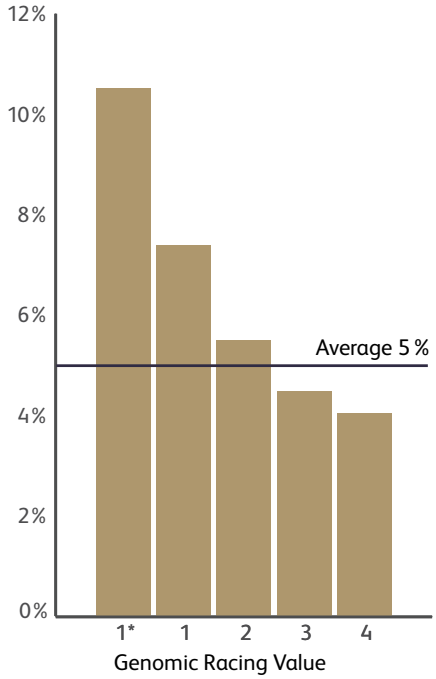
A score of 1* highlights Class 1 horses that are at the very top of the range.

Class Distribution in General Thoroughbred Population



Almost 40 % of the Class 1 horses are Class 1*. Class 2 and 3 are the most common classes in the general Thoroughbred population

Percentage Black Type in Each Class



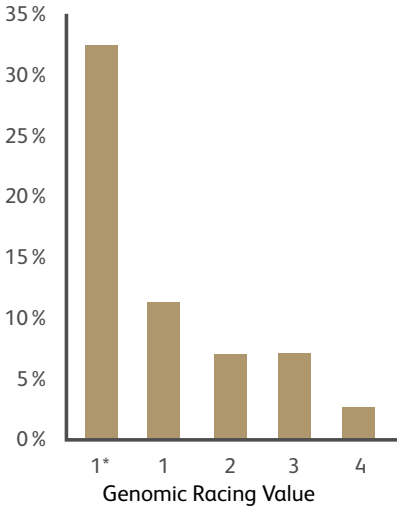
Class 1* horses are over two times more likely to achieve black type than Class 4 horses

Case Study - Europe

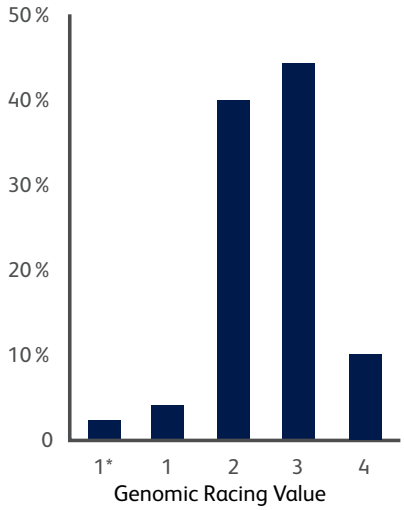
306+ horses from two leading UK stud farms

- Class 1 horses were 4x more likely to be black-type than Class 4
- Class 4 horses were 2.5x less likely to be black-type than average for the farms

% Black-Type by Genomic Racing Value in Two Leading UK Stud farms



Proportion of Genomic Racing Values in Two Leading UK stud farms



Genomic Breeding Value

The Genomic Breeding Value (GBV) represents the potential for a broodmare or stallion to produce offspring with a higher potential for elite success. This is based on an assessment of the favourable genetic variants that can be passed on to the foal

Each horse is given a Genomic Breeding Value (GBV) of 1–4, where a value of 1 indicates the highest probability of producing elite racehorses.

Genomic Inbreeding Value

The Genomic Inbreeding Value evaluates the actual level of inbreeding in a Thoroughbred horse, which can be used to inform future mating decisions

Each horse is given a value of Low, Medium or High for Genomic Inbreeding.

- A high value means that the individual has inherited a significantly greater proportion of identical genetic information from sire and dam.
- Our research indicates that individuals with a lower level of genomic inbreeding have a slightly higher probability of being elite racehorses.

Case Study

Pedigree is generally a good indicator of expected level of inbreeding, but it can also be misleading (see table). Level of Genomic Inbreeding can have important consequences for future breeding decisions.

The table shows the actual Genomic Inbreeding of a horse versus the apparent level of duplication illustrated by the pedigree. **Stallion C** appears to have a high level of inbreeding based on pedigree, but genetically has a low proportion of identical genetic markers. **Stallion F** appears to have a low level of inbreeding based on pedigree, but genetically has a very high proportion of identical genetic markers and is relatively highly inbred.

