Preliminary Report

A contribution to the study of the genetic basis of laryngeal hemiplegia

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Laryngeal hemiplegia has been suspected to have a genetic basis for a long time (Quinlan and Morton, 1957; Cook 1970), but defintive proof of its hereclitary nature is lacking.

Galizzi Vecchiotti and Galanti have shown that the offspring of eight affected thoroughbred families suffered in significantly larger numbers from hemiplegia (29 %) than did comparable offspring of unaffected sires (3.4%)
In this preliminary report, we present results of a study concerning 47 offspring of an affected stallion compared with a similar number of unrelated controls.

Material and methods

The horse concerned was a French-Riding-Horse stallion (selle français) and for show jumping, born in 1977 and measuring 165 cm at the withers. He was a son of the thoroughbred sire "Solvedo" (Royal Palace - Persian Gulf).

The horse had a history of progressively worsening inspiratory trouble due to laryngeal hemiplegia. He was put-down in 1987, autopsied and the left recurrent nerve was examined histologically. As two young sons were approved as stallions and both developed an inspiratory noise due to

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laryngeal hemiplegia shortly afterwards, it was decided to examine a larger number of offspring.

47 out of 59 progeny above 2 years of age of the stallion and 50 control horses were examined. The control animals were descendants of different sires, excluding "Solvedo" and his antecendants on the sire's and the dam's side (three generations).

The sex and age of the horses examined are given in table 1.

All horses were measured at the withers.

All 97 animals were examined endoscopically. 42 offspring of the stallion and all 50 control horses were ridden or lunged for several minutes and the noise phenomena produced were recorded by two veterinarians.

The observations were grouped as follows:

1) normal endoscopic picture, normal symmetry and symmetric motility of larynx no inspiratory noise at work.

2) leftsided asymmetry of larynx but preserved motility; no noise.

3) asymmetry and reduced motility of larynx at left side. Inspiratory noise.

Group 3) was classified as laryngeal hemiplegia, group 2) was considered suspect. These horses will have to be re-examined later-on. Photographs were taken of all suspect larynxes at this stage.

All horses were typed as to their Equine Leucocyte Antigen haplotypes.

Results

At post-mortem the isolated larynx of the stallion showed massive leftsided paralysis and abductor muscle atrophy. The left recurrent nerve also was massively damaged, especially in its most distal region (close to larynx). There was a diffuse loss of fibres with de-myelinisation and signs of re-myelinisation in the remaining fibres as well as massively occurring Reynaud bodies. Some fibres showed Wallerian degeneration.

The results of the endoscopic and of the clinical examinations are given in table 2. The difference of the numbers of positive offspring of the stallion concerned compared with the controls is highly significant ($p < 0.001$ for groups 2 and 3 together; $p < 0.01$ for group 3 alone).There is no statistical difference between the sexes, nor is the heighth of the horses statistically different.

Some (how many??) horses showed signs of follicular pharyngitis. This finding was felt to be insignificant as the numbers of cases in both groups was approximately the same.

No association between laryngeal hemiplegia and the ELA haplotypes could be established.

Discussion

The stallion concerned was suffering from laryngeal hempiplegia. Neuropathological examination of his left recurrent nerve showed changes similar to those described in the literature (Cole, 1946). It is thought that the changes represent a primary axonopathy.

The differences between the offspring of this stallion and the controls are significant, both if the endoscopically suspect and positive horses are taken together or if only the established cases of hemiplegia are considered. This finding seems to confirm the suspicion that there must be

a genetic basis to laryngeal hempiplegia (see Quinlan and Morton, 1957) and the results of Galizzi Vecchiotti and Galanti (1985) are confirmed by our investigation. It is unusual however, to find such a high percentage of affected offspring from a hemiplegic stallion. Kuhn (cited from Manninger and Mócsy, 1959) found no increased frequency of laryngeal hemiplegia in 200 offspring of one affected stallions. Quinlan and Morton (1957) investigated 196 progeny of suspected stallions and found a percentage of 10.7 % compared with 4.8 % in 292 controls ($p < 0.05$). The italian study revealed a percentage of 29 % in the eight families affected.

The genetic factor responsible for the predisposition to laryngeal hemiplegia is neither marked nor represented by an equine leucocyte antigen. Galizzi Vecchiotti and Galanti (1985) tend to the hypothesis of a dominant gene.

That we have found no difference in the heighth of affected and unaffected animals does, of course, not exclude a correlation between the frequency of hemiplegia and the size of horses. The stallion and his offspring were of medium size and, if compared for instance with a population of horses under 160 cm or ponies, there would probably seem to be an association of hemiplegia and size. (see Cook, 1970)

The question whether horses with hemiplegia laryngis should be admitted to horse-improvement schemes was discussed already in the 19th century (Quinlan and Morton, 1957 for references). We feel that the evidence presented here justifies at least the exclusion of affected stallions from such a schemes, although our stallion seems extreme compared to the ones Quinlan and Morton (1957) have used. It seems inadmissible in any case that a subsidized stallion should, with our knowledge, produce a percentage of over 40 % of unsound horses.

The stallion concerned was very popular and used extensively; in fact, he was considered to be among our country's most promising young sires as his

offspring invariably were very well conformed and showed a superior ability for show jumping. However, as his first sons approved for breeding developed a laryngeal hemiplegia and as nearly half of the offspring examined were endoscopically hemiplegics, it was decided to eliminate himself and all his male offspring from breeding. His female descendants and their later products will be closely watched in future. This may perhaps enable us to establish the pathway of heredity.

The breeders having been informed of the results of this study will perhaps not use the female offspring extensively as brood mares anyway. The horses are considered to be unsound by the breeders and the mares are practically not saleable anymore as broodmare prospects.

The results of this study justify the requirement that all entire horses presented for approval as subsidized stallions must be endoscopically examined beforehand.

Summary

A study is presented concerning the offspring of a stallion (selle français) with advanced laryngeal hemiplegia. 22 out of 47 offspring showed a laryngeal asymmetry endoscopically, 11 out of 47 were endoscopically unsound and produced a distinct inspiratory noise. These figures differ significantly from the results established in a group of 50 unrelated control horses.

The implications of this finding for the breeding of warmblooded horses are clear: horses with an established diagnosis of laryngeal hemiplegia must not be used for breeding purposes.

References

Table 1: Sex and age of horses

	Offspring of Stallion X (N)	Controls (N)	total (N)
sex: male (entire)	5	20	25
gelding	16	3	19
female	26	27	53
total	47	50	97
age	2 to 5 years	3 to 20 years	

Table 2: Clinical results

Category	Numbers	
	Offspring of Stallion X	Controls
stage 1 (sound)	25	45
2	11	4
3	11	1
males + geldings stages 2 and 3	12	2
females stages 2 and 3	10	3

The differences between the offspring of stallion X and the controls are highly significant ($p < 0.001$) if stages 2 to 3 are taken together, they are significant if only confirmed cases are considered (stage 3; $P < 0.01$) The sexes do not differ significantly from each other. The offspring of stallion X measured 163.9 ± 4.0 cm at the withers, the controls 166.6 ± 3.0 cm.

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