

POSTMORTEM EXAMINATION PROGRAM

Conducted for the California Horse Racing Board
July 1, 2013–June 30, 2014

**California Animal Health and Food Safety
Laboratory System**

**J.D. Wheat Veterinary Orthopedic
Research Laboratory**

School of Veterinary Medicine
University of California, Davis

April 2015



Postmortem

Examination

Program

California Animal Health and Food Safety Laboratory System

J.D. Wheat Veterinary Orthopedic Research Laboratory

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April 2015

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POSTMORTEM EXAMINATION PROGRAM

Introduction

The Postmortem Examination Program has been in operation since February 1990, and has performed examinations on 6,325 horses, as of June 30, 2014. Initiated by the California Horse Racing Board (CHRB), the program is a partnership with the California Animal Health and Food Safety Laboratory System (CAHFS) to meet three primary objectives: 1) to determine the nature of injuries occurring in racehorses, 2) to determine the reasons for these injuries, and 3) to develop injury prevention strategies. To accomplish this, a broad, cooperative approach was organized involving the development of a contract with the CAHFS to perform a necropsy on every horse that died spontaneously or was euthanized on racetracks or training facilities under the jurisdiction of the CHRB. This visionary partnership has become a national and international model for the horse racing industry in an effort to improve the safety and welfare of racehorses.

Pathologists at the CAHFS' Davis, Tulare and San Bernardino laboratories conduct postmortem examinations and compile detailed information on each horse, which is then reported to the equine medical director and the submitting CHRB official veterinarian. A broad range of specimens are collected and shared with veterinary scientists in the School of Veterinary Medicine (SVM) at the University of California, Davis (UC Davis). Specimens from select cases are also sent to the Veterinary Orthopedic

Laboratory at UC Davis for in-depth analyses. This has helped to more precisely determine the causes and risk factors leading up to catastrophic injuries in racehorses, resulting in their death or euthanasia. Racing associations provide transportation of the horses to the nearest laboratory facility and additional studies are funded by the Center for Equine Health at UC Davis and private sources.

Information from the tests and data gathered from the postmortem examinations are analyzed in efforts to elucidate the specific cause of catastrophic injuries.



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SUBMISSIONS

General Submission Information

During the 2013-14 fiscal-year, 199 horses were submitted to CAHFS as part of the CHRB Postmortem Program. This number is a decrease of ~5 percent (10 horses) over the fiscal year 2012-13 count of 209, and continues the downward trend initiated several years ago (Figure 1). The 2013-14 total number of fatalities (199) represents the lowest number of fatalities of the past 19 years. The graph below (Figure 1) shows the number of horses that have been submitted to the program since 1990 by fiscal year. The first year of the program (1990) began in February and does not represent a full fiscal year. The trend line shows that the number of horses submitted for the CHRB program have been increasing slightly almost every year until 2005-06, after which a decline, interrupted temporarily in 2008-09 and 2011-12.

The CAHFS' Davis, Tulare and San Bernardino laboratories performed the necropsies, with horses being brought directly to the closest CAHFS facility.

At the time of submission, the CHRB track official categorized the activity of the horse at the time of injury into one of three types: non-exercise, racing or training (Table 1).

