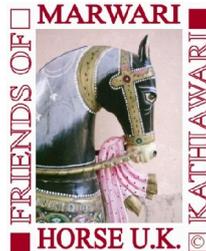


A pilot study to examine the relationship of Marwari and Kathiawari horses to other breeds of horse.



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Background:

The origin of Marwari and Kathiawari horses is a matter of current interest. Different hypotheses have been advanced. Much interest has centred on the possible role of Arabian and/or Thoroughbred horses, but the relatively recent origin of both these breeds makes them unlikely ancestors of traditional Indian breeds, and the genetic relationship of the Marwari to the Thoroughbred is significantly less than the Marwari to the Spiti (Indian pony breed) relationship (Behl et al 2007).

Geographical proximity has been demonstrated in studies of several species as an important factor, but a study of five Indian breeds (Behl et al, 2007) indicated that the Marwari is not closely related to native Indian pony breeds. Nevertheless there is a strong likelihood that Marwari and Kathiawari horses have evolved as part of the family of native Indian breeds but their distinctive traits indicate that there probably have been other ancestral influences in their development.

For example, their notable trait of incurving ears is seen in a less extreme form in Caspian ponies in Iran. The geographical proximity, ancient lineage and genetic traits of the Turkoman suggest it as a possible ancestor of Indian horses. Turkoman horses now are an endangered breed. They descend from very early equine types in Persia, and the Akhal Teke is a sub-type of the breed. The Turkoman was an ancestor of the Thoroughbred.

The current study was initiated to test these hypotheses. In particular the relationship between the Marwari and Kathiawari and the role of the Turkoman in their development are important questions.

Method and Results:

Tail hair samples collected from 18 Indian horses (6 Marwari, 12 Kathiawari) were subjected to **DNA testing at Weatherbys Laboratory (Ireland)** and results from 13 markers were **analysed by Countrywide Livestock Ltd (UK)** to calculate allele frequencies. The results were compared with test results already on file from 91 Turkoman horses (Iran), and with 105 Pryor Mountain Feral horses (USA), which were included as an unrelated control group; Pryor Mountain horses are related most closely to Old World (European) breeds and least related to Oriental and Arabian breeds (Cothran, 2010).

The two Indian breeds were related more closely to the Turkoman than to the Pryor Mountain Feral horses (genetic distance 32% greater) or to each other (genetic distance 25% greater)

The mean number of alleles (MNA) per locus for the total Indian horse sample was 6.08 and the observed heterozygosity was 0.71, but analysis of the breeds separately showed the MNA per locus was 4.77 for the Marwari sample and 4.61 for the Kathiawari sample. Observed heterozygosity was 0.75 for the Marwari and 0.69 for the Kathiawari. Results for the Turkoman sample were 9.54 MNA per locus and 0.78 observed heterozygosity.

Discussion:

The systems used in this study are based on molecular genetic data with analysis of allele frequencies which provide the most objective and statistically powerful method for assignment to breed, and calculation of genetic distance between breeds. They indicate the likelihood of a relationship between the Indian breeds (Marwari and Kathiawari) and Turkoman horses, in comparison with the distant relationship to Pryor Mountain Feral horses.

The relationship is stronger between the Marwari and the Turkoman, compared with the Kathiawari and the Turkoman, and this would support the concept of a Turkoman infusion moving from the region of ancient Persia and modern Turkmenistan with increasing dilution as it approached Kathiawar / Gujarat.

The genetic distance between the Marwari and Kathiawari was surprisingly large in view of their phenotypic similarities and very close geographical proximity. This result is likely to have been compromised by the small samples of both breeds (particularly the Marwari) and the low genetic diversity of the Kathiawari which probably results partially from a recent genetic bottleneck (a phase of development where the breed experienced a reduction in population and associated loss of alleles).

The validity of these preliminary results and soundness of the conclusions is compromised by two factors:

First, there is conflicting evidence regarding the level of genetic diversity in the Indian breeds. The observed heterozygosity in the current study was relatively high (Marwari 0.75; Kathiawari 0.69) but other studies of the Marwari observed lower heterozygosity, e.g. 0.53 (Gupta et al 2005), 0.54 (Chauhan et al 2010) and 0.58 (Behl et al 2007). There are less data for the Kathiawari but it appears to have undergone a recent bottleneck which affects its genetic variability. In contrast, the current study found a low MNA per locus of Marwari 4.77 and Kathiawari 4.61, whereas other studies found greater diversity in the Marwari with a MNA 5.9 (Gupta et al) and 5.72 (Behl et al).

These contrasting results demand some caution in interpretation. In particular, a larger sample of Marwari and Kathiawari horses probably would show a higher MNA for both breeds. However, the overall outcome of the sample tested indicates a likely sub-optimum level of diversity in the Indian breeds which will influence the evaluation of their relationship to other breeds, and will need to be evaluated to assist ongoing breeding policies.

Second, the small number of samples from both Indian breeds makes the results less reliable, and is particularly relevant in evaluating the relationship between the Marwari and Kathiawari. It appears there is a relationship between both breeds and

the Turkoman, but the genetic distance between them appears greater than their genetic distance to the Turkoman. In one study (Chauhan et al) "all individuals were assigned to their respective breed in all three populations (Marwari, Kathiawari, Spiti)" but genetic distance measurements showed the Kathiawari closer to the Spiti than to the Marwari.

Conclusions:

The results obtained in this pilot study are valuable and have confirmed the likelihood of a relationship of the Marwari and Kathiawari breeds to the Turkoman, but conclusions drawn at this stage are unreliable due to the small numbers of animals sampled for the Indian breeds. In addition, genetic variation within a population is influenced by bottlenecks. Although there is little evidence of a recent bottleneck in the Marwari population, there is evidence of a bottleneck in the Kathiawari population and this potentially further exaggerates the genetic difference between breeds.

In order to confirm the conclusions a larger sample of the Indian breeds is necessary. A sample of 50 individuals per breed, unrelated as far as possible, would enable statistically significant evaluation.

References:

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