Stallion	Genomic Inbreeding Value	Duplicates in 5 Generation Pedigree
A	Low	4
B	Low	2
C	**Low**	**8**
D	Low	2
E	High	6
F	**High**	**0**

Dirt vs. Turf v1.0 NEW

Identify prospects suited to dirt or turf racing

Surface preference is considered to be indicated by pedigree and physical type since sires are often ranked according to the success of their progeny on different surfaces. However, it is often unclear until a horse has raced a number of times as to which surface it is best suited to. Similarly, some stallions can produce progeny with different surface preferences, in which case pedigree does not always indicate surface preference type. Dirt vs. Turf v1.0 indicates genetic affinity of an individual for achieving their best win on dirt or turf surface.

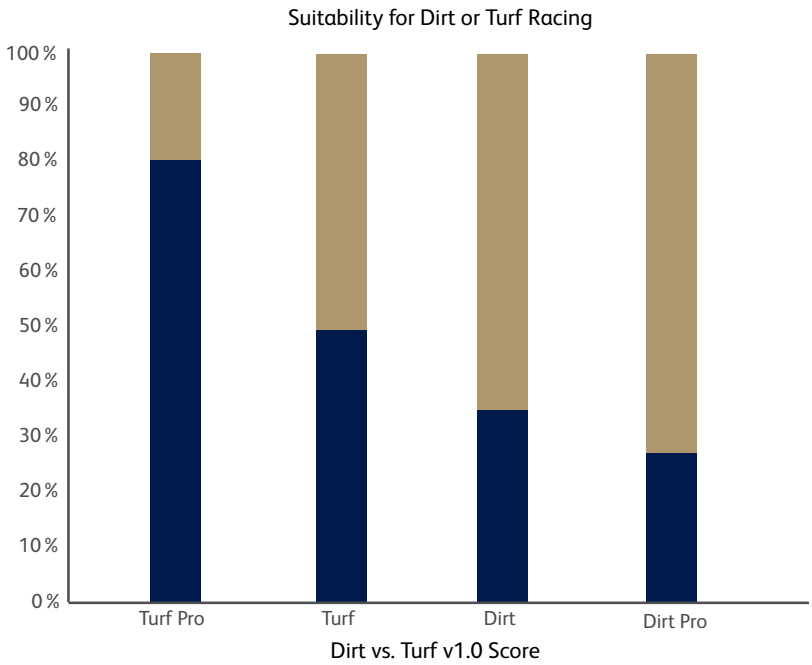
In the USA, 68 % of Group races are run on dirt and 32 % are run on turf, while in Europe, the majority (98 %) of Group races are run on turf. This test, developed using horses raced in North America, analyses over 48,000 genetic markers to determine the result.

Dirt

Turf

Horses are categorised as:

- Turf Pro – 80 % suited to turf racing
- Turf – 50 % suited to turf racing
- Dirt – 64 % suited to dirt racing
- Dirt Pro – 75 % suited to dirt racing



Case Study - North America

273 retired racehorses from two leading US stud farms

- Horses with a 'Dirt Pro' result were 6.7x more likely to have won/placed on only dirt than turf
- Horses with a 'Turf Pro' result were 2.0x more likely to have won/placed on only turf than dirt
- The smaller amount of turf races available probably means that more turf horses raced on dirt due to lack of opportunity

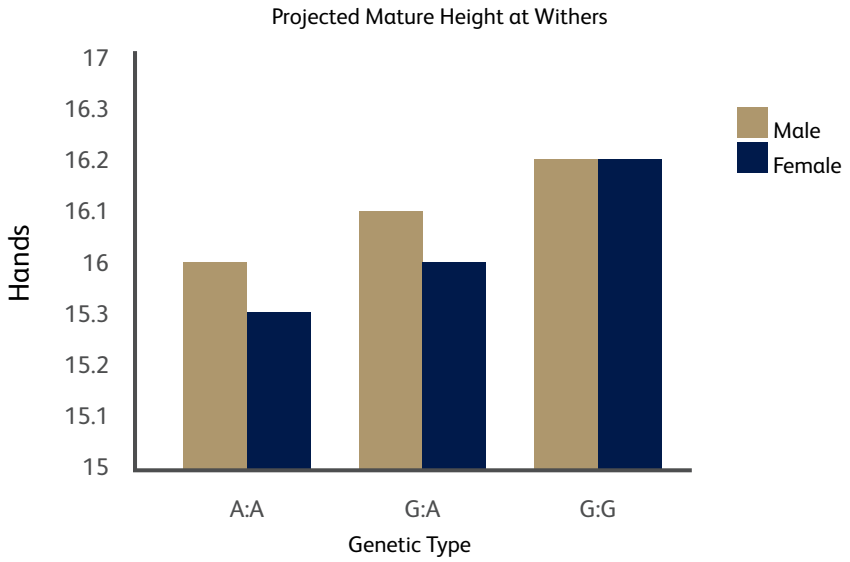
Dirt vs. Turf Score	% of Population	Dirt Win/Place Only	Turf Win/Place Only
Dirt Pro	29 %	87 %	13 %
Dirt	17 %	79 %	21 %
Turf	25 %	50 %	50 %
Turf Pro	30 %	33 %	67 %

