GENETIC STUDIES WITH AUSTRALIAN AND NEW ZEALAND THOROUGHBREDS

J. R. GALLAGHER[A], *P. R. BEATSON*[B] *and K. HOPE*[C]

[A]Dept of Agricultural Technology, Roseworthy Campus, University of Adelaide, S.A. 537 1.
*Animal and Veterinary Science Group,Lincoln University, Canterbury, New Zealand.
[C]53 Kyeema Avenue, Cumberland Park, S.A.

It has been estimated by Hill (1988) that the rate of improvement in speed in the winners of English Classic races is only one tenth the rate of genetic progress noted by Smith (1984) in economic traits in other domesticated livestock. This slow rate of progress in Thoroughbred horses warrants enquiry since Gaffney and Cunningham (1988) reported that the heritability of racing performance is 0.36.

Cunningham (1991) has reported that 10 horses have contributed 50% of the genes in the modem Thoroughbred which suggests that inbreeding may influencing fitness traits in the breed. There has been scant attention directed to the genetics of the Australian and New Zealand Thoroughbred and it is the aim of this study to determine inbreeding levels in winners of the Australian classic race the W.S. Cox plate and also to establish if there has been an improvement in winning times in the period 1945-90.

Inbreeding coefficient was determined by Fisher's method for each of the 62 winners based on a study of 5 generations of ancestors. The level of inbreeding calculated was 0.5 1% (s.d. ± 0.7). There was no inbreeding recorded in 44% of the horses and the highest level of inbreeding recorded (3%) was observed in only 3 horses, Australian bred horse Heroic (1926) and New Zealand bred Sir Dane (1964) and Daryl's Joy (1968), bred respectively to Cyllene, Bahram, Hyperion. The low level of inbreeding of less than 1% observed in this study confirms results of Mahon (1980) and (Cunningham 1991) with English and Irish Thoroughbreds which were also based on 5 generations. However when they traced a few horses 20 generations to foundation animals they recorded an average inbreeding coefficient of 12.5%. Most of that inbreeding was attributed to the concentration of genes from a small number of outstanding stallions in the 18th century. It can be concluded that there has been no marked recent addition to inbreeding in Cox plate winners.

Regression analysis was used to establish rate of change of winning time in Cox plate winners. The regression equation (± s.e.) was:

$$Y = 214 - 0.044\ X\ (\pm\ 0.005)$$

where Y is the time to cover 2040 m and X is the year the time was recorded. The decline in winning time of 2.2 s per half century was not significant.

Beatson (1989) has calculated the difference in the speed of the first and last horse in trials and concluded that there is insufficient between animal variation in speed to effect a significant reduction in running times in the English classic races. The review of Gaffney (1991) suggests an alternative explanation of the failure of times for English classic races to decrease which might also apply to the Cox Plate. He concludes from the evidence of Wilson *et al.*(1989) that sprinting speed has increased due to genetic selection. In contrast, speed over longer races has not increased due to physiological limitations associated with rapid accumulation of lactic acid at high workloads.

BEATSON, P. R. (1989). *Nature 337:* 414.
CUNNINGHAM, P. (1991). *Scientific Amer.* (May) 56–62.
GAFFNEY, B. and *CUNNINGHAM.* P. (1988). *Nature 332: 678.*
GAFFNEY, B. (1991). *Aus. Assoc. Anim. Breed. Gen. 9: 452-6.*
HILL, W. G. (1988). *Nature Lond. 332: 678.*
MAHON, G. A. T. (1980). Ph.D. Thesis, Dublin University.
SMITH, C. R. & D. (1984). *Agric.1: 79-85.*
WILSON, D. E., WILLHAM, R. L., BUTTRAM, S. T., HOEKSTRA, J. A. and LUECKE, G. R. (1989). *J. Anim. Sci. 66:* 2817.