VETERINARY MEDICAL DIAGNOSTIC PROGRAM

JANUARY 2006 TO DECECMBER 2006

Supported by the

Oklahoma Horse Racing Commission

Conducted by the

Oklahoma Animal Disease Diagnostic Laboratory

Center for Veterinary Health Sciences

Stillwater, OK

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Veterinary Medical Diagnostic Program

Supported by: **The Oklahoma Horse Racing Commission (OHRC)**

Conducted by: **The Oklahoma Animal Disease Diagnostic Laboratory (OADDL)**
Center for Veterinary Health Sciences
Oklahoma State University

Reporting Period: **January 2006 through December 2006**

Introduction

This report summarizes the case submissions and diagnostic findings of the Veterinary Medical Diagnostic Program for the period starting January 1, 2006 and ending December 31, 2006.

The Veterinary Medical Diagnostic Program, initiated in 1997, serves to: 1) investigate and document the types of injuries sustained by horses involved in horse racing and in race training related activities on racetracks that fall under OHRC jurisdiction; 2) monitor this population of migrating horses for the presence of any epizootic disease(s) that may pose a threat to Oklahoma's horse industry; and 3) evaluate the overall effects of all other aspects (including diet and stress) of racing and race training on the health and well being of Oklahoma's racehorses. This program is the result of an alliance formed between the Oklahoma Horse Racing Commission (OHRC) and the Oklahoma Animal Disease Diagnostic Laboratory (OADDL).

All horses that die or must be humanely euthanized on any of the four Oklahoma racetracks that fall under the OHRC jurisdiction are submitted to OADDL for a comprehensive necropsy examination. Results are reported to the OHRC office in Oklahoma City with a copy sent to the Official Veterinarian at the submitting racetrack. The necropsy examination includes: 1) a complete necropsy and gross examination of the carcass including microscopic examination of tissues (histopathology) if necessary; 2) a thorough examination of all injuries, including an analysis of pre-existing conditions that may have led to the occurrence of the injury; 3) microbiology testing in cases where infectious diseases are suspect; and 4) toxicology testing as indicated by necropsy findings or as requested by the OHRC.

For the calendar year 2006, a total of seventy-three (73) horses were submitted to OADDL under the Veterinary Medical Diagnostic Program. Fifteen (15) animals were found dead and fifty-eight (58) animals were humanely destroyed, see Table 1. A summary of OADDL's necropsy findings follow:

Table 1: Total Equine Mortality - 2006

	Total	RP	BRD	FMT	WRD
Died	15	3	9	1	2
Euthanized	58	30	10	10	8

*RP=Remington Park; BRD=Blue Ribbon Downs; FMT=Fair Meadows-Tulsa; WRD=Will Rogers Downs.

Submissions:

A total of seventy-three (73) horses from Oklahoma racetracks were submitted to OADDL for examination during the 2006 calendar year. This number reflects an increase of twenty (20) animals from 2005, see Table 2. The increase in fatalities may reflect the overall growth experienced in the racing industry in Oklahoma, amplified by increased purse structures, regulation changes, more races, more racing days and more entries. In addition, Will Rogers Downs was added to the OHRC jurisdiction in 2005.

Table 2: Total Submissions – 2003-06

	2003	2004	2005	2006
Necropsy Submissions	35	41	53	73

Monthly Distribution of Submission:

Table 3 represents the distribution of submissions from each racetrack, sorted by month. One animal was injured during a race at Blue Ribbon Downs (BRD) and euthanized at Will Rogers Downs (WRD). The monthly distribution reflects increases associated with more racing days and training activity. There was again a peak in September and October associated with the successful and expanding role of the Fall Race Meet at Remington Park. The majority of the submissions continue to occur during late spring and summer. This may reflect the majority of race starts for the year. When comparing injuries by racetrack, one needs to take into account the number of race days, number of races and the number of entrants per race. Breed, age and whether the animal resides on the racetrack grounds are additional variables at this time. Ship-in horses that suffer catastrophic injury while racing or training are included in these surveys but do not reside on grounds under OHRC jurisdiction.

Table 3: Monthly Distribution of Case Submissions for 2006

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
RP			2	4	2	1		2	10	7	5		33
BRD	1				1	1	1	4	4	4	2		18
FMT						4	7						11
WRD	1	1	5	1	3								11
Totals	2	1	7	5	6	6	8	6	14	11	7	0	73

Breed of Horse:

Table 4: Breed of Horse

BREED	Number of Horses
Paint	4
Quarter Horse	23
Thoroughbred	46

Table 4 shows the submissions by horse breed. During this reporting period, Thoroughbred submissions were nearly twice the number of Quarter Horse submissions, similar to 2005. There were no Appaloosa fatalities reported or submitted. Previous studies have reported increased Thoroughbred fatalities and this may reflect differences in training, race distance and gait. This information should be assimilated with known residence numbers, reported race results and training history for an accurate analysis. There may be increased numbers of races for Thoroughbreds, improved purses for Thoroughbred races and increased numbers of Thoroughbreds raised, trained and raced in Oklahoma.

