

POSTMORTEM EXAMINATION PROGRAM

Conducted for the California Horse Racing Board
July 1, 2011–June 30, 2012

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

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

School of Veterinary Medicine
University of California, Davis
February 2013



Postmortem

Examination

Program

California Animal Health and Food Safety Laboratory System

J.D. Wheat Veterinary Orthopedic Research Laboratory

School of Veterinary Medicine
University of California, Davis
Davis, CA 95616
(916) 752-8700
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Equine Welfare and Racing Injury Prevention Committee

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Gary Beck, DMV
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Jeff Blea, DVM
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POSTMORTEM EXAMINATION PROGRAM

Introduction

The Postmortem Examination Program has been in operation since February 1990 and has performed examinations on 5,917 horses, as of June 30, 2012. 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 model for the 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 CHRB. 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). Starting in 2011, all musculoskeletal specimens from CHRB horses necropsied at CAHFS laboratories are being shipped to the Veterinary Orthopedic Laboratory at UC Davis for the newly developed Enhanced Examination Program.

In-depth analyses of these specimens helps to more precisely determine the causes and risk factors that lead up to catastrophic injuries in racehorses resulting in their death or euthanasia. During the past years, funding for postmortem examinations and

ancillary testing was provided by the CHRB. 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. An advisory board, composed of horse owners, trainers, veterinarians, track maintenance people and CHRB officials, gives insight into injury investigations as well as sharing program findings and prevention strategies with the horse racing industry.



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SUBMISSIONS

General Submission Information

During the 2011-12 fiscal year, 278 horses were submitted to CAHFS as part of the CHRB Postmortem Program. This number is an increase of approximately 5 percent (13 horses) over the fiscal year 2010-11 count of 265 horses, but still a decrease of approximately 13 percent (42 horses) over the fiscal year 2008-2009 count of 320 horses. It is, however, higher than the average number of horses submitted per year since the program began. 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, started. In 2011-12 there was a slight increase in the number of horses received as compared to the year before.

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

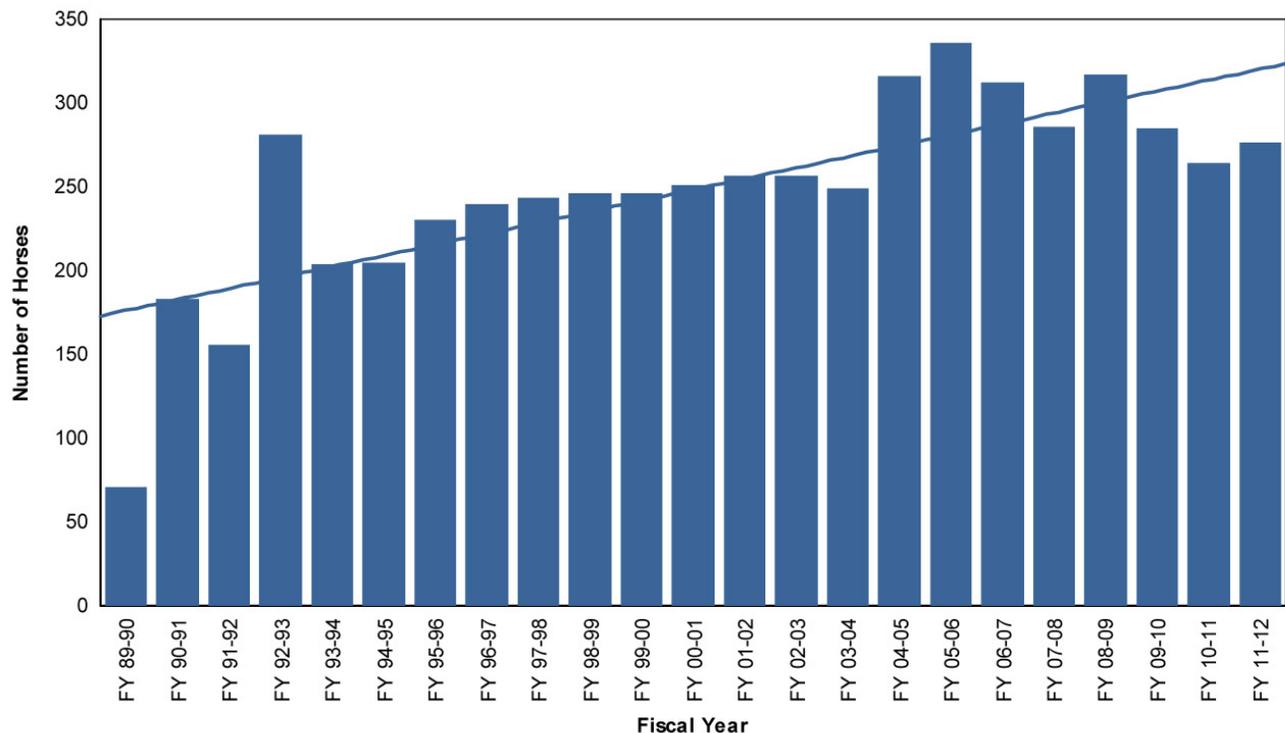
The majority of catastrophic injuries, 39.6 percent, occurred during or immediately following