Projected Height Test

Predict with confidence the expected mature height of a young foal; breed more horses of the desired height

Mature height at withers can be predicted from birth within 2.54cm (1 inch), with a 70% success rate, based on DNA analysis of the *LCORL/NCAPG* gene region and the sex of the horse.

At the *LCORL/NCAPG* gene region, a position in the DNA code contains either the genetic marker G or A. Each individual has two copies of the gene – one inherited from each parent, so there are three possible combinations of genetic markers: A:A, G:A, G:G.

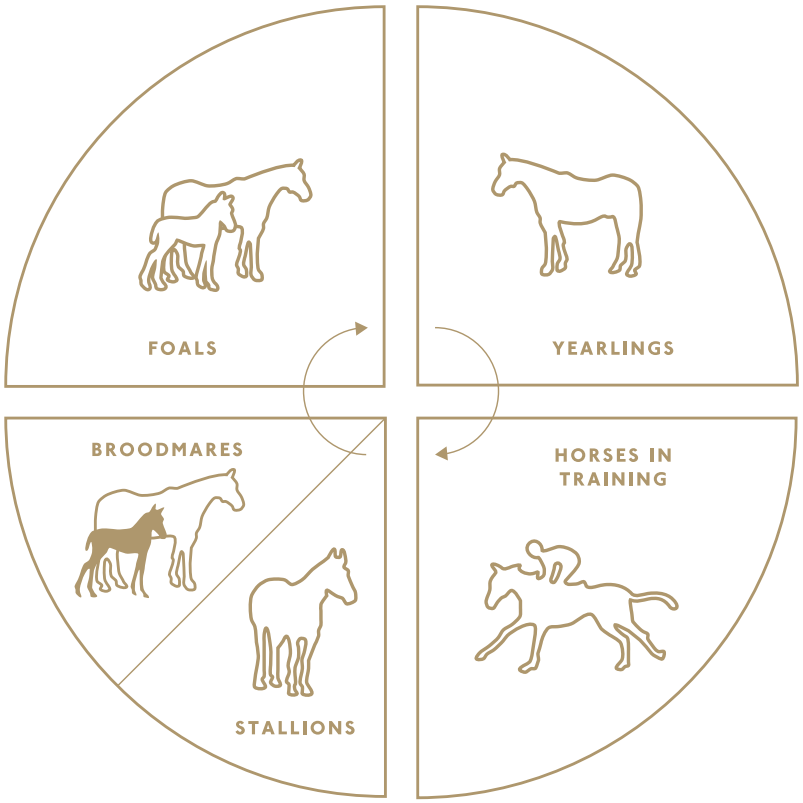


Genetic Type	Physical Type	Precocity	Breeding Potential
A:A	Small	Female 161.08cm (approx. 15.3hh) Male 162.80cm (approx. 16hh)	Can only produce small or medium horses
G:A	Medium	Female 163.44cm(approx. 16hh) Male 165.14cm (approx. 16.1hh)	Can produce small, medium or tall horses
G:G	Tall	Female 168.28cm (approx. 16.2hh) Males 168.28cm (approx. 16.2hh)	Can only produce medium or tall horses

"I find the genetic information provided by Equinome highly credible and it's interesting to see how this information can be applied in both Breeding and Racing. As a breeder, it is helpful to be able to use genetic information along with other selection criteria to make those tough decisions."

Marguerite Joyce,
Cahermorris Stud, Ireland
Breeder of Group 3 winner Smash Williams

Applications



FOALS & YEARLINGS

- Inform selection and sales decisions
- Identify most precocious prospects

HORSES IN TRAINING

- Reduce operating costs
- Optimise training regime
- Fine-tune racing strategy

STALLIONS

- Predict stamina index for young stallions
- Promote stallion potential
- Inform selection and sales decisions

BROODMARES

- Optimise breeding outcomes
- Identify optimal breeding stock
- Select compatible stallions
- Inform selection and sales decisions

> “All of our mares have been tested under the Speed Gene Test, and we see it as a useful application of scientific knowledge to the alchemy of breeding a champion. Breeding is still an art form, no matter how much information science can give you, but you try to take as much guesswork out of it as you can.”