Age of Horse:

Table 5: Distribution of Age of Horse by Track

Age (Year)	Total	RM	BRD	FMT	WRD
2	**21**	11	7	3	0
3	**22**	12	3	3	4
4	**11**	4	4	2	1
5	**11**	4	4	1	2
6	**1**	0	0	0	1
7	**4**	0	2	2	0
8	**2**	1	0	0	1
>9	**1**	0	0	0	1

The distribution of racehorse submissions arranged by age during 2006 is shown in Table 5. Case controlled studies have suggested increasing age as a risk factor for catastrophic injury in racehorses. Our Oklahoma data continue to indicate larger numbers of 2-3 year old animals in total mortality. There may be more animals of the two- and three-year old age group in active training and racing in Oklahoma, and thus are at risk in the population. For the Quarter Horse breed, there were 44% (10/23) two year olds submitted; and for Thoroughbreds, there were 37% (17/46) three year olds submitted. Both reflect the single largest submission for each age group. All four Paint horses submitted were two year olds. Comparison to individual track records of animals in residence, age demographics for race starts and number of races should be considered for accurate interpretation. Numbers of four- and five-year old horses from previous years' analysis remained stable with a slight increase in seven year old animals noted. This may represent increased races available for these animals. The one older animal submitted was a 26 year old pony horse that died on grounds at Will Rogers Downs.

Fatality Groups by Age:

Table 6: Fatality Event by Age of Horse

Age (Year)	Racing	Training	Non-exercise	Accident
2	15	2	4	0
3	12	5	4	1
4	8	0	2	1
5	8	1	2	0
6	1	0	0	0
7	3	0	1	0
8	1	0	0	1
>9	0	0	1	0
Totals	48	8	13	4

Table 6 illustrates the distribution of the fatal event (determined by history and necropsy) as compared to age of the horse. The categories included are animals injured during racing, routine training, and accidents as well as those dying of non-exercise or "natural" disease conditions. There were increased numbers of animals present in age groups 2-5 years in both racing fatalities and non-exercise related fatalities. This age group may represent a larger proportion of animals residing and competing at Oklahoma race tracks (see above section on age). Management changes and exposure to other animals (congregation) can predispose or expose animals to natural disease states (non-exercise) such as metabolic conditions (colic, laminitis) and infectious disease (pneumonia, enteritis). Younger animals are also developing muscle, tendon and bone while beginning athletic training for racing. Athletic training and acclimation to the training barn and training regimen will remain risk factors for young animals. Continued vigilance by all racing authorities, regulatory veterinarians, practicing veterinarians, trainers and owners is necessary to safeguard the younger equine population; however, some of these cases will remain unpreventable. The "accident" category was included in the 2006 summary and represents unpreventable accidents associated with large animal husbandry. The majority of this year's cases were animals that escaped containment and injured themselves in a panic situation. The USDA National Animal Health Monitoring System data from 2005 reported a nationwide risk of death of 1.8% for equine animals greater than 6 months of age. For the ages 6 months to 5 years of age, the leading causes of fatality were injury/trauma (16.3%) and colic (15.2%).

Interestingly, Table 6 reveals very few training injuries again in 2006. Other studies have shown almost equal numbers of catastrophic injuries during training and racing in Thoroughbred horses. Theories for increased incidence in Thoroughbreds center on the training regimen for these horses. The training emphasizes longer work at race speed than used for Quarter Horses (sprinters). Since this report has a higher proportion of Thoroughbred to Quarter Horse submissions, it is unusual that so few training injuries were seen. The 2006 summary reports fewer training injuries than the 2005 reporting period which had ten (10). In Oklahoma jurisdictions, most animals injured during training may not be resident at an OHRC sanctioned track and thus, not be submitted for examination under our current program. Likewise, animals injured during training that are transported for therapy or evaluation would not be submitted to the OADDL for examination.