Continued

Table 1. Activity at Time of Injury/Fatality

Non-exercise	71
Racing	97
Training	110
Total	278

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



SUBMISSIONS • continued

a training session. A total of 34.6 percent of the fatal injuries occurred during a race or immediately following a race. This is a variation from previous years when most fatalities occurred during a race or immediately after a race. The third most frequent category of fatalities, accounting for 25.6 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.

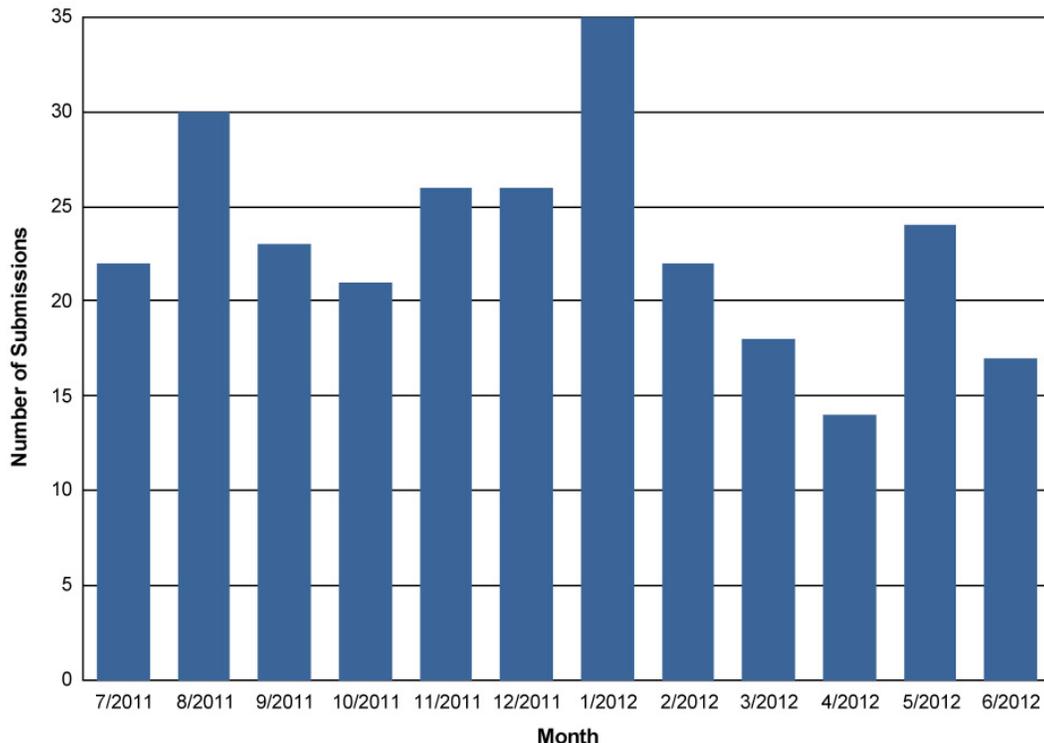
As in the past, the vast majority of submissions (80.2 percent) during FY 2011-12 were Thoroughbreds (Table 2). Forty six of the horses submitted in 2011-12 (15.6 percent) were Quarter Horses. This is a 4 percent decrease over the prior fiscal year and it constitutes the second year in which a reduction in the number of Quarter Horse submissions is observed. With very small numbers of the other breeds racing,