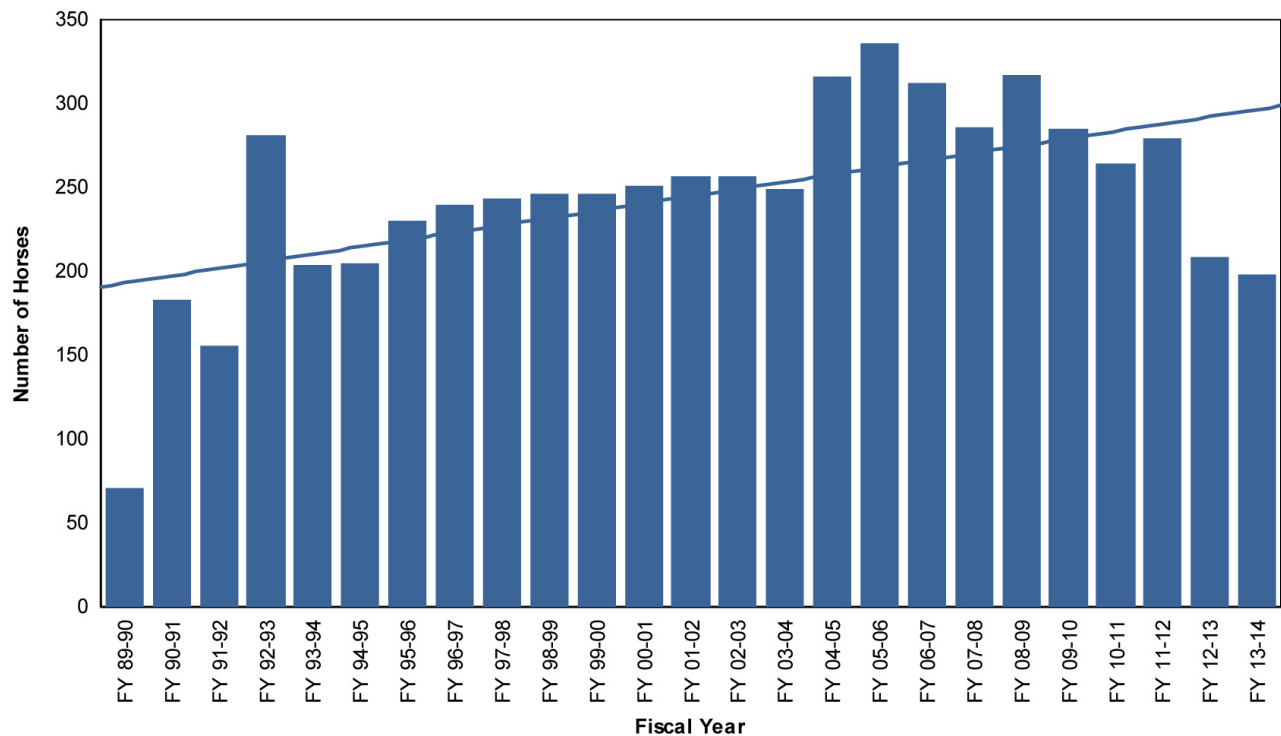
The vast majority of catastrophic injuries, 74 percent, occurred during or immediately following training or racing. Of these, approximately 52 percent occurred during or immediately after racing, and the remaining 48 percent were training-related. This

Continued

Table 1. Activity at Time of Injury/Fatality

Non-Exercise	52 (26%)
Racing	76 (38%)
Training	71 (36%)
Total	199 (100%)

Figure 1. Number of Horses Submitted to the CHRB Postmortem Program by Fiscal Year



SUBMISSIONS • continued

is in agreement with previous years, in which most fatalities were exercise-related. The third category of fatalities, accounting for ~26 percent of submissions, included horses in the non-exercise group. These were horses suffering primarily from medical conditions such as colic, infectious diseases or other conditions.

As in the past, the vast majority of submissions, 176 (~88 percent) during FY 2013-14 were Thoroughbreds (Table 2). Nineteen of the horses submitted in

