

# Considerations for the Definition

## Introduction by Chris Gould

*The following article was commissioned by the CWHBA Board for submission to the AAFC as expert opinion regarding the principles of Warmblood horse breeding. Its author, Professor Jan Philipsson PHD is the head of the Department of Animal Breeding and Genetics at the University of Upsala in Sweden. Jan was the Chairman of the Swedish Warmblood Horse Breeders Association from 1982 to 1994. He was the head of the Interbull centre for international genetic evaluation of cattle from 1991 to 2001 and has Chaired the international committee "Interstallion" set up by EAAP, WBFSh and ICAR since 2002.*

*It would be impossible to find a more knowledgeable and articulate individual to look to for insights and answers to questions about genetics and breed definitions. With over 75 peer reviewed published papers and over 400 published articles, we are very grateful that Jan has found the time and had the interest to prepare this article for Warmblood breeders in Canada.*

*It is our hope that the understanding coming from this article will provide a solid basis for productive discussions with the AAFC and CSHA about the future of Warmblood horse breeding in Canada.*

## Background

The definition of breeds has always been under debate, as there are not only genetic principles to follow but as much organizational and economic issues to consider. Defining a breed has a primary purpose of helping the breeders to determine their breeding program so that it is operationally feasible and will give anticipated results according to resources and methods put in place. For this reason breeds have evolved in various ways for all farmed species over long periods of time according to goals, resources and methods practiced in different geographical areas. As an example Holstein Friesian cattle are found in most parts of the world, but there are substantial differences in breeding objectives, conformation and some functional traits between the strains in e.g. USA, New Zealand and Ireland, due to differences in production systems and markets.

An important principle to consider in defining a breed, and its breeding objectives, is that the main purpose of the breeding program is to improve the breed by selection of superior animals as parents, thereby causing a continuous change of the breed to successively better fit the market needs of the animals or their products. Thus, all successful breeds undergo changes by time, genetic progress in target traits. A basic assumption for such progress is that there is enough variation among animals within the breed. The size of the genetic variation and the accuracy (heritability), with which you can determine the genetic merits (breeding values) of individuals within the breed, are key parameters influencing the opportunities for genetic progress. Thus, it is important that individuals within a breed show some variation at the same time as the breed differentiates itself from other breeds. The variation refers to mental, biomechanical and physiological traits as well as conformation traits. Often breed descriptions just mention conformation standards, which is a too narrow breed description to be sufficient.

A practical breed definition therefore includes both genetic and organizational aspects. At the end it is normally a definition made by the breeders in a country or region depending on the circumstances. A common definition is: "A population of animals within a geographic area bred according to a particular breeding objective". This assumes that there are enough animals of similar kind in the area that are suitable for the breeding of horses according to the agreed objective, and that allow various testing programs to be applied as selection tools. The population/breed may either be "closed", such as the Thoroughbred or Arabian studbooks, or "open" as is usually the practice of Warmblood studbooks. "Open" means that the studbook may enter individuals of other studbooks according certain qualifications.

## The Warmblood horse development

These principles for breed evolutions and definitions apply fully to the horse sector, not least to the situation for Warmblood horses. These have been developed over more than 300 years and have had different uses over time in different parts of the world, primarily in Europe as cavalry horses in armies and for light draft purposes in agriculture. Since World War II a strong development has taken place everywhere in the direction of producing sport horses for elite as well as amateur equine sports with the Olympic disciplines (dressage, show-jumping, eventing) primarily guiding the breeding objectives. It is worth noting that already at the Olympic Games in Stockholm 1912 the Warmblood horses together with Thoroughbreds dominated the equestrian games. It could also be noted that many of these warmbloods had thoroughbred horses in their pedigrees, a still practiced principle in all Warmblood breed societies. Warmblood studbooks in the various countries or regions have in general been kept open to include Thoroughbreds and to accept potential breeding horses from other Warmblood studbooks.

## Breed organizations for Warmblood horses

In a study to characterize the breeding objectives of Warmblood horse populations by Koenen et al. (2004) an inquiry was sent to all member associations (~40) of the World Breeding Federation for Sport Horses (WBFSh). Nineteen associations replied and they were all European. Seven of these were from different states of Germany, whereas the others were from Belgium, Denmark, Finland, France, Hungary, Ireland, Italy, Netherlands, Norway and Sweden. It shows that the established and leading Warmblood breed associations are still located in Europe, whereas many Warmblood horses nowadays also are found in other parts of the world, not least in North-America. These horses have either been exported from Europe or been domestically produced, either within domestic Warmblood studbooks or within subsidiaries to the European studbooks.