Continued

Table 2. Submissions by Breed and Month

Breed	Jul 11	Aug 11	Sep 11	Oct 11	Nov 11	Dec 11	Jan 12	Feb 12	Mar 12	Apr 12	May 12	Jun 12	Total
Arabian	0	1	0	0	0	0	0	0	0	0	0	0	1
Quarter Horse	4	7	6	5	3	5	3	3	3	3	4	0	46
Standardbred	2	1	0	1	1	0	0	0	0	1	0	0	6
Thoroughbred	15	21	17	15	22	21	32	19	15	9	20	17	223
Undetermined	1	0	0	0	0	0	0	0	0	1	0	0	2
Grand Total	22	30	23	21	26	26	35	22	18	14	24	17	278

Figure 2. Number of Horses Examined by Month



SUBMISSIONS • continued

not enough data exists to allow comparison of injury rates among breeds for any predisposition to any particular type of injury.

The number of horses submitted per month was variable, although there were not 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.

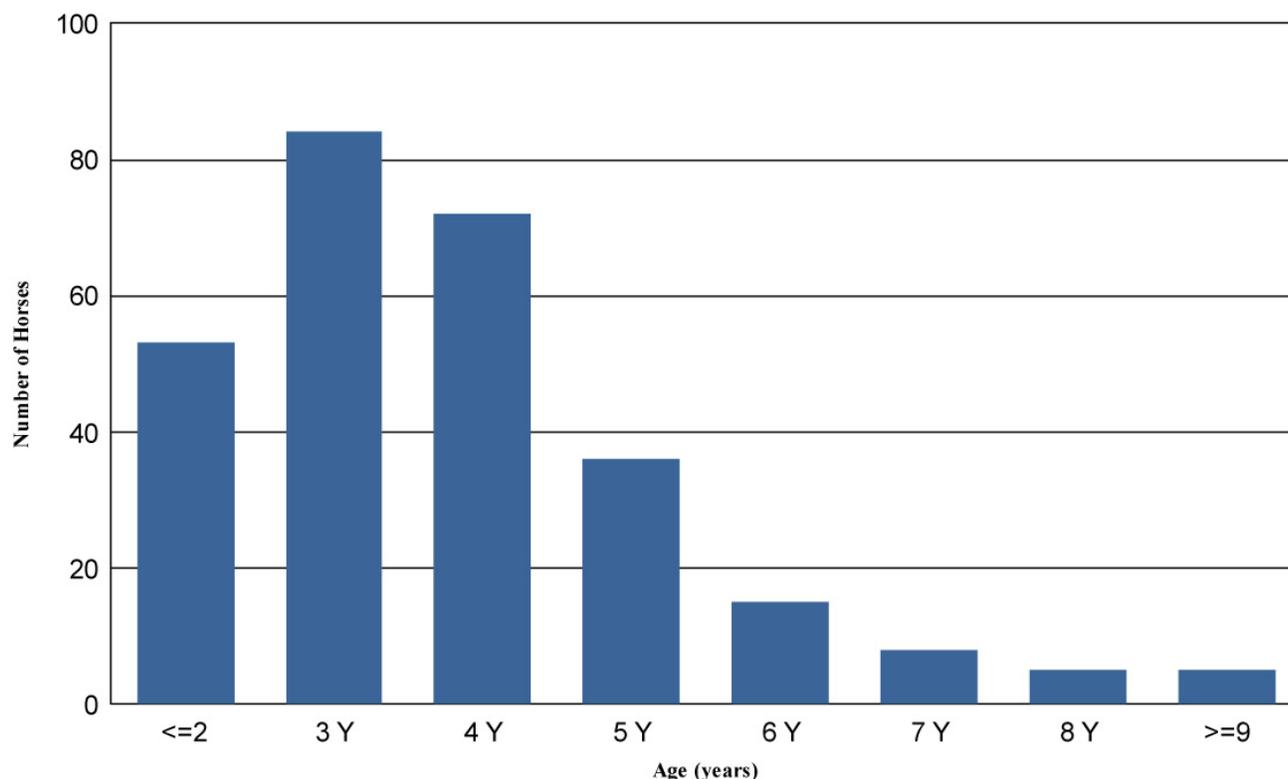
The largest proportion of submissions (>50.0 percent) were 3- or 4-year-old horses (Table 3). Only