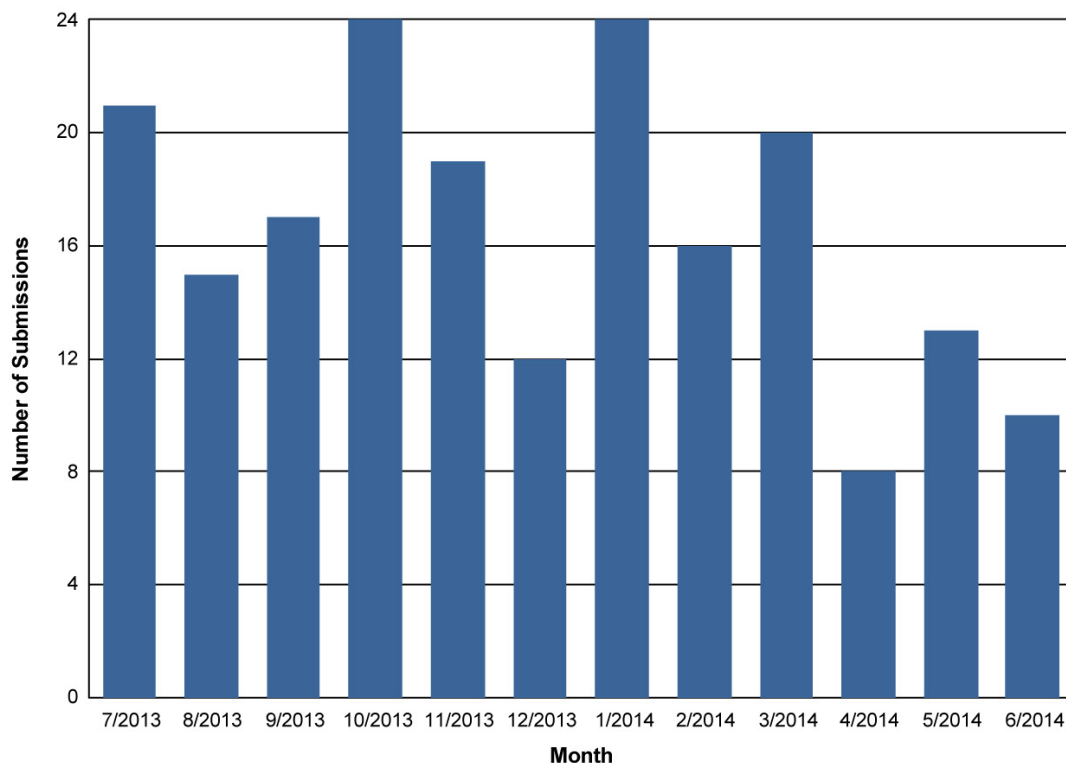
2013-14 (~10 percent) were Quarter Horses. This is an ~8 percent decrease over the prior fiscal year and constitutes the third year in which a reduction in the number of Quarter Horse submissions is observed. With very small numbers of other breeds racing, not enough data exists to allow comparison of injury rates among breeds for any predisposition to any particular type of injury.

Continued

Table 2. Submissions by Breed and Month

Breed	Jul 13	Aug 13	Sep 13	Oct 13	Nov 13	Dec 13	Jan 14	Feb 14	Mar 14	Apr 14	May 14	Jun 14	Total
Appaloosa	0	0	0	1	0	0	0	0	0	0	0	0	1
Quarter Horse	1	0	5	3	3	3	1	1	1	0	0	1	19
Standardbred	0	0	0	0	0	0	1	0	1	1	0	0	3
Thoroughbred	20	15	12	20	16	9	22	15	18	7	13	9	176
Grand Total	21	15	17	24	19	12	24	16	20	8	13	10	199

Figure 2. Number of Horses Examined by Month



SUBMISSIONS • continued

The number of horses submitted per month was variable, with no obvious clusters of submissions at any given month of the year (Table 2 and Figure 2). This is very similar to submission patterns over the last few years.