The application of a Warmblood breed definition in this case is clearly following the principles mentioned above. Seventeen of the breed associations are geographically defined Warmblood populations, one is a closed breed (Trakehner, allowing in-flow of only thoroughbreds, but often contributes genetics to other Warmblood breeds), and one is at an evolving stage (Irish sport horse with different registries). All 19 populations have similar breeding objectives but with different emphasis on dressage vs. show-jumping or eventing.

# of Warmblood Horses in Canada

In a recent scientific study of the genetic connectedness between five different Warmblood populations, it was concluded that these populations were more closely linked to each other genetically, than corresponding populations in different countries having the same cattle breeds such as the Holstein or Ayrshire (Thorén Hellsten et al., 2005).

## Methods applied for breed improvement

The methods characterizing Warmblood horse breeding include the following steps:

- Identification and pedigree control
- Definition of breeding objectives
- Testing of horses for traits included in the breeding objectives
- Genetic analyses of data on tested horses for estimation of genetic parameters
- Estimation of breeding values of tested horses and their parents
- Selection of stallions and mares for breeding purposes
- Public presentation of breeding values for officially selected stallions

An officially recognized breed society should have the capacity to conduct these activities alone or in collaboration with other official authorities (e.g. jointly with other breed organizations, government institutions, universities etc). All the breed societies in charge of registration of horses in Europe are officially recognized by the European Commission, after review by the government bodies in each country. Thus, all the different Warmblood societies in Europe have an official status as breed organization with a responsibility to register the horses of their respective sub-population of the Warmblood breed.

Most open stud books recognize a horse as a Warmblood horse if the last three generations are Warmblood horses or of horses of breeds accepted by these studbooks due to performance and similarity or other desired characteristics for breed improvement, e.g. Trakehners, Thoroughbreds. Most studbooks are practicing DNA-testing for pedigree control and chips-marking to ensure right identities.

In a study conducted by leading European scientists (Thorén Hellsten et al., 2006) the methods of testing Warmblood horses and the genetic parameters achieved in the various populations were reviewed from 17 internationally published research reports being available on this issue. It was concluded from the study that practically all countries have developed specific performance tests for stallions and young horses as the main source for genetic evaluations and selection. A few countries base their selection of potential breeding animals on results from competitions when horses are 4-6 years old. In general heritabilities of performance test results are high (0.4-0.5) for specially designed stallion tests (at least a week long) and moderate at competitions of 4-6 year olds and at one-day field tests of 3-4 year old horses (0.2-0.4). The results were very consistent across the strains of the Warmblood populations as regards the genetic variance of different traits, their inheritance and genetic interrelationships between traits. These results are similar to what is found for production traits in cattle breeding, and thus, indicate that the different strains of the Warmblood breed has the genetic potentials of improvement as any other farm animal breeds.

In order to achieve rapid genetic gains the most successful breed societies have also applied the scientifically most efficient methods to their data for prediction of breeding values of all potential breeding animals, the BLUP-Multi-Trait Animal Model. Breeding values are finally published for all major traits of the breeding objectives by each breed society and are often available via internet for the breeders' use.

## The specific issues raised according to the Canadian situation

The apparent issue relates to the definition of a "breed" for the Warmblood horses in Canada, in relation to the alternatives given by the Canadian Animal Pedigree Act. In order to reply to the questions raised from a Canadian horizon it seemed important to describe the situation in Europe and how the breed definitions are practiced in relation to Warmblood horses. As I understand the issues the following questions need to be answered:

### **1. Is "Warmblood" a distinct breed definition as opposed to an "evolving" breed definition?**

No doubt "Warmblood" is a distinct breed with breeding objectives to produce horses for the Olympic equine sports disciplines for amateurs as well as professionals. The breed is established in officially recognized studbooks for different strains of the breed according to geographical area, such as country or state, run by studbook/breed organizations in the various countries/states. As an example the Swedish Warmblood horse population, having had much influence of German and French stock as well as Thoroughbreds in the late eighteen hundreds and in the first half of the last century, established its studbook for "Swedish Warmblood horses" by the government in 1918, and in 1928, when the Swedish Warmblood Association was formed, it was given the responsibility of registering horses of this breed in Sweden. It still has that responsibility, but nowadays it is also recognized by EU for this task.

The definition "evolving" breed related to the development of a new breed is not applicable in the case of Warmblood horses. The Warmblood breed is long established in Europe and has a number of strains in different parts of the world with breeding objectives adapted to the markets in question for each country or region where it is established.

### **2. Is the Warmblood breed based on scientific genetic principles?**

As has been shown in the previous chapter data on Warmblood horses being analyzed for genetic variance and heritability of different traits show expected and consistent heritabilities and genetic variance for all important traits as described in the breeding objectives, proving that anticipated inheritance of these traits will be achieved in the various Warmblood populations. It should be noted that scientific analyses of Warmblood data exceed what has been done with any other horse breed, including thoroughbreds, globally.