Rick Barnes, Owner and Breeder,
Grangecon Stud, Ireland
Group 1-winning breeder

Plusvital Supplements

Premium supplements balanced with the latest scientific thinking and anti-doping expertise

Racing Syrup

Palatable molasses-based multivitamin, amino acid and trace element balancer supplement. Scientifically formulated to take the guesswork out of balancing the daily feed ration of the racehorse

Key Features

- 30 vitamins, minerals, trace elements and amino acids
- Meets and exceeds NRC recommendations
- Increased vitamin E to reduce oxidative stress
- Selenium to neutralise free radicals and support the immune system
- Branched chain amino acids and threonine to support muscle recovery
- Zinc and biotin to support growth of healthy hoof and hair.

multivitamins | branched chain amino acids | molasses based

Available in 2 or 5 litres. Daily dose 60ml, no further supplementation is required. Please consult with an equine nutritionist or veterinary surgeon before using in conjunction with other supplements.

Breeding Syrup

Source of vitamins, minerals and amino acids to help support the breeding horse and foal

Key Features

- Highly palatable molasses-based balancer
- Supports the needs of the mare and stallion during the breeding season
- Complete multivitamin, amino acid and mineral formation
- Contains folic acid, essential for cell formation and for DNA metabolism
- Essential amino acids lysine and methionine – crucial for growth and bone development
- B vitamins have been added for their role in cell reproduction and growth

enhanced flavour | easy to pour | molasses based

Available in 5 litres. Daily dose: Broodmares 60ml daily, foals and yearlings 30ml daily, stallions in service 90ml daily, stallions for maintenance 60ml daily.

Other Products

Neutragast

Comprehensive gut support for horses prone to gastric disturbances

E-Dash

Innovative anti-oxidant support for the performance horse

Recovery-7

Highly concentrated formula to aid in muscle recovery after peak performance

"The global movement of horses and the vagaries of regional racing programmes mean that sometimes a pedigree doesn't always give the truest picture of a horse's natural aptitude regarding its best distance and precocity. I have found the Speed Gene Test an extremely useful tool in levelling those differences and giving some concrete data that can help provide a more tailor-made training programme for each horse. This helps give the horse and owner their best possible chance for success."

Francis-Henri Graffard,
Group 1-winning trainer

"I have been interested in genetics for some time. I believe improvements in this scientific approach should be a consideration for any serious breeder. Anything that can give the breeder an edge to potentially breed a superior racehorse should be a strong consideration.

Along with traditional consideration when making purchases or planning nominations for your mares, using genetics could give added confidence on your selections.

The decision to purchase Fountain of Youth was boosted by the result that he was C:C [on the Speed Gene Test], had a high genomic breeding value [on the Elite Performance Test v2.0] giving him a higher chance of passing on elite gene variants to his progeny. This gave me the added confidence to invest in him."

Terry Holdcroft,
Bearstone Stud

"After finding out that she was a T:T, she was tried at 2200m and won first time out. She has subsequently won a Stakes race at 2400m and Grade 2 at 3200m. Her value as a broodmare has now obviously increased greatly as a result of the change in race distance and addition of black type, as well as the additional prize money returned."

Tinus Gericke,
Leading South African owner/breeder

Commitment to Science

Our research team consists of world-leading experts in molecular biology, genomics, bioinformatics, computational biology, equine exercise physiology and nutrition

200+
scientific papers
published by members of our research team

13,000+
horses genetically tested

9
book chapters
authored by members of our research team

All our nutritional products are manufactured to EU feed hygiene standards and are designed in accordance with the FEI and Jockey Club regulations

> "When it comes to published academic research, Hill may be champion among the geneticists engaged in the search for the secrets of equine athletic potential."
>
> **Scientific American**

1,000+

Black Type winners tested worldwide

clients in **28** countries worldwide

including all major racing jurisdictions

How to Order

If you would like to arrange for genetic testing of your horses, please contact us directly for a quote and instructions for the collection and shipping of samples to Plusvital laboratories. Plusvital is able to accept DNA samples from all major bloodstock regions of the world. The process is simple and involves a 4–5ml uncoagulated blood sample from each horse in a purple cap K2-EDTA tube.

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