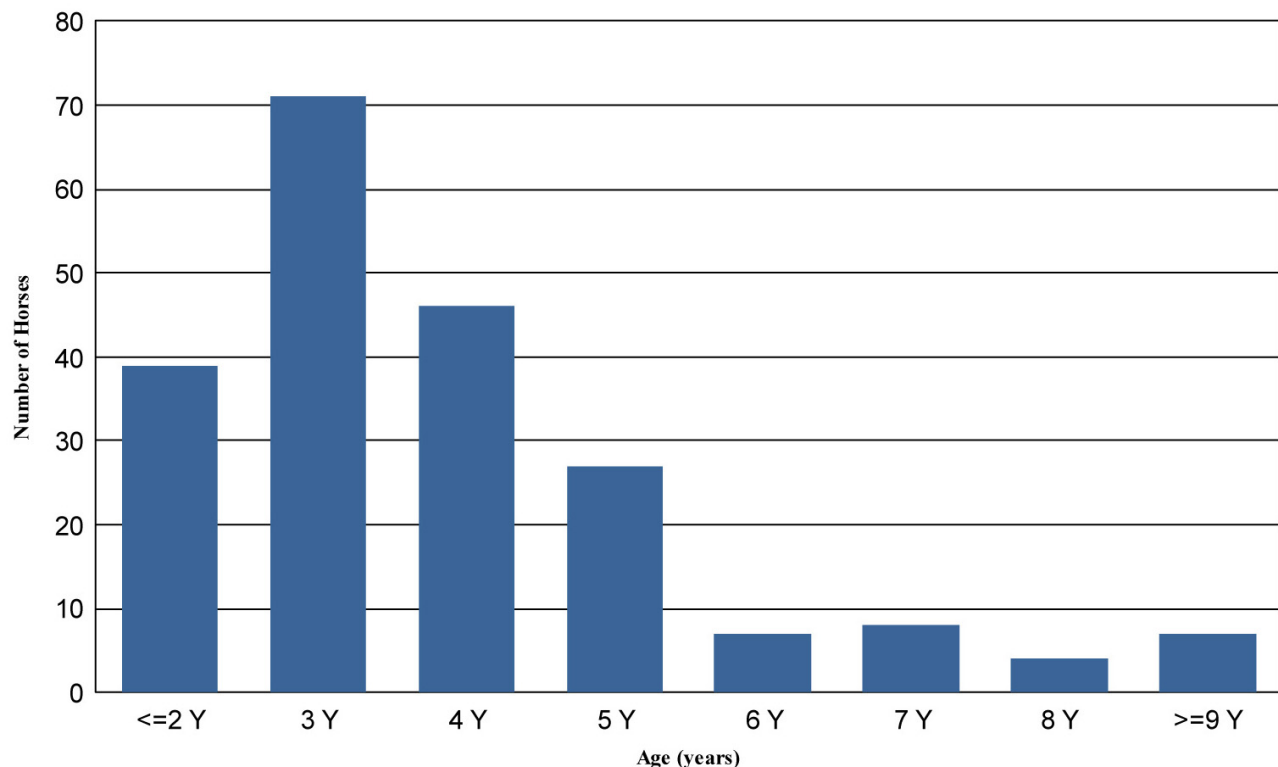
The largest proportion of submissions (~50.0 percent) were 3- or 4-year-old horses (Table 3). Only ~19 percent of all racehorses submitted were 2-years-old or less. The number of horses submitted

with catastrophic injuries or death drops dramatically after the fifth year of age (Table 3 and Figure 3). This distribution is consistent with the age distribution that has been seen in prior years of the program. We cannot conclude if horses 5 years of age and greater are much less susceptible to the athletic injuries of racing, because the total number of horses in each age group that are racing and training on facilities controlled by CHRB are not known to us.

Table 3. Submissions by Breed and Age

Breed/Age	<=2	3	4	5	6	7	8	>=9	Total
Appaloosa Horse	0	0	0	0	0	0	0	1	1
Quarter Horse	9	6	2	0	0	0	1	1	19
Standardbred	0	0	0	1	0	1	0	1	3
Thoroughbred	29	47	43	31	12	7	2	5	176
Total	38	53	45	32	12	8	3	8	199

Figure 3. Number of Horses Examined by Age



SUBMISSIONS • INJURIES

Submissions By Gender

The gender distribution of the horses submitted during 2013-14 is shown in Table 4 below. Males represented ~63 percent of the total group, with 31 percent of males being intact (stallions) and 69 percent geldings. Females comprised ~37 percent of the group.

Table 4. Distribution of Horses by Gender and Category

Gender	Non-Exercise	Racing	Training	Total
Mares	23	28	22	73 (37%)
Stallions	8	10	21	39 (19%)
Geldings	21	38	28	87 (44%)
Total	52	76	71	199 (100%)

Injuries

As previously mentioned, the categories of injury represent the activity of the horse or circumstances at the time of the fatal or catastrophic injury. The largest cluster of fatal injuries, ~86 percent, occurred in 2-, 3-, 4- and 5-year-old racehorses (Table 5). The age of the horses submitted for non-exercise related fatalities was also concentrated between 2 and 5 years of age.