The developments and practice of modern methods for genetic evaluation of Warmblood horses (BLUP-MT-AM) in many countries are more advanced than for any other horse breeds in the world.

### **3. Are there any other breeds or studbooks practicing similar breeding objectives as the Warmblood breed?**

In reality all breeds or studbooks in different countries having high ambitions regarding production of horses for the Olympic disciplines

belong to the Warmblood breed. Exceptions are the Andalusians and Lusitanos in Spain, which only aim at dressage, but so far have had little success, and the evolving breed Irish Sport Horse, which has been successfully bred for show-jumping. Trakehners, which generally are accepted by Warmblood studbooks, aim primarily to produce dressage horses and have had some success in doing so.

#### **4. Are the Warmblood horses genetically stable?**

Yes, as has been described under ad. 2, the genetic parameters for the various Warmblood strains in different countries/regions are stable and consistent, meaning that anticipated results from selection are achieved in each one of the Warmblood populations.

#### **5. Are Warmblood horses conformationally distinguishable from other breeds of horses?**

Yes, they are easily distinguishable from other breeds by being the tallest light type of noble riding horse, having considerably more substance than a Thoroughbred horse, and movements suited for performance in either dressage and/or jumping. There is plenty of scientific data to describe the breed as regards different body measures with means and standard deviations showing its unique conformation. Furthermore, the mental and biomechanical characteristics, contributing to the performance of the horse, are well documented and analyzed genetically.

#### **6. Is the primary criterion for registration pedigree or adherence to conformation and performance standards?**

The primary criterion for registration is such pedigree information that shows that the parents of the horse are qualified both from a pedigree and a minimum performance point of view. The criteria on the sire is that he should have passed a licensing including an approved performance test or having competition results deemed equal to the tests. Different registries are usually kept according to the depth of the pedigree and level of the conformation or performance test results.

#### **7. If registration is based on pedigree what role does conformation and performance evaluation play?**

As explained above conformation and performance is to some extent considered when registering a horse as regards its parents, especially the sire. Usually no conformation or performance requirements of the horse itself have to be met before registration of an individual horse. However, in most Warmblood populations mares and stallions are undergoing genetic evaluations at different stages of life, whereby progeny results at performance tests, shows and competitions are evaluated according to the BLUP-procedure. Depending on the estimated breeding values (BLUP-indexes) from these analyses, stallions and broodmares may be graded for their quality as producers of sport horses. Different procedures are practiced in various countries. As it is the responsibility of each national/regional organization to estimate and publish breeding values of stallions of its population, and different scales and units of measurements are used, a special committee, Interstallion, set up by the WBFSH and two other international organizations, is looking into the opportunities to have comparable breeding values published across countries and organizations. The need for this has become evident as semen is exported from different Warmblood stallions to many countries, and the breeders need to have easy access to objective and comparable information and be able to interpret the results for use in their own population.

## **Conclusions**

It is obvious that the Warmblood horse since long is an established, distinct breed with different strains in various countries, states or

regions. The breed has all genetic credentials for successful breeding, which are demonstrated by genetic improvement trends in various countries and by results at the Olympic Games ever since 1912.

There is a continuous exchange of genetic material between most Warmblood populations and the genetic connectedness between these is generally high depending on the great influence that stallions primarily from Germany have had world-wide in the last century. This development has been further enhanced in the last two decades by the frequent use of artificial insemination and export of semen.

The establishment of a Canadian Warmblood breed and registry for Canada is a parallel development to what has been happening in practically all European countries. It is a great advantage for the Canadian breeders to have their own Warmblood registry compared to a situation where various European Warmblood studbooks compete on the Canadian market in registering foals considered being eligible for registration in these studbooks, as is presently happening in the USA, due to lack of breeding policies.

Finally, it should be underlined that there has been no long-term successful nation world-wide in the equine sport without having a base in a domestic breeding program producing horses for its own market. If a domestic expansion of the sport and production of horses can be made possible, it also gives opportunities for production of elite horses and development of riders for high class sport.

I hope that this explanation, from a scientific as well as an organizational view, will contribute to an understanding among Canadian authorities and breeders what the principles of Warmblood breeding is all about, and that the Warmblood horse is such a distinct breed that for many generations has allowed high performance in major Olympic equine disciplines. This is still the case for those breeding organizations that apply sound genetic principles for selection and production of the horses. Any nation or region in the world, having enough Warmblood horses, has the opportunity to establish such a Warmblood horse breeding program.

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