GOAL 1: INVESTIGATE AND DOCUMENT TYPES OF INJURIES:

Distribution of Fatal Activity and Track Location:

Table 7: Fatal Activity by Track

Racetrack	Racing	Training	Non-exercise	Accident	Totals
REM	25	5	2	1	33
BRD	7	1	10	1	19
FMT	11	0	0	0	11
WRD	5	2	1	2	10
TOTAL	**48**	**8**	**13**	**4**	**73**

Table 7 represents the distribution of fatal activity stratified by submitting racetrack. As noted above, there are very few training fatalities submitted under the current protocol. This may represent a bias in submission of samples, as some training and non-exercise deaths do not occur under OHRC jurisdiction. The increased number of fatalities experienced during racing events at both Remington Park and Fair Meadows do not necessarily represent track surface issues or management. Remington Park, Oklahoma's premier facility, has more race days, more races, more entries and more horses in residence than the other three tracks. A larger population at risk would be associated with a higher number of fatalities. Fair Meadows does not have a significant training element and has very few horses in residence for race meets; therefore, all of the fatalities reported from that facility were race associated. To further clarify the appropriate injuries, this year in 2006 we have chosen to also differentiate fatal activity as represented in Table 8.

Table 8: Cause of Death Determined at Necropsy

	TOTAL	RP	BRD	FMT	WRD
Natural Disease:	**13**	**2**	**10**	**0**	**1**
Pulmonary Hemorrhage:	**4**	**2**	**0**	**1**	**1**
Musculoskeletal	**56**	**29**	**9**	**10**	**8**
Disorders:					
1. Racing	44	23	7	10	4
2. Training	8	5	1	0	2
3. Accident	4	1	1	0	2

The majority of "injuries" sustained by athletic horses affect the musculoskeletal system. By segregating the 2006 cases by natural disease state, pulmonary hemorrhage and musculoskeletal disorders, a more representative portrait of injuries sustained during racing and training is possible. This method of separating racetrack injuries has been used in most other jurisdictions world-wide. By this means of segregation, it is possible to assess the Catastrophic Musculoskeletal Injury Index (CMI) utilized to evaluate over-all incidence of injury.

Exercise Induced Pulmonary Hemorrhage:

Exercise induced pulmonary hemorrhage (EIPH), or "bleeders" in the horse remains an enigma affecting racehorses and other equine athletes. This condition has been reported since early history in the horse and research efforts remain directed at the underlying pathophysiology, treatment and management of this condition. The condition is typically not reported as an "injury" in most jurisdictions since the majority of these cases are not fatal. Identification systems for "bleeders" are in place in Oklahoma. We at the OADDL are not familiar with all of the OHRC and individual track mechanisms that monitor these animals or their approved medication status. During 2006, four cases of acute pulmonary hemorrhage were submitted to OADDL for examination. These cases represent severe bleeding throughout the lung parenchyma resulting in death, not merely bleeding noted at the nostrils. Comparison of EIPH cases to race history or race record would be necessary for complete analysis. The animals were 2, 3, 6 and 7 years of age; with one Quarter Horse and three Thoroughbred animals submitted.

Musculoskeletal Injury:

As seen in Table 8, 76% (56/73) of the total fatalities were related to musculoskeletal disorders. It has been previously reported that the majority of musculoskeletal injuries sustained by horses racing in the United States involve the limbs. Continued monitoring of limb injuries is important to provide Commission Veterinarians, Track Veterinarians, Track Management and Groundskeepers information that ensures and improves a safe racing environment.

Musculoskeletal Disorder – Limb Injury during Race or Race Training:

Table 9: Primary Injured Limb by Track

Limb	Total	RP	BRD	FMT	WRD
Right Front	**19**	12	2	3	2
Left Front	**25**	12	3	7	3
Right Hind	**3**	2	1	0	0
Left Hind	**3**	1	1	0	1
Both Front**	**3**	3	0	0	0

Table 9 displays the distribution of limb injuries sustained by animals during racing or race training. Seven (7) cases submitted had multiple limbs injured; three of these cases involved bilateral forelimb injuries(**). In those cases, a decision was made by one of the two senior pathologists regarding a primary or principle first limb of injury. In 2006, slightly more injuries were sustained in the left front limb than the right front. These findings are similar to our 2004 annual report and opposite from the 2005 report. Most previous studies do indicate slightly increased incidence of left front limb injury over right front limb in the United States with counter-clockwise oval flat-track and turf courses. It is uniformly accepted that the front limbs, which bear the majority of a horses' weight, are more frequently injured than rear limbs in flat racing. There were two fracture cases that did not involve limbs in 2006, one skull fracture and one rib fracture case.

Musculoskeletal Disorder – All Racing or Race Training Injuries:

Surveys and research in other racing jurisdictions have reported increased injury frequency to the front limbs and identified injuries to the distal limbs (distal to the carpus) as the most common injury in the racing equine athlete. Table 10 below reports the anatomic site of injury for all musculoskeletal injury fatalities at Oklahoma race tracks for 2006.