Table 5. Category of Injury/Fatality by Age

Category/Age	<=2	3	4	5	6	7	8	>=9	Total
Non-Exercise	15	11	7	10	1	2	1	5	52
Racing	7	17	25	15	5	5	1	1	76
Training	16	25	13	7	6	1	1	2	71
Total	38	53	45	32	12	8	3	8	199

During this fiscal year, Thoroughbred horses suffered exactly the same number of racing as training (39 percent each) catastrophic injuries (Table 6). This is a variation from the year before when racing fatalities were more numerous than training catastrophic injuries, and from the year before when these proportions were inverted. Quarter Horses suffered only two (10 percent) catastrophic injuries during training in this period. This is consistent with previous years, when Quarter Horses infrequently suffered a catastrophic injury during a training session. Quarter Horse submissions during 2013-14 were significantly lower than the previous year, continuing the steady decline which started five years ago. Figure 4 shows the historical number of Quarter Horses submitted to the program since its inception.



INJURIES • continued

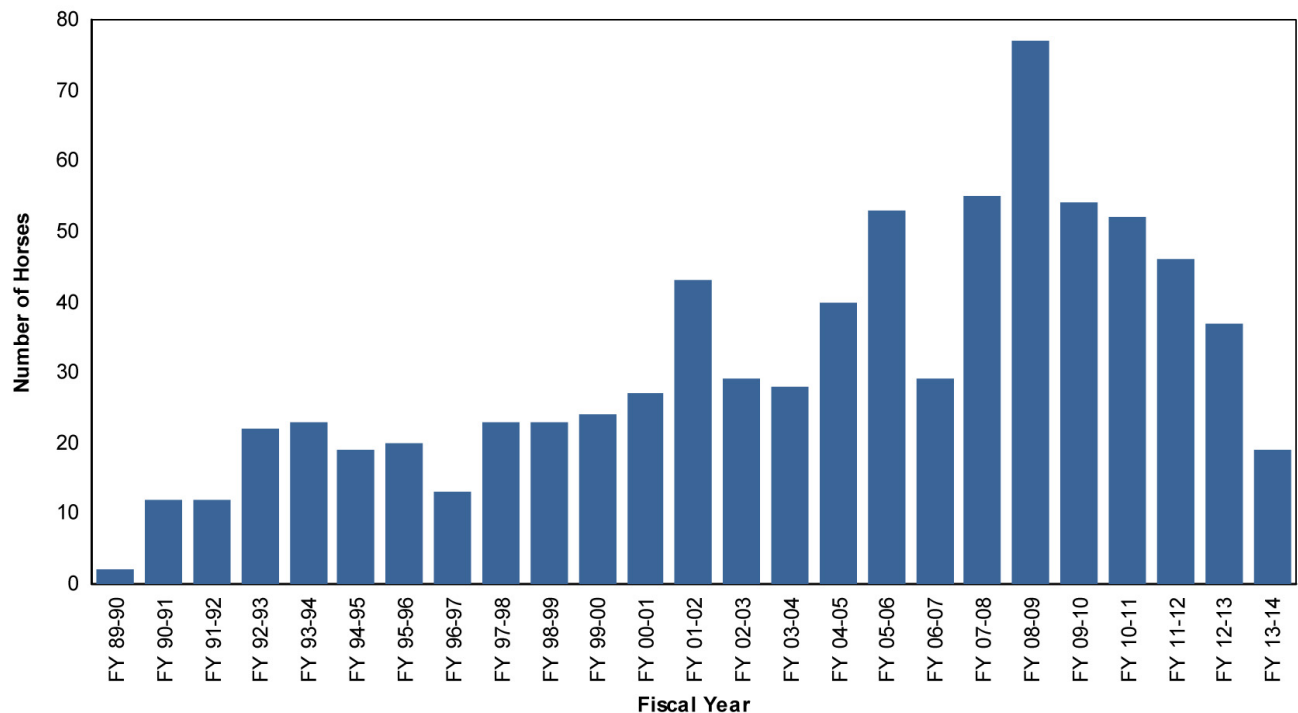
In 2013-14, ~77 percent of the total primary injuries or conditions in all breeds were due to musculoskeletal problems (Table 7), which is consistent with what has been observed in previous years. Of this group, ~82 percent of injuries affected the front or rear legs (Table 8). The injuries listed in these tables represent the primary injury to the horse.

