

PROJECT: Catastrophic Musculoskeletal Injury

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Objective: A primary objective of the New Zealand Racing Board is to promote the health and welfare of the equine participants. As part of this programme the current project utilised a two prong approach to identify if, and how many, horses suffer an injury during racing that would be classified as a catastrophic musculoskeletal injury.

Method: The initial strategy was to use an epidemiological study to examine historical racing records and quantify the number of, and reasons why, horses fail to finish a race. This data was then examined to compare differences between horses that fail to finish (i.e. have a career limiting injury, or precursor event) and those that did not, to identify possible risk factors. This data can then be used to modify or change management or practises to reduce the risk to the horse. In association with this data describing the racing production process and the then environment (racing tracks and surfaces) were generated.

The second and parallel component of the study is a post-mortem examination of those few horses that required euthanasia due to severe injury. The patho-physiology of these injuries were examined using the sophisticated pathology and imaging technology within the Massey Veterinary Teaching Hospital.

Results:

The study included 188,616 race starts for 16,646 horses, representing 6,072 2-year-old starts, 43,228 3-year-old starts and 139,316 4-year-old+ starts. During the study period there were 544 failure to finish events, of which just under half were pulled up (49%), 33% were lost rider events and 13% fell (Figure 1). The overall incidence of failure to finish events was 2.88 (95% CI 2.64-3.12) per 1,000 horse starts. Approximately 50% of these events were due to musculoskeletal injury (1.4 / 1000 horse starts). The rate of catastrophic musculoskeletal injury was low at 0.4 / 1000 horse starts. Internationally, the rates of musculoskeletal injury alone on race-day range from 3.1 per 1,000 starts to 4.4 per 1,000 starts, which is greater than the New Zealand rate for failure to finish events reported in this study. The lowest rate (2.66 per 1,000) occurred in the 2009/10 racing season and there was no significant effect of horse age on failure to finish events.

Failure to finish and lost rider events were less likely to occur in autumn and winter compare to spring. Horses racing in fields of 12–13 runners and 14–18 runners had a higher rate of failure compared to horses in fields of 3–9 runners. Horses racing over longer distances (1671 metres+) were more likely to fail to finish or be pulled up compared to horses racing over 1200 metres or less (Figure 2). The failure to finish,

pulled up and lost rider rates were lower at all ratings bands 55 or greater compared to rating band 50-54.

Computer tomography (CT) and spatial analysis of the This preliminary data of the limited cases of catastrophic injury has highlighted the significant role variation in training load, rather than just racing exposure, has on the patho-physiology observed. This data emphasises the need for accurate training data to understand the precursor remodelling responses that are occurring prior to the advent of a catastrophic musculoskeletal injury.

Implications: As with previous studies, the results highlighted the many factors that can contribute to race-day events. Factors such as race distance and size of the field have been identified in overseas studies of musculoskeletal injury. The association with season and low ratings bands may reflect younger, inexperienced horses at the start of a racing campaign. This pattern of greater risk with the less experienced / lower grade horses has been reported in studies of jockey falls in Australia. However, further investigation to better understand the race and environmental factors that contribute to the lower rate observed in New Zealand is now needed. Contributing factors to the low failure to finish rate may relate to the structure and pattern of training and racing in New Zealand. Investigation of the biological and industry based drivers is required to identify pragmatic management changes that could reduce the risk of failure to finish.

RESEARCH OUTPUTS (Abstracts, Presentations, Papers, Industry Stories)

PAPERS:

1. ROGERS CW, BOLWELL CF, GEE EK. Proactive management of the equine athlete. *Animals* 2012;2:640-55.
2. ROGERS CW, BOLWELL CF, TANNER JC, VAN WEEREN PR. Early exercise in the horse. *J Vet Behav: Clin App Res.* 2012;7:375-9.
3. TANNER JC, ROGERS CW, BOLWELL CF, GEE EK. Preliminary examination of wastage in Thoroughbred and Standardbred horses in New Zealand using training milestones. *Proc N Z Soc Anim Prod.* 2012;72:172-4.
4. TANNER JC, ROGERS CW, FIRTH EC. The association of 2-year-old training milestones with career length and racing success in a sample of Thoroughbred horses in New Zealand. *Equine Vet J.* 2013;45:20-4.
5. BOGERS SH, ROGERS CW, BOLWELL CF, ROE WD, GEE EK, MCILWRAITH CW. The effect of 2-year-old race training on BMDv and its spatial distribution in the distal epiphysis of the third metatarsal bone. *Vet J.* 2014;201:353-8.
6. BOLWELL C, ROGERS C, GEE E. Descriptive epidemiology of race-day jockey falls and injuries in New Zealand. *Comp Ex Phys.* 2014;10:49-55.