Table 10: All Fatal Injuries during Racing or Race Training

Injury	Total	RP	BRD	FMT	WRD
Hoof/Pastern	**1**	0	0	1	0
Fetlock Failure:	**21**	12	0	6	3
Sesamoid Fracture	14	8	0	4	2
Suspensory Ligament	3	3	0	0	0
Condyle (P1/McIII)	7	4	0	2	1
Metacarpus/tarsus					
mid-shaft Fracture:	**6**	2	2	1	1
Tendon Laceration:	**2**	2	0	0	0
Carpal Failure:	**11**	8	1	1	1
C3	8	6	1	1	0
Radial CB	3	2	0	0	1
Humerus	**1**	0	0	0	1
Femur	**1**	0	0	0	1
Scapula	**5**	1	3	1	0
Ileum	**1**	0	1	0	0
Pelvis/Sacrum	**1**	1	0	0	0
Skull	**1**	0	1	0	0
Laceration/Rib Fracture	**1**	1	0	0	0
TOTAL	**52**				

In 2006 there were 58% (30/52) fatal musculoskeletal injuries documented affecting the region below the carpus. This agrees with previously published findings for race track injuries in the horse. The majority of injuries involved the fetlock joint, 40% (21/52). There were 6 (12%) complete fractures of the metacarpus (cannon) bone in 2006, reduced from 8 in 2005 and 9 in 2004. Eleven animals (21%) sustained primary injury to the carpal joint with single case fatalities also reported in a variety of other locations as depicted. Two animals were injured due to flexor tendon laceration in 2006. During the 2006 racing year there were 5 (9.6%) fractures of the scapula. Previous years report 2 scapular fractures in 2005 and 3 in 2004. In comparison to other published data, slightly more fractures of the scapula occur at Oklahoma race tracks. The reason for this is unclear, but there would be OADDL interest in looking further into this fact if additional funding becomes available. Gross examination and desiccation of these limbs has so far not identified pre-existing fracture lines.

In this years' report, an effort was made to look at the subset of anatomic structures injured for fetlock and carpal injuries. In many cases multiple structures fail depending

upon how quickly the animal can be eased or "pulled-up." In our first year of separating the data in this manner, evidence reveals that the proximal sesamoid bones are most frequently involved in fetlock joint failure. This is consistent with other reported work and similar to the 2005 OHRC report.

GOAL 2: MONITOR FOR EPIZOOTIC DISEASE:

In Table 8 from page 5 there were thirteen (18%) horses reported as fatalities due to natural disease states. These animals include cases of infectious or communicable disease of importance to all animals competing, training or residing in the racetrack environment. Table 11 below documents cases based on final necropsy analysis at OADDL.

Table 11: Natural Disease Death Occurrences 2006

Disease Condition	**Total**	**RM**	**BRD**	**FMT**	**WRD**
Respiratory:	**2**	**0**	**2**	**0**	**0**
Pleuropneumonia	1		1		
Pharyngitis/Upper Airway	1		1		
Gastrointestinal:	**9**	**2**	**6**	**0**	**1**
Colic/Endotoxemia	1	1			
SI - torsion	2		1		1
LI - impaction	2		2		
LI - torsion	2		2		
Intussusception	1		1		
Not Determined	1	1			
Laminitis	**1**		**1**		
CNS Disease	**1**		**1**		

The majority (69%) of natural disease fatalities during the 2006 reporting year were due to gastrointestinal disorders. This is similar to national data for the equine population as a whole (2005 USDA-NAHMS) and for equine athletes in any form of athletic or show training. There were two cases each of small intestine torsion, large intestine impaction and large intestine torsion in 2006. There were also single cases of an intussusception and endotoxemia. An intussusception is a telescoping of intestine sections into itself and seen in many species secondary to diarrhea or enteritis. Endotoxemia is a systemic illness state, generally associated with a primary gastrointestinal disturbance. These gastrointestinal disorders are fairly standard. Submission of samples from these cases to the microbiology section of OADDL did not reveal any Salmonella bacteria or potentially communicable organisms. The diagnosis in one case could not be determined due to severe post-mortem autolysis. This animal died at Blue Ribbon Downs during the summer when environmental temperatures were high and retrieving the carcass for examination was delayed.