19 percent of all racehorses submitted were 2 years of age 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
Arabian	0	0	1	0	0	0	0	0	1
Undetermined	0	0	0	0	1	0	0	0	1
Quarter Horse	17	14	9	3	1	1	0	1	46
Standardbred	2	1	1	0	1	0	2	0	7
Thoroughbred	34	69	61	33	12	7	3	4	223
Total	53	84	72	36	15	8	5	5	278

Figure 3. Number of Horses Examined by Age



SUBMISSIONS

Submissions By Gender

The gender distribution of the horses submitted during 2011-12 is shown in Table 4 below. Males represented 65.1 percent of the total group with 29.8 percent of males being intact (stallions) and 70.2 percent geldings. Females comprised 34.8 percent of the group. The amount of injuries during training increased comparatively to racing when compared to the year before.

Table 4. Distribution of Horses by Gender and Category

Gender	Non-Exercise	Racing	Training	Total
Female	24	29	44	97
Male	13	16	25	54
Gelding	34	52	41	127
Total	71	97	110	278

Injuries

As mentioned earlier, 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, 75.2 percent, occurred during racing and training in 2-, 3- and 4-year-old racehorses (Table 5). The age of the horses submitted for non-exercise related fatalities was concentrated between 2 and 4 years of age.

Table 5. Category of Injury/Fatality by Age

Category/Age	<=2	3	4	5	6	7	8	>=9	Total
Non-Exercise	21	18	11	7	6	2	3	3	71
Racing	8	26	34	17	6	3	2	1	97
Training	24	40	27	12	3	3	0	1	110
Total	53	84	72	36	15	8	5	5	278