7. BOLWELL CF, ROGERS CW, GEE EK, ROSANOWSKI SM. Descriptive statistics and the pattern of horse racing in New Zealand: Part 1 Thoroughbred Racing. An Prod Sci. 2014;<http://dx.doi.org/10.1071/AN13442>.
8. BOLWELL CF, ROGERS CW, GEE EK, ROSANOWSKI SM. Descriptive statistics and the pattern of horse racing in New Zealand: Part 2 Standardbred Racing. An Prod Sci. 2014;<http://dx.doi.org/10.1071/AN13443>.
9. ROGERS CW, BOLWELL CF, GEE EK, PETERSON ML, MCILWRAITH CW. Profile and surface conditions of New Zealand Thoroughbred racetracks. J Equine Vet Sci. 2014;34:1105-9.
10. ROSANOWSKI SM, ROGERS CW, COGGER N. The movement pattern of horses around race meetings in New Zealand An Prod Sci. 2014;<http://dx.doi.org/10.1071/AN13345>.
11. Bogers, S.H., Rogers, C.W., Bolwell, C., Roe, W.D., Gee, E.K., McIlwraith, C.W., 2016. Quantitative comparison of the bone mineral density characteristics of third metacarpal distal epiphyses with and without condylar fracture. Am. J. Vet. Res. 77, 32-98.
12. Tanner, J.C., Rogers, C.W., Bolwell, C.F., Cogger, N., Gee, E.K., McIlwraith, C.W., 2016. Analysis of Failure to Finish a Race in a Cohort of Thoroughbred Racehorses in New Zealand. Animals 6, doi:10.3390/ani6060036.

Conference proceedings

1. Bolwell CF, Rogers CW, French N. Early exercise in Thoroughbred racehorses Proceedings of the International Society of Veterinary Epidemiology and Economics. 2012.
2. Rogers CW, Bolwell CF, Tanner JC, Gee EK, Van Weeren PR. The importance of early exercise in the horse Proceedings of the Australian Equine Science Symposium. 2012;4:33.
3. Tanner JC, Rogers CW, Bolwell CF, Gee EK. Preliminary examination of wastage in Thoroughbred and Standardbred horses in New Zealand using training milestones. Proc N Z Soc Anim Prod. 2012;72:172-4.
4. Bolwell C, Rogers CW, Gee E. Race-day jockey falls and injuries in Thoroughbred racing in New Zealand. Proceedings of the Australian Equine Science Symposium. 2014;5:56.
5. Bolwell C, Rogers CW, Gee EK, Rosanowski SM. Production and wastage in the Thoroughbred racing industry. Proceedings of the New Zealand Equine Veterinary Association of the NZVA conference 2014.
6. Rogers CW, Bolwell C, Gee E, Peterson ML, McIlwraith CW. Physical characteristics of New Zealand Thoroughbred racetracks. Proceedings of the Australian Equine Science Symposium. 2014;5:66.

7. Rogers CW, Bolwell CF, Gee EK. The benefits of early exercise. Proceedings of the New Zealand Equine Veterinary Association of the NZVA conference 2014.
8. Rogers CW, Bolwell CF, Gee EK. The racing of 2-year-old racehorses - the facts in relation to welfare. Proceedings of the New Zealand Equine Veterinary Association Conference. 2015:37.

THESIS

MVS Thesis –Ms Sophie Bogers. Quantitative analysis of the bone density characteristics of the Third Metacarpal and Third Metatarsal distal epiphysis of Thoroughbred horses using image analysis. Massey University, Palmerston North, New Zealand.

Veterinary MSc Thesis - Ms Charlotta Kronander. Spatial mapping of sclerosis in Thoroughbred horses with and without condylar fracture. Faculty of Health and Medical Sciences, University of Copenhagen, Denmark