

SynchroGait®

Learn about your horse's natural ability for different gaits

Get help from the DNA-test SynchroGait® to learn about your horse's genetic potential for gaits. The test is very easy to use and by using information from the test, you are able to plan breeding to maximize the chances of getting offspring with the gaits that you prefer. It also provides valuable information for matching the right horse to the right rider and discipline and lays the foundation for a successful relationship between rider and horse.

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Background

In 2012, the discovery that there is a single gene with a dramatic effect on horse locomotion was published. A change in this gene allows lateral gaits in a variety of breeds and permits horses to trot at high speed without proceeding to gallop. Due to this change, two variants of the gene exist and they were called A and C. A horse carries two copies of each gene and can thus be AA, CA or CC. It was initially shown that flying-pace has a very simple inheritance pattern in Icelandic horses and that a horse needs to be AA to perform this gait. Since then, the effect of the gene on other gaits and in other breeds has been studied extensively and the high impact on different gaiting abilities has been established.

Today, anyone can test his or her horse using the DNA test *SynchroGait®*. The research and test have helped people working with horses worldwide both in the selection of horses for competition and breeding and to customize training schemes and adjust expectations.

Summary about the three different genetic classes

AA horses

Are most often easy gaited horses. In a study of Morgan horses, we had only three AA horses but they were all classified as five-gaited (walk, trot, gallop, amble, and pace).

AA Icelandic horses have the potential to perform flying pace - given other factors such as correct training, conformation and character. They can also amble and most of them do so easily and naturally. There is a high frequency of AA horses in gaited breeds worldwide.

CA horses

Can often but not always amble. In Morgan horses, almost half (41%) of the CA horses were classified as three-gaited and 55% as four-gaited (ambling + basic gaits).

In Icelandic horses, the vast majority can amble, but they cannot perform flying pace. On average they obtain higher scores for the basic gaits than AA Icelandic horses (CC horses unavailable for comparison). Some of the CA horses may not show ambling easily at the beginning of their training. The genotype may therefore be “hidden” in a three-gaited horse because the horse has not been trained to amble.

CC horses

Classical three-gaited horses. Probably the optimum genotype for horses used for show jumping, eventing, high-level classical dressage, heavy pulling, and gallop racing.

Locomotion is a complex trait

Gaits in horses are influenced by several factors, both genetic and environmental. The summary above is what we see most often, but there are exceptions. Horses can to some extent be trained to re-shape their natural pattern of locomotion. Conformation also has an impact on the gaits and we have had reports of CC horses that are gaited and AA horses that seem unable to perform pace. However, these instances are quite rare and the gait-gene has a proven dramatic impact on horses' gaits.

When is it good to know the horse's genotype?

For Morgan horse owners, the information from the test can be used in different ways depending on the discipline the horse is used for. In general, the test can be used:

- To plan mating in order to maximize the chances of getting a horse with the pattern of locomotion that the owner prefers.
- To predict the gaits of foals and young horses (i.e. for buying/selling youngsters).
- To match the right discipline, training, and rider with the right horse.
- To avoid pressuring a CC horse in attempts to amble or pace.

- Keep a distinct part of the population as classical three-gaited horses or as gaited horses by taking informed breeding decisions.

For those preferring classical three-gaited horses

- Test youngsters before buying/training to check if they have the best prerequisites (CC).
- For horses used in breeding. We have seen that some CA horses largely behave like three-gaited horses. However, when these are used in breeding they may produce different kinds of offspring compared to CC horses. If they are crossed with a CC horse half of the offspring will be CA and might amble. If they are crossed with another CA horse, 25% of the offspring will be gaited AA.
- Test stallions used for breeding and show that they don't carry A.

For those preferring gaited horses

- Test youngsters before buying and/or training to check if they have the right prerequisites (AA or CA).
- Choose suitable riding horses. AA horses are naturally gaited (usually amble very easily). CA horses are less lateral in their movements. They are sometimes more difficult in the initial phase of amble practice, but usually have no problem after some training. The fact that CA horses are in general less gaited usually means that they have better basic gaits.
- For horses used in breeding. A horse that is presented as four-gaited can be either AA or CA (or in very rare cases CC, if the horse has unique conformation and is trained very much). The genotype is then important information for breeders to know. For example, if you have a gaited CA mare you do not want to cross her with a gaited CA stallion because 25% of the offspring will be CC and therefore very likely "non-gaited."