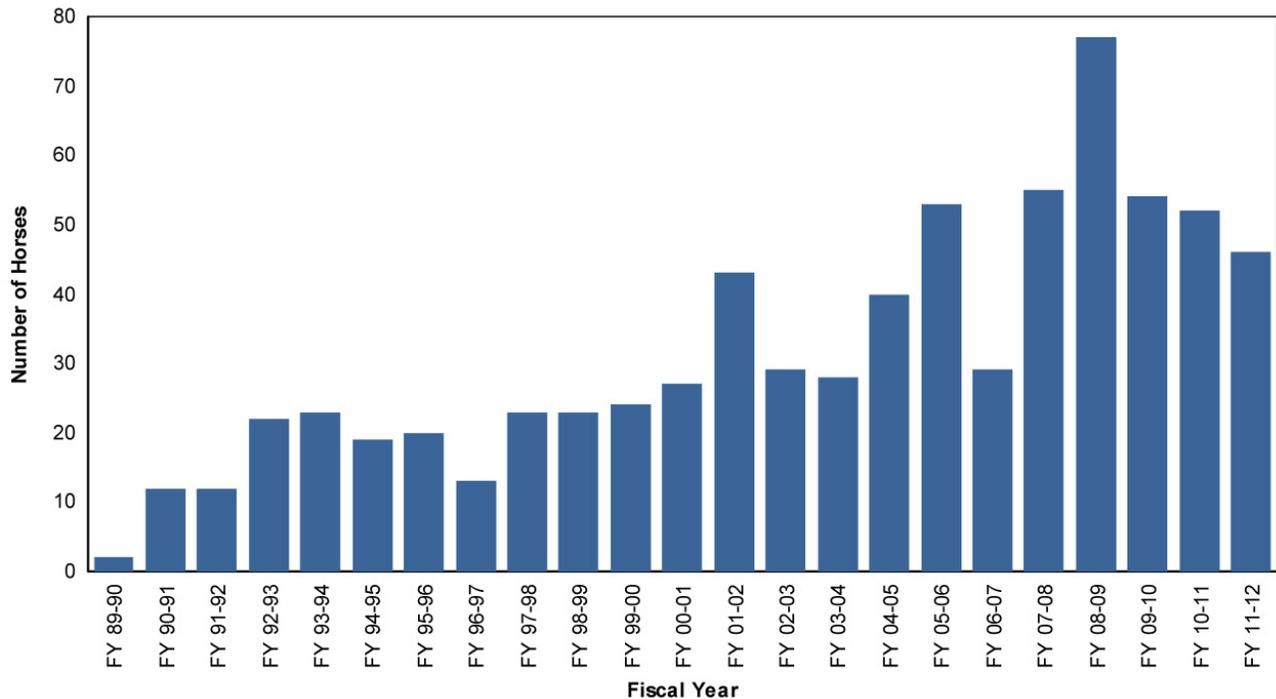
INJURIES

During this fiscal year Thoroughbred horses suffered many more training (47 percent) than racing (33.2 percent) catastrophic injuries (Table 6). This is a variation from the year before when nearly equal proportions of racing and training catastrophic injuries were observed. Typical of previous years, Quarter Horses infrequently suffered a catastrophic injury during a training session. Quarter Horse submissions during 2011-12 were lower than the previous year, but they were still higher than the historical average submission for this breed. Figure 4 shows the historical number of Quarter Horses submitted to the program since its inception.

Table 6. Category of Injury/Fatality by Breed

Injury Class by Breed	Non-Exercise	Racing	Training	Total
Arabian	0	1	0	1
Undetermined	2	0	0	2
Quarter Horse	19	22	5	46
Standardbred	6	0	0	6
Thoroughbred	44	74	105	223
Total	71	97	110	278

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



INJURIES • continued

In 2011-12, 74.1 percent of the total primary injuries or conditions in all breeds were due to musculoskeletal problems (Table 7). Of this group, 74.5 percent of injuries affected the front or rear legs (Table 8). The injuries listed in these tables represent the primary injury to the horse.

For this report, 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

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 7. Organ Systems Affected

Breed	CV	GI	MS	Nerv	Resp	Skin	Uro	WB	Total
Arabian	0	0	1	0	0	0	0	0	1
Undetermined	0	1	0	0	0	0	0	0	1
Quarter Horse	2	4	31	0	4	0	0	5	46
Standardbred	1	1	2	2	0	1	0	0	7
Thoroughbred	12	10	170	5	8	3	1	14	223
Total	15	16	204	7	12	4	1	19	278

(CV=Cardiovascular; GI=Gastrointestinal system; MS=Musculoskeletal; Nerv=Nervous system; Resp=Respiratory system; Skin=Integumentary system; Uro=Urogenital/Reproductive; WB=Whole body).

Table 8 compares limb-specific catastrophic injuries. The number of front limb injuries sustained during racing was very similar to those injuries sustained during training. There were nearly equal

numbers of right and left front limb injuries as well as similar numbers of right and left rear limb injuries. Table 9 lists the specific type of musculoskeletal injuries by breed.

