

## THE INCIDENCE OF NATURAL DIPHTHERIA ANTITOXIN IN HORSES: ITS INFLUENCE ON THE RESULTS OF ANTIGENIC STIMULUS

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The presence of diphtheria antitoxin in sera of untreated horses was detected by Bolton as early as 1896. Working with four horses—two with and two without naturally present diphtheria antitoxin in the blood—he opined that, 'The presence or absence of more or less antitoxin normally has no effect upon the ultimate production of artificial antitoxin by inoculation.' The number of animals used in his experiment, however, was too small to warrant any general conclusion. Glenn (1925*a*), working with many hundreds of horses over 15

221 horses brought into this laboratory during 1944-5 for antiserum production have been examined for their natural immunity against diphtheria. Of these, thirty Indian horses had been used in carts and cabs in the streets of Calcutta for unknown periods previous to their arrival, 124 horses were fresh from Afghanistan, purchased from transborder traders, and the remaining sixty-seven were Indian horses from different parts of the Punjab. The last two groups were all young animals of about 5 years of age, while the Calcutta

Table 1

Source of horses	No. of horses tested	No. of horses with natural titre below 0.02 unit per c.c. of serum	No. of horses with natural titre between 0.02 unit and 0.1 unit per c.c. of serum	No. of horses with 0.1 unit or more per c.c. of serum
Calcutta	30	21 (70 %)	5 (16.7 %)	4 (13.3 %)
The Punjab	67	39 (58.2 %)	4 (6.0 %)	24 (35.8 %)
Afghanistan	124	84 (67.7 %)	12 (9.7 %)	28 (22.6 %)
Total	221	144 (65.2 %)	21 (9.5 %)	56 (25.3 %)

Table 2

Natural titre in unit per c.c. of serum	No. of horses	No. of horses that failed to respond to primary stimulus	No. of horses that responded to primary stimulus	Average titre obtained in horses that responded to primary stimulus (unit per c.c. of serum)
1	2	3	4	5
Below 0.02	112	52 (46.4 %)	60 (53.6 %)	151
Between 0.02 and 0.1	14	3 (21.4 %)	11 (78.6 %)	139
0.1 or more	44	8 (18.2 %)	36 (81.8 %)	146
Total	170	63 (37.0 %)	107 (62.9 %)	148

years, concluded that horses having natural antitoxin in their blood are usually much more readily immunized and give serum of higher titre than those with no natural antitoxin. In a very recent paper Barr & Glenn (1945) have published figures showing marked differences in three groups of horses obtained from different sources in their natural immunity to diphtheria. Again, amongst the horses with no natural antitoxin, the groups responded differently to a single dose of diphtheria A.P.T., thus showing differences in 'potential immunity'.

horses were older, the average age being about 7 years. The natural antitoxic titres of the horses as observed shortly after arrival are given in Table 1.

The response obtained in 170 animals from amongst the Punjabi and the Afghani horses, as determined by flocculation test after primary stimulus in the form of six small doses of diphtheria A.P.T., is given in Table 2. The minimum titre tested for was 20 units/c.c. of serum. Horses whose sera contained less than 20 units/c.c. have been placed in column 3 of the table. These figures give some indication of the responsiveness of the animals to stimulus.

## DISCUSSION

Glenny observed (1925*b*), 'it would be of great interest to obtain figures for the antitoxic content of horses in different parts of the world, comparing those in close contact with men and other horses with those living relatively isolated existences, and to compare their immunity rate with that of man in the same district'. Of 620 English horses examined by him (1925*a*) during 5 years (1920-4), 360 (58 %) showed natural immunity to diphtheria to the extent of 0.02 unit or more per c.c. of serum. Out of 1400 English civilian horses examined during 1935-7, Barr & Glenny (1945) observed circulating antitoxin in 33.7 %, while in English army horses and in Polish horses natural antitoxin was much more frequently present. Of the 221 animals tested here during 1944-5, 77 (34.8 %) showed a natural antitoxin level of 0.02 unit/c.c. or higher. Considering that the horses belong to a tropical climate, where the incidence of diphtheria is comparatively low, and were mostly obtained from rural areas, the number showing natural immunity was not specially small, though it must be noted that the Calcutta horses, in spite of their

closer association with man, were possessed of a higher natural antibody content.

The results in Table 2 corroborate the observations of Glenny (1925*a*) that horses possessed of natural antibody are more likely to respond to immunization than those that lack it, and of Barr & Glenny (1945) that the animals which do respond to such immunization react to a very similar extent no matter whether their original natural antibody level was high or low.

## SUMMARY

1. Out of 221 horses tested 34.8 % showed natural diphtheria antitoxin to the extent of 0.02 unit or more per c.c. of serum.

2. Amongst the horses in which no natural circulating antitoxin was detected, a much larger number failed to respond to stimulus than amongst those having circulating antitoxin. But, amongst the animals that did show appreciable response to primary stimulus, there was not much difference in degree of response between the horses with and those without natural circulating antitoxin.

## REFERENCES

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