Inheritance

The gene variant exists in two forms: A and C. Horses get one copy of the gene from the mare and one from the stallion and can thus be AA, CA or CC. The outcomes from all possible matings are shown below. For example, if you mate two CC horses all offsprings are guaranteed to be CC and if you mate two AA horses all offspring will be AA. For some matings, chance will decide which genotype the offspring will receive and the average outcomes are listed in the table.

		 stallion		
		C:C	C:A	A:A
 mare	C:C	100% C:C	50% C:C 50% C:A	100% C:A
	C:A	50% C:C 50% C:A	25% C:C 50% C:A 25% A:A	50% C:A 50% A:A
	A:A	100% C:A	50% C:A 50% A:A	100% A:A

How to order

The SynchroGait® test is available for Morgan horse owners through AMHA. Applications are available on the AMHA website www.morganhorse.com/registry/forms or you can call 802/985-4944.

Upon testing, you will receive an official certificate with the corresponding *SynchroGait*® stamp that shows if the horse is AA, CA, or CC.

In Sweden and other countries, stallion owners use the stamp on their marketing material to display that the horse has been properly tested for *SynchroGait*®.



Research

New research on Morgan horses

In December 2014, a study of the effect of the *DMRT3* gene on Morgan horses was published in the scientific journal *Animal Genetics*. The study included 59 pure bred Morgan horses. We got a description from the horse owners about the gaits of the horse. To be classified as a four-gaited horse the horse should be able to perform the

three basic gaits and also a four-beat amble. The horses classified as five-gaited could also perform the lateral gait pace. It is important to bear in mind that we did not see the horses ourselves, but have relied on the answers from a questionnaire. The skill and knowledge of these riders varies, which might influence the results. Most Morgans in Sweden are three-gaited and we therefore did not have as many gaited individuals.

We could see a clear connection between the genotypes and the gaits. Most three-gaited horses were CC, four-gaited horses CA, and five-gaited horses AA (table 1).

Table 1. Reported ability to gait in relation to *SynchroGait*[®] results in Morgan horses (p= 8.6E-8).

	Three-gaited	Four-gaited	Five-gaited	Number
CC	91% (31)	6% (2)	3% (1)	34
CA	41% (9)	55% (12)	4% (1)	22
AA	0% (0)	0% (0)	100% (3)	3

Notes on the results:

1. The fact that nine of the three-gaited horses were CA is not surprising. Some CA Icelandic horses will have to be trained quite extensively in tölt (ambling) at the beginning of their training.
2. However, the fact that we see two CC four-gaited horses and one CC five-gaited horse is quite strange. We would like to continue with these horses by looking at a video of their gaits. We do see some CC ambling Icelandic horses (never in flying pace though). But the Icelandic horse has been bred for thousands of years for a conformation and body suitable for tölt and some can therefore be taught even though they are CC. We don't know if this is the case here or just a misclassification.

In a previous study, a random set of Morgan horses originating from the U.S. had been tested, but the gaiting ability of these horses was not known. The result showed that 2% of the horses were AA, 24% were CA, and 74% were CC. These figures might be close to the true frequency of the gait gene in the population.

The discovery of the gene that control gaits

The research was led by researchers at two major Swedish universities: Uppsala University and the Swedish University of Agricultural Sciences (SLU) and was published in the renowned scientific journal *Nature*. The publication was the first ever to present a gene that control gaits in horses and identified a new molecule for regulating the pattern of locomotion. The study started on the multi-gaited Icelandic horse. It was shown that genetics play a crucial role in whether an Icelandic horse can perform flying pace or not. Flying pace turned out to have a simple genetic inheritance pattern. AA is a prerequisite for pace, but the horse also needs correct training, conformation, temperament, etc. In fact, in breeding field tests 30-50% of the AA horses are not shown in flying pace. However we know that many of these instances depend on a young age of the horse or that the owner wants to direct all efforts to achieving a high score for tölt. AA horses can also amble and thus most AA horses are called five-gaited (walk, trot, gallop, tölt, and flying pace). CA horses cannot perform flying pace, but they can amble. CC horses are very rare in the Icelandic horse population. The gene has also an effect on the other gaits. CA horses have better capacity for the basic gaits of walk, trot, and canter while AA horses have a better capacity for ambling gaits (however, no differences at low speed). CC horses were unavailable for analysis in this study.

The frequency of the newly discovered gene variant (A) in other breeds was thereafter investigated and it turned out to have a worldwide distribution. In general, non-gaited horses such as those used for dressage and show jumping, eventing, drafting and gallop racing are CC while gaited horse breeds carry A. Sometimes nearly 100% of the individuals are AA, such as the Missouri Fox Trotter and Tennessee Walking horse, but in other breeds all three different combinations are present (CC, CA and AA). For example, this is the case for the American Saddlebred and the versatile Morgan horse, where we know that both gaited and non-gaited individuals exist.

More information and contact

More information and references to the scientific publications can be found at: www.capiletgenetics.com. If you have any questions, please do not hesitate to ask on our Facebook page "SynchroGait - USA" either by using the messenger service or preferably on the page wall.

For specific questions about your order or to order the test, please contact AMHA directly.