In many cases, several primary findings for each horse submitted were recorded. Thus, the total number of reported injury types exceeds the total number of horses submitted. This is especially true in severe

Table 6. Category of Injury/Fatality by Breed

Injury Class by Breed	Non-Exercise	Racing	Training	Total
Appaloosa Horse	1	0	0	1
Quarter Horse	11	6	2	19
Standardbred	2	1	0	3
Thoroughbred	38	69	69	176
Total	52	76	71	199

Figure 4. Number of Quarter Horses Submitted to the CHRB Postmortem Program by Fiscal Year



INJURIES • continued

injuries involving multiple bones in the fore- or hind-limbs. In these cases, multiple related injuries, such as tendon and ligament ruptures are identified concomitantly.

Musculoskeletal injuries are most likely to occur during racing or training. Because these injuries are by far the most common, most of the investigative efforts at the University of California, Davis, have focused on causes and prevention of limb injuries.

Table 8 lists catastrophic injuries by limb and other axial locations. The number of front limb injuries sustained during racing (65) was slightly higher than those injuries sustained during training (63). There were variable numbers of right and left front limb injuries, but similar numbers of right and left rear limb injuries.

Table 7. Organ Systems Affected

Breed	CV	GI	MS	Nerv	Resp	Skin	Spec Sens	WB	Total
Appaloosa Horse	0	0	0	0	0	0	1	0	1
Quarter Horse	0	2	13	2	1	0	0	1	19
Standardbred	0	0	1	0	0	0	0	2	3
Thoroughbred	1	11	139	8	5	1	0	11	176
Total	1	13	153	10	6	1	1	14	199

(CV=Cardiovascular; GI=Gastrointestinal system; MS=Musculoskeletal; Nerv=Nervous system; Resp=Respiratory system; Skin=Integumentary system; Spec Sens=Special Senses; WB=Whole body).

Table 8. Musculoskeletal Structures Affected

Structure Affected	Non-Exercise	Racing	Training	Total
Left Front	0	34	24	58
Left Rear	1	1	3	5
Right Front	1	31	39	71
Right Rear	1	1	0	2
Pelvis	1	7	3	11
Skull	5	0	0	5
Vertebra	0	1	2	3
Various Structures*	10	0	0	10
Total	19	75	71	165

* Includes laminitis and/or tendinitis of one or more legs



INJURIES • continued

Table 9. Musculoskeletal Injury Type by Breed

Finding	Quarter Horse	Standard bred	Thorough- bred	Total
Carpal Fracture – Left	0	0	2	2
Carpal Fracture – Right	5	0	5	10
Femur Fracture – Left	0	0	1	1
Fedlock Failure – Left Front	0	0	39	39
Fedlock Failure – Left Rear	0	0	2	2
Fetlock Failure – Right Front	0	0	35	35
Humerus Fracture – Left	0	0	5	5
Humerus Fracture – Right	0	0	6	6
Laminitis	5	0	3	8
Metacarpus III Fracture – Left	2	0	2	4
Metacarpus III Fracture – Right	1	0	8	9
Metatarsus III Fracture – Left	0	0	1	1
P1 Fracture – Left Front	0	0	2	2
P1 Fracture – Right Front	0	1	4	5
P1 Fracture – Right Rear	0	0	2	2
P2 Fracture – Left Front	0	0	1	1
Pelvis Fracture	0	0	11	11
Radius Fracture – Left	0	0	1	1
Radius Fracture – Right	0	0	2	2
Scapula Fracture – Left	0	0	3	3
Skull Fracture	0	0	5	5
Suspensory Apparatus Failure – Left Front	0	0	2	2
Suspensory Apparatus Failure – Right Front	0	0	1	1
Suspensory Apparatus Failure – Left Rear	1	0	0	1
Tendon Rupture – Right Front	0	0	1	1
Tenosynovitis	1	0	0	1
Ulna Fracture – Right	0	0	1	1
Vertebra Fracture	0	0	3	3
Total	15	1	148	164