The second largest category of natural disease states was respiratory disease (15%). Respiratory diseases including upper airway disease, lymphadenitis and pneumonia are highly prevalent in all populations of horses and increase in frequency when animals are

congregated or commingled, as seen at racetracks. Single cases of pleuropneumonia and upper airway infection were submitted during 2006. Tissues from these cases and a third animal (an EIPH animal) were submitted to the microbiology section. In the three cases Streptococcus equi bacteria were isolated, and reports were issued to both Commission and Track Veterinarians regarding the equine pathogen. Histopathology and virology analysis in these cases did not confirm viral disease. Finally, single cases of laminitis (founder) and central nervous system (CNS) disease were seen. Laminitis is a systemic disorder which displays itself in the laminar regions of the hoof wall and is the result of a variety of stressors. Many severe cases are eventually euthanized for humane reasons. The CNS case revealed no gross or microscopic evidence of degenerative, traumatic or inflammatory change in brain tissue supporting CNS disease. This animal had been previously euthanized, supplied history was incomplete and there was no diagnostic evidence to suggest nervous system involvement. No additional laboratory testing was undertaken in either of these cases.

The disease surveillance emphasis for the cooperative OADDL:OHRC program is vital to the Oklahoma racing industry. The outbreak of Equine Viral Arteritis (EVA) in the Southwestern United States during 2006 emphasized the importance of disease surveillance for general health of the equine population. There is bias in the current program, however, in that only necropsy examinations are being performed. If interest increases or funding becomes available for expanding the disease surveillance portion of this program to live animals, we at OADDL would be very interested in participation.

Drug Testing (TOXICOLOGY):

Since the initiation of the cooperative OADDL:OHRC Diagnostic Program, some toxicology analysis has been added, at the request of the OHRC. When possible, urine and synovial fluid are harvested from fatally injured equines that died during or immediately following an OHRC race. During 2006, thirty-seven (37) urine samples and thirty-three (33) synovial fluid samples were analyzed by mass spectrophotometry in the toxicology section of OADDL. One additional cerebral spinal fluid sample was analyzed by this method and a single brain sodium level test was also performed. The toxicology results were forwarded to both the Commission and Track Veterinarians upon completion. The toxicology results are summarized in table form below, Tables 12, 13 and 14.

Table 12: OHRC Urine – Mass Spectrophotometry

Substance Detected	Number of Animals	Comments
Phenylbutazone	37	NSAID

Pentobarbital	33	Detection indicates that barbiturates used to euthanize animals move extremely rapidly to synovial fluid as well as brain and major organs.
Phenytoin	23	Euthanasia drug
Oxyphenbutazone	18	Phenylbutazone derivative
Xylazine	4	Sedative
Ketamine	3	Sedative- assumed to be related to euthanasia.
4-hydroxyphenylbutazone	3	Sedative- assumed to be related to euthanasia.
Acetominophen	2	NSAID
Diphenylamine	1	Naturally occurring sulfoxide
Sulfadiazine	1	Antimicrobial
Trimethoprim	1	Antimicrobial
Flunixin	1	NSAID

Table 13: OHRC Joint Fluid – Mass Spectrophotometry

Substance Detected	Number of Animals	Comments
Pentobarbital	30	Detection indicates that barbiturates used to euthanize animals move extremely rapidly to synovial fluid as well as brain and major organs.
Phenylbutazone	25	NSAID
Phenytoin	22	Euthanasia drug
Ketamine	4	Sedative- assumed to be related to euthanasia.
Xylazine	2	Sedative
Phenobarbital	1	Euthanasia drug
Dimethylsulfone	1	Naturally occurring sulfoxide
Butylated hydroxytoluene	1	Preservative
Benzol alcohol	1	Preservative in oral/topical medications
Benzoic Acid	1	Preservative in oral/topical medications
4-hydroxyphenylbutazone	1	Phenylbutazone derivative
Codeine	1	Narcotic/opiate
Methylprednisolone	1	Glucocorticoid antiinflammatory steroid
Melatonin	1	Pituitary hormone, can be naturally ocurring
No Drugs detected	3	

Table 14: OHRC Additional Tests

Test Preformed	Number	Results
Mass Spectrophotometry of CSF	1	Positive for Pentobarbitol, Phenylbutazone, & Oxyphenbutazone
Brain Sodium	1	1,756 ppm Na+, inconculsive

Urine remains the most valuable and useful sample for toxicology analysis. In an attempt to obtain more urine samples, cooperation with both Commission and Track Veterinarians was improved during 2006. Veterinarians on-site could obtain urine for laboratory submission to OADDL if urine began leaking from the animal following death. This procedure is standard operation for the laboratory personnel who transport the animals to Stillwater for examination. The majority of compounds identified during 2006 were associated with euthanasia or common non-steroidal anti-inflammatory (NSAID) medications currently allowed under OHRC regulations. Some additional sedative agents and antimicrobials were also identified along with one synovial fluid sample with Codeine, one with Melatonin and one with Methylprednisolone. These results were forwarded to the Commission upon completion of the analysis.