Table 8. Musculoskeletal Area Affected

Limb Affected	Non-Exercise	Racing	Training	Total
Left Front	0	47	45	92
Left Rear	1	3	10	14
Right Front	1	46	44	91
Right Rear	0	8	2	10
Pelvis	1	4	5	10
Skull	6	0	1	7
Vertebra	0	8	1	9
Other Structures	16	5	5	26
Total	25	121	113	259



INJURIES • continued

Table 9. Musculoskeletal Injury type by Breed

Finding	Arabian	Quarter Horse	Standard- bred	Thorough- bred	Total
Arthritis	0	8	0	0	8
Carpal Fracture – Left	0	0	0	5	5
Carpal Fracture – Right	0	1	0	6	7
Cervical Vertebra Fracture	0	0	0	1	1
Degenerative Joint Disease	0	0	0	1	1
Diaphragmatic Hernia	0	0	0	1	1
Distal Sesamoidean Ligament Rupture	0	0	0	1	1
Fedlock Joint Luxation – Left Front	0	1	0	3	4
Fetlock Joint Luxation – Right Front	0	0	0	3	3
Fibula Fracture – Left	0	0	0	1	1
Fibula Fracture – Right	0	0	0	1	1
Humerus Fracture – Left	0	0	0	9	9
Humerus Fracture – Right	0	2	0	11	13
Joint Disarticulation	0	1	0	1	2
Laminitis	0	4	0	4	8
Lateral Proximal Sesamoid Fracture – Left Front	0	0	0	1	1
Lateral Proximal Sesamoid Fracture – Left Rear	0	0	0	1	1
Lateral Proximal Sesamoid Fracture – Right Front	0	0	0	3	3
Lateral Proximal Sesamoid Fracture – Right Rear	0	0	0	1	1
Medial Proximal Sesamoid Fracture – Left Front	0	0	0	6	6
Medial Proximal Sesamoid Fracture – Right Front	0	2	0	9	11
Medial Proximal Sesamoid Fracture – Left Rear	0	0	0	3	3
Metacarpus II Fracture – Left	0	0	0	2	2
Metacarpus II Fracture – Right	0	0	0	1	1
Metacarpus III Fracture – Left	0	0	0	16	16
Metacarpus III Fracture – Right	0	2	0	16	18
Metacarpus IV Fracture – Left	0	0	0	1	1
Metatarsus III Fracture – left	0	0	0	3	3
Metatarsus III Fracture – Right	0	0	0	2	2
P1 Fracture – Left Front	0	0	0	7	7
P1 Fracture – Left Rear	0	0	0	5	5

Table 9 continues on next page



INJURIES • continued

Table 9. Musculoskeletal Injuries by Breed (continued)

Finding	Pony	Quarter Horse	Standard-bred	Thoroughbred	Total
P1 Fracture – Right Front	0	0	0	4	4
P1 Fracture – Right Rear	0	0	0	2	2
Pastern Joint Luxation – Right Front	0	2	0	0	2
Pelvis Fracture	0	1	1	8	10
Radius Fracture – Left	0	1	0	1	2
Radius Fracture – Right	0	1	0	0	1
Scapula Fracture – Left	0	0	0	2	2
Scapula Fracture – Right	0	1	0	4	5
Sesamoid Fracture, Biaxial – Left Front	0	5	0	28	33
Sesamoid Fracture, Biaxial – Right Front	1	1	0	19	21
Sesamoid Fracture, Biaxial – Right Rear	0	0	0	1	1
Skull Fracture	0	1	0	6	7
Suspensory Apparatus Failure – Left Front	0	0	0	3	3
Suspensory Apparatus Failure – Right Front	0	0	0	1	1
Suspensory Desmitis	0	0	0	1	1
Suspensory Ligament Rupture	0	0	0	2	2
Tarsus Fracture – Right	0	2	0	0	2
Tendon Injury	0	1	0	1	1
Tibia Fracture – Left	0	0	1	1	2
Tibia Fracture – Right	0	0	0	3	3
Vertebra Fracture	0	3	0	5	8
Total	1	40	2	216	259



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. The data shows that for the current fiscal year the absolute number of injuries on dirt surfaces was slightly 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

