

# Lay-Up Is Associated with Complete Humeral but Not Pelvic Fracture in California Thoroughbred Racehorses

Tracey K. Carrier, DVM, MPVM; Leah Estberg, DVM, MPVM, PhD;  
Susan M. Stover, DVM, PhD; Ian Gardner, BVSc, MPVM, PhD;  
and Bill J. Johnson, DVM

California Thoroughbred racehorses were at greatly increased risk for complete humeral fracture shortly after return to training from a lay-up of  $\geq 60$  days. Racehorses cautiously reintroduced into training after lay-up may avoid suffering a catastrophic humeral fracture. Authors' addresses: California Veterinary Diagnostic Laboratory System (Johnson), and Dept. of Veterinary Medicine, Section of Medicine and Epidemiology (Gardner) and Section of Anatomy, Physiology, Cell Biology (all other authors), School of Veterinary Medicine, University of California at Davis, Davis, CA 95616. © 1997 AAEP.

## 1. Introduction

On average, 83% of Thoroughbred fatalities in California are due to musculoskeletal injuries, with the majority (85%) being due to skeletal fracture.<sup>1</sup> In one study, many complete humeral fractures occurred after a period of racing inactivity.<sup>2</sup> We hypothesized that lay-ups may be associated with an increased risk for bone fracture. Our objective was to determine whether a return to training and racing from periods of lay-up  $\geq 60$  days predisposes California Thoroughbred racehorses to an increased risk for humeral or pelvic fracture.

## 2. Materials and Methods

California Thoroughbred racehorses that died or were euthanized because of a complete humeral or pelvic fracture and were necropsied by the California Veterinary Diagnostic Laboratory System (CVDLS)

for the California Horse Racing Board Post Mortem Program between January 1991 and July 1994 were studied. Age, gender (male or female), cause of death (humeral or pelvic fracture), and date of fracture were obtained from the CVDLS, and racing and officially timed work-out records were obtained from a commercial racehorse database.<sup>a</sup>

For each fracture type (humeral or pelvic) the distribution of age, gender, and number of lay-up periods were compared by chi-square analysis; the number of days from last officially recorded exercise event to fracture, the number of days from end of last lay-up to fracture, and the total career length were compared by a Mann-Whitney test.<sup>b</sup> A case-cross-over study was used to estimate the relative risk (RR) for fracture of the humerus or pelvis for hazard periods of 10 and 21 days following a lay-up of  $\geq 60$  days.<sup>3,4</sup> Statistical significance was set at  $p \leq 0.05$ .

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## NOTES

## RACING

**3. Results**

Thirty-four horses had a complete humeral fracture and 20 horses had a complete pelvic fracture. Pelvic fractures occurred more frequently in female and older horses with either no lay-ups or  $\geq 2$  lay-ups, whereas humeral fractures tended to occur in 3-year-old males with one lay-up. Pelvic fracture cases had considerably longer careers, fewer days from last official exercise event to fracture, and a greater number of days from end of last lay-up to fracture.

RR estimates indicated a strong association between return from lay-up and an increased risk for humeral fracture during 10-day and 21-day hazard periods (RR = 71 and 45, respectively), but not for pelvic fracture (RR = 1.1 and 1.1, respectively).

**4. Discussion**

Thoroughbred racehorses were at increased risk for humeral, but not pelvic, fracture following a return to exercise from a lay-up. The age and sex distributions differed for humeral and pelvic fracture cases but were similar to those in other studies.<sup>5,6</sup> These findings suggest that likely different factors lead to either humeral or pelvic fracture.

In summary, California Thoroughbred racehorses were at an increased risk for developing a complete humeral fracture shortly after a return to training following lay-up. Gradual reintroduction of a horse into training may decrease its susceptibility to injury.

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**References and Footnotes**

1. Johnson B, Stover SM, Daft BM, et al. Causes of death in racehorses over a 2 year period. *Equine Vet J* 1994;26:327-330.
  2. Stover SM, Johnson BJ, Daft BM, et al. An association between complete and incomplete stress fractures of the humerus in racehorses. *Equine Vet J* 1991;24:260-263.
  3. Rothman KJ. Stratified analysis. In: *Modern epidemiology*. Boston: Little, Brown & Co., 1986;177-182, 195-197, 213-215.
  4. Maclure M. The case-crossover design: a method for studying transient effects on the risk of acute events. *Am J Epidemiol* 1991;133:144-153.
  5. Mackey VS, Trout DR, Meagher DM, et al. Stress fractures of the humerus, radius, and tibia in horses. *Vet Radiol* 1987;28:26-31.
  6. Little C, Hilbert B. Pelvic fractures in horses: 19 cases (1974-1984). *J Am Vet Med Assoc* 1987;190:1203-1206.
- <sup>a</sup>Bloodstock Research Information Systems Inc., Lexington, KY.  
<sup>b</sup>Dixon WJ. *BMDP statistical software manual: version 7*. Berkeley, CA: U. of California Press, 1992;141-153, 269-278, 457-459.