Expanding the role of toxicology analysis under this program should be an important topic to consider in 2007. The toxicology section of OADDL is currently limited to mass spectrophotometry for analytical analysis of samples. The identification of steroidal anti-inflammatory agents which cannot be identified by mass spectophotometry may be of particular interest. This type of drug testing is important to human, equine and canine athletic regulatory commissions and commercially available tests are under research. These tests are costly and have a relatively short "shelf-life" or stability. If additional funds are available to expand the scope of toxicology testing, we at OADDL would be interested in participating.

GOAL 3: OVERALL RACEHORSE HEALTH:

As we begin our tenth year of cooperation in the OHRC:OADDL Diagnostic Program, we at the OADDL remain excited about the future. We continually look for ways to apply the information to the overall health and well being of the Oklahoma racehorse population. Of particular interest to the two senior pathologists in this program is the hoof anatomy/morphology/angle and shoeing characteristics of the equine population. Table 15 displays the hoof/shoeing data compiled during the 2006 time period.

Hoof Anatomy/Shoe Characteristics:

Table 15: Hoof Anatomy and Horse Shoe Characteristics

	TOTAL	RP	BRD	FMT	WRD
Not Performed	**18**	6	4	2	6
Long Toe/Long Heel	**23**	13	5	3	2
Regular (Long) Toe Grabs	**21**	7	8	5	1
Short (low) Toe Grabs:	**18**	10	2	4	2
Hind Feet Only	**8**	8	0	0	0
Flat Shoe/Racing Plate	**7**	2	4	0	1

The data in Table 15 remains preliminary with 18 animals not examined and one barefooted (i.e. no shoes) pony horse. Given a sample size of 54 animals, however, almost one-half (23/54) have a long-toe/low-heel anatomy or hoof trim angle. This pattern of hoof was favored for some time in racing, but has been shown to place increased strain and wear on the flexor surfaces. Shoes with long toe grabs (greater than 0.5cm) have also been associated with similar flexor surface strains. Both of these findings were cited as associated with catastrophic musculoskeletal disorders in racehorses in a paper funded by this cooperative OADDL:OHRC program (Balch, O.K., et.al. in AAEP Proceedings, Vol 47, 2001, pp 334-338). The impact of small (rim) toe grabs and toe grabs on hind limbs have not been thoroughly evaluated at this time, and may serve a purpose in some racing situations. Persistent vigilance and education regarding the impact that hoof anatomy/angle and shoe selection have on Oklahoma equine athletes remains a priority for all racing personnel.

Gastric Ulcers:

Table 16: Prevalence of Gastric Ulcers

	TOTAL	RP	BRD	FMT	WRD
Gastric Ulcers:					
None	**31**	12	9	5	5
Mild	**19**	7	4	6	2
Moderate	**6**	2	2	0	2
Severe	**7**	4	2	0	1
Not Reported	**10**	7	3	0	0

Gastric ulceration has been increasingly identified over the last twenty years as a serious disease condition affecting equine athletes. Indeed, stalled animals involved in a variety of training situations can be affected by significant gastric ulceration – regardless of activity and diet. We are fortunate at the Center for Veterinary Health Sciences, Oklahoma State University to have researchers involved in the identification, treatment and pathogenesis of equine gastric ulcers. Monitoring of gastric ulcers continues to be a component of the OHRC:OADDL Diagnostic Program. Table 16 presents the data compiled during 2006 regarding gastric ulceration in the Oklahoma racehorse diagnostic program. There were ten (10) cases submitted that did not have specific necropsy data collected regarding gastric ulcers. Of the 63 animals with gastric lesions reported, almost one-half (31/63) had no grossly

detected ulcers present. The majority of these horses were young animals or animals new to race training based on other physical findings. Research has shown that gastric ulcers take time to develop when animals are placed in a stall environment and exposed to training. Of the remaining animals with ulcers, the majority (25/32) had only mild or moderate gastric ulceration. These findings suggest that trainers, owners and veterinarians recognize the importance of gastric ulcers in the horse. It is not known how many of these animals were being medically treated for ulcers; however, the data suggest some were.

Fatal Injury and Track Location:

Table 17: Race Fatality by Track Location

	TOTAL	RP	BRD	FMT	WRD
Not Reported	**7**	3	1	2	1
Finished Race	**9**	4	3	1	1
"At Finish"	**8**	5	1	2	0
Far Turn	**7**	5	2	0	0
1/8th pole-past finish	**6**	2	0	4	0
1/16th pole	**3**	2	1	0	0