Limb	Dirt	N/A	Synthetic	Turf	Total
Left Front	49	0	32	11	92
Left Rear	1	1	11	1	14
Right Front	50	0	31	10	91
Right Rear	6	0	4	0	10
Pelvis	5	1	2	2	10
Skull	1	6	0	0	7
Vertebra	5	0	2	2	9
Other Structures	8	15	3	0	26
Total	125	23	85	26	259

Human Injury

During the fiscal year 2011-2012, there were 21 human injuries related to catastrophic horse breakdowns. This represents 7.6 percent of the 278 horses submitted to the CAHFS lab during this year. Although human injuries have been reported to CAHFS over the past few years, these numbers have not been analyzed before.

Other Organ Systems Affected by Injuries

Cardiovascular:

During this period there were 11 cases of sudden death due to cardiac failure. This represents an increase from four horses with this diagnosis during 2008-2009 and six with the same diagnosis in 2010-2011.

Diagnosis	Total
Cardiac failure	11
Cecal infarction	2
Major vessel rupture	2
Exsanguination	1
Total	16



Integumentary (Skin):

Only four diagnoses of diseases of the skin were made on horses submitted to CAHFS during 2011-2012. 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	3
Subcutaneous hemorrhage	1
Total	4

Gastrointestinal:

Of the digestive system diagnoses, colitis and intestinal displacements were the most frequently observed findings. Most cases of enterocolitis were due to infection with *Clostridium difficile* or *Clostridium perfringens*.

Diagnosis	Total
Enterocolitis	12
Intestinal displacement	5
Intestinal hernia	1
Perforated ulcer	1
Upper digestive disease	1
Total	20

Respiratory:

There were slightly more cases of respiratory diseases identified in 2011-2012 than had been seen in previous years. By far the main cause for pleuropneumonia was bacterial and within this, *Streptococcus zooepidemicus* was the most prevalent etiology. Other less represented etiologies included *Actinobacillus equuli* and *Actinomyces pyogenes*.

Diagnosis	Total
Pleuropneumonia	13
Pleuritis	4
Exercise-induced pulmonary hemorrhage	2
Pulmonary edema	2
Total	21



INJURIES • continued

Nervous System:

Horses with neurological disorders were identified infrequently during 2011-2012. There were two cases of Equine degenerative myelopathy and two cases of Equine Protozoal Myelitis, caused by the protozoal parasite *Sarcocystis neurona* (same number as the year before). Head and spinal cord injury were also diagnosed.

Diagnosis	Total
Equine degenerative myelopathy	2
Equine Protozoal Myelitis	2
Head injury	2
Spinal cord injury	1
Total	7

Whole Body:

The number of unexplained sudden deaths in horses was higher during this reporting period than the previous year. In none of these cases a definite cause of death could be determined. Five horses succumbed to systemic bacterial or fungal infections, and a small number of horses had miscellaneous diagnoses.

Diagnosis	Total
Unexplained sudden death	12
Septicemia	5
Anaphylaxis	2
Endotoxemia	2
Metastatic neoplasm	1
Total	22

Urogenital System:

Only one diagnosis of urinary disease (urolithiasis) was made.

Diagnosis	Total
Urolithiasis	1
Total	1

RESEARCH SUPPORT

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- Researchers**
- | | |
|--------------------|-------------------|
| Mark Anderson | Akinyi Nyaoke |
| Bradd Barr | Sarah Puchalski |
| Patricia Blanchard | Deryck Read |
| Vanessa Dahl | Guillermo Rimoldi |
| Alfonso de la Mora | Sara Sammons |
| David Fyhrie | Tiffany Sarrafian |
| Patricia Fyhrie | Jacob Setterbo |
| Tanya Garcia | Farshid Shahriar |
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| Feredico Giannitti | Jennifer Symons |
| Dave Hawkins | Francisco Uzal |
| Mont Hubbard | Leslie Woods |
| Hailu Kinde | |
| Janet Moore | |





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

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

School of Veterinary Medicine
University of California, Davis
West Health Sciences Drive
Davis, California 95616