INJURIES • continued

Track Surface and Musculoskeletal Injuries in Thoroughbreds

The distribution of musculoskeletal injuries in Thoroughbreds was evaluated when comparing the three types of track surfaces in which these horses performed. Table 10 shows the limb distribution of injuries. As before, this data shows that for the current fiscal year the absolute number of injuries on dirt surfaces was higher than on other surfaces. Because the total number of horses racing on each surface is not known to CAHFS, it cannot be determined from this data whether the injury rates differ by track surface.

Table 10. Musculoskeletal Injury: Affected Limb by Track Type

Structure Affected	N/A *	Dirt	Synthetic	Turf	Total
Left Front	0	29	19	10	58
Left Rear	1	2	1	1	5
Right Front	1	39	25	6	71
Right Rear	1	1	0	0	2
Pelvis	1	6	3	1	11
Skull	5	0	0	0	5
Vertebra	0	2	1	0	3
Various Structures**	10	0	0	0	10
Total	19	79	49	18	165

*Injuries that did not occur on a racing/training surface.

**Includes laminitis and/or tendinitis of one or more legs.

Other Organ Systems Affected by Injuries

Cardiovascular:

During this period there was one case with a confirmed diagnosis of cardiovascular disease; Cardiomyopathy.

Diagnosis	Total
Cardiomyopathy	1
Total	1

Integumentary (Skin):

Only one diagnosis of disease of the skin was made on horses submitted to CAHFS during 2013-2014. This is consistent with the reduced number of horses with diseases of the skin submitted regularly to CAHFS as part of the CHRB necropsy program.

Diagnosis	Total
Cellulitis	1
Total	1



Other Organ Systems Affected by Injuries

Gastrointestinal:

Of the digestive system diagnoses, enteritis, colitis and typhlitis or combinations of these syndromes, and gastrointestinal displacements and/or ruptures were the most frequently observed diagnoses. Causes of these syndromes during this period were due to infections with *Clostridium difficile*, *Clostridium sordellii*, Non-steroidal anti-inflammatory drugs, enteroliths or undetermined.

Diagnosis	Total
Enteritis/colitis/typhlitis	16
Gastrointestinal displacement/rupture	6
Total	22

Respiratory:

There were significantly fewer cases of respiratory diseases identified in 2013-2014 (9) than had been seen the two previous years (21 and 22, respectively). By far the main cause for pneumonia and pleuropneumonia, was bacterial and within this, *Streptococcus equi*, subspecies zooepidemicus was the most prevalent etiology.

Diagnosis	Total
Pleuropneumonia	2
Pneumonia	5
Upper respiratory disease	2
Total	9

Nervous System:

Horses with neurological disorders were identified infrequently during 2013-2014.

Diagnosis	Total
Equine Protozoal Myelitis	3
Bacterial encephalitis	1
Head trauma	1
Nervous disease of undetermined etiology	5
Total	10

Whole Body:

The number of unexplained sudden deaths (10) in horses was significantly lower during this reporting period (10) than the previous year (27). Of these 10 horses, 7 died during exercise (5 during race, and 2 during training), while the remaining 3 were not exercising when they died.

* Refers to horses that were euthanized but the cause of disease was not found on post-mortem examination.

Diagnosis	Total
Hemoperitoneum	1
Septicemia	2
Unexplained sudden death	10
Unexplained cause of disease (euthanasia)*	3
Total	16

Special Senses:

Diagnosis	Total
Periodic ophthalmia	1
Total	1



RESEARCH SUPPORT

- Research Sponsors**
- Center for Equine Health, with funds provided by:
 - State of California Satellite Wagering Fund
 - Southern California Equine Foundation
 - Private donors
 - Dolly Green Foundation
 - Grayson-Jockey Club Research Foundation, Inc.
 - Pacific Coast Quarter Horse Racing Association

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