The analysis of location on a racetrack where a catastrophic injury occurs to a racehorse has been utilized by several racing jurisdictions to improve overall safety for equine competitors. This data is compiled as part of the cooperative OADDL:OHRC diagnostic program but is also reliant upon submission of this data from Commission/Track personnel. The 2006 data for track location is included in this report as Table 17. Seven (7) cases involved animals euthanized following a race for which this information was not supplied by OHRC or the individual tracks. In addition, the specific location on the track was supplied by handwritten notation by the submitting commission or track veterinarian. The above data is preliminary with eight (8) additional "locations" obtained in writing representing single sites of occurrence. Presented above are only sites for which track location was described on more than one occasion, in exactly the same manner. In addition, these are only race day fatalities (training accident locations excluded) with the EIPH (pulmonary hemorrhage) cases included. Improved reporting and standardizing of track location terminology by both Commission and Track personnel could improve the usefulness of this data in the future. Since the EIPH horses are included in this data table, the majority of track location fatalities are "at the finish" or "finished race." This location is also common for many Quarter Horse (sprint) races. Of current interest to the Commission and Fair Meadows authorities may be the identification of 64% (7/11) race day fatalities near or around the finish line.

Race Fatality and Class of Race:

Table 18: Race Fatality by Class of Race

	TOTAL	RP	BRD	FMT	WRD
Race Fatality	**44**	23	7	10	4
Accredited OK Bred	**19**	9	1	7	2
Maiden Race	**11**	7	2	2	0
Maiden Claim Race	**12**	7	3	1	1
Claiming Race	**12**	5	3	3	1
Stakes Race	**3**	2	0	1	0
Allowance Race	**2**	0	0	1	1
Futurity Trial	**2**	2	0	0	0

At OADDL we continue to look for new ways to utilize the data from this program for the benefit of Oklahoma racing and horsemen. This year we began incorporating OHRC statistics and animal race records into our diagnostic program material. This process is time-consuming and the data is very preliminary at this point. Table 18 demonstrates the class of race in which an animal was entered at the time of a catastrophic injury. EIPH animals are excluded in this case. Also, at the time of this report, race records were not available for two cases. It may be of interest to the Commission that almost one-half of the race day fatality cases (19/44) were enrolled in the Accredited Oklahoma Bred racing program. Thirty-five race day fatalities, or 83% (35/42), occurred in Maiden or Claiming races. This information verifies work in other jurisdictions. Maiden races many times consist of animals fairly new to racing or animals competing after a significant "lay-off" period. These animals would be at greater risk of injury for the same reasons young animals in their first exposure to a racing environment are at increased risk. The increased numbers of animals injured in Claiming races may be due to a variety of issues and has been noted in other jurisdictions. Of note is that only seven (17%) race fatalities were reported in Stakes, Allowance and Futurity races during 2006. This reinforces the fact that Oklahoma racetracks are a very safe environment for competition by the elite equine athletes. Another factor is the probability that some of the higher quality equine athletes received medical intervention. Five private equine surgical hospitals in the Oklahoma City area treat injured animals with state-of-the-art facilities. Similar facilities are also located close to the Tulsa and Sallisaw racetrack environments.

In addition, we are trying to look at race fatality with respect to distance of race. If this type of information is useful and informative to the OHRC and Track Authorities we will continue to expand its application. Further cooperation between OADDL and both the OHRC and individual track entities would facilitate this effort.

Chronic Musculoskeletal Lesions:

Complete identification of pre-existing or chronic changes in the musculoskeletal system continues to be documented in the OADDL:OHRC diagnostic program. This analysis was completed on 46 of the 56 musculoskeletal disorder cases during 2006. The injuries included race fatalities, training injury fatalities and animals injured in accidents. Table 19 reports the findings of chronic lesions in various locations identified in 2006.

Table 19: Chronic Lesions Documented at Necropsy

	TOTAL	RP	BRD	FMT	WRD
No Limb Exam	**10**	2	4	1	3
OCD	**6**	6	0	0	0
Fetlock:					
Osselets	**23**	12	5	4	2
Cartilage Wear	**5**	3	1	0	1
Chip Fractures	**1**	1	0	0	0
Sesamoid Abnormality	**2**	2	0	0	0
Cannon:					
Bucked Shins	**7**	4	1	1	1
Splints	**4**	3	1	0	0
Chronic Tendon/Ligament	**2**	2	0	0	0
Carpus:	**17**	10	1	6	0
Carpal Exostosis:	**5**	4	0	1	0
Radial CB	**14**	8	1	5	0
Intermediate CB	**7**	4	1	2	0
Radius Exostosis:	**5**	3	1	1	0
Chronic Lesion Ipsilateral	**12**	6	2	3	1
Chronic Lesion Contralateral	**17**	9	2	6	0

The pre-existing or chronic lesions noted in animals with musculoskeletal injuries are similar to those reported for many equines in athletic and race training. Dorsal fetlock arthrosis or "osselets" were the most frequently identified pre-existing condition. These are very common in race training and generally considered a normal event. Table 19 is used as an identifier in this 2006 report. Some animals had chronic lesions in more than one limb so numerical interpretation or percent of animals affected is not possible. More significant fetlock cartilage wear was noted in five limbs with a chip fracture, and an irregular previous proximal sesamoid fracture was noted in one limb each. Cannon bone lesions included seven "bucked shins," common in younger animals in early race training and four limbs with splint formation in the MCII/MTII or IV bones. These later splints are considered a "blemish" by many horsemen and can also be associated with poor conformation. Chronic changes in the carpal bones were present in seventeen animals. Again, some change and remodeling of bone is necessary and expected in animals undergoing rigorous training and racing. The radial carpal bone was most frequently noted and is consistent with other reports. Two limbs had evidence of chronic tendon or ligament thickening, and six limbs had evidence of osteochondritis dessicans (OCD),

which is considered a developmental orthopedic disease of the equine species. A majority of pre-existing lesions were present in the contralateral limb to the primary limb of injury, a finding also supported by previous studies. These chronic and pre-existing lesions were documented and reported to the OHRC and Track at the completion of each case.

SUMMARY:

Conclusions from the 2006 year end report indicate that Oklahoma racetracks remain an active and safe environment for equine athletes. From public data available regarding OHRC statistics for 2006, there were 264 racing days available. During that time period, there were 44 race day musculoskeletal fatalities for an incidence of 167 fatalities per 1000 race days – see Table 20. By comparison, other jurisdictions have reported incidence rates of 1.1 (NY), 1.8 (IL), 1.7 (CA), and 1.4 (KY) catastrophic musculoskeletal injuries (CMI) per 1000 STARTS (AAEP 1997). Assuming a minimum of 100 starters per race day in Oklahoma, or 26,400 starts – Oklahoma in 2006 would have a 1.67 CMI per 1000 starts. With improved access to OHRC data, these findings could potentially be substantiated even more.

Table 20: Number of Musculoskeletal Fatalities per Number of Race Days

	TOTAL	**RP**	**BRD**	**FMT**	**WRD**
Race Fatalities	**44**	23	7	10	4
Number of Race Days	**264**	118	71	33	44
Fatality per Race Day	**0.167**	0.195	0.098	0.303	0.091

The strength and vitality of Oklahoma racing is also illustrated by overall growth in the OHRC:OADDL diagnostic program which experienced a nearly 50% increase in case submissions during 2006, up from 53 in 2005 to 73 in 2006 (see Summary Table below). The increase in the diagnostic program reflects an overall growth in racing in Oklahoma during the same time period.

As a result of more races and more horses competing (particularly Thoroughbreds), there were some increases in both Thoroughbred breed and older age horses in the mortality data compiled for this report. Also there was the addition of a full time facility, Will Rogers Downs, to the racing and training jurisdiction of the OHRC which increased the number of animals at risk. Limb of injury, anatomic location of injury and month of injury were all similar to previous years' reports. The over-all CMI index for Oklahoma racing jurisdiction is positive and compares well on a national basis. Disease surveillance on necropsy cases did identify common equine bacterial respiratory pathogens but did not identify significant enteric pathogens or viral disease cases. Toxicology analysis of specimens was performed on many urine and synovial fluid specimens and those results forwarded to the OHRC. Monitoring of hoof anatomy, shoe characteristics, gastric ulcers and the presence of chronic limb lesions continued and was forwarded to OHRC upon completion of each case. New comparisons of injury data to OHRC racing information was begun in hopes of extending the scope and impact of this programs usefulness.

The Oklahoma Animal Disease Diagnostic Laboratory remains proud to be included as an integral part of the Veterinary Medical Diagnostic Program in cooperation with the Oklahoma Horse Racing Commission. The OADDL remains committed to accomplishing the goals outlined for this project and is pleased to support the important racing and equine industries of the state. OADDL is excited to continue the program and has outlined several areas in this report for a potential expanded role in injury monitoring, disease surveillance, toxicology screening and data analysis.

SUMMARY TABLE: Veterinary Medical Diagnostic Program

	Racing	Training	Non-exercise	Accident	TOTAL
Remington Park:					
2003	10	2	1	0	13
2004	10	1	2	0	13
2005	14	5	3	2	24
2006	25	5	2	1	33
Blue Ribbon Downs:					
2003	8	3	5	0	16
2004	8	2	7	0	17
2005	9	4	10	0	23
2006	7	1	10	1	19
Fair Meadows:					
2003	4	2	0	0	6
2004	6	1	4	0	11
2005	5	0	0	0	5
2006	11	0	0	0	11
Will Rogers Downs:					
2005	0	1	0	0	1
2006	5	2	1	2	10