Welfare and Safety of the Racehorse Summit VI

July 8, 2015

821 Corporate Drive
Lexington • Kentucky 40503
(859) 224-2700
grayson-jockeyclub.org/WefareSafety/default.asp

Grayson-Jockey Club Research Foundation

Dear Guests:

It is my pleasure to welcome you to the sixth Welfare and Safety of the Racehorse Summit, on behalf of The Jockey Club and Grayson-Jockey Club Research Foundation. We are grateful to Keeneland Association for hosting all of the Summits, one of many illustrations of that unique organization's constant readiness to support the sport of racing through the well-being of horses and jockeys.

Today's presentations represent both a look forward and progress reports on past Summits. You will hear reports on what has been learned from the Equine Industry Database and the Racing Surfaces Testing Lab, both creations growing from the first Welfare and Safety of the Racehorse Summit. Will also highlight efforts on behalf of the health and safety of jockeys and unveil a new program to help trainers stay abreast of new information from the veterinary research community.

The underlying purpose of the Summits is, of course, advancement in the processes of promoting equine health and soundness. Everyone involved here is privileged to have in their lives the glorious and somewhat mysterious creatures called the Thoroughbred. But the Thoroughbred is only one of numerous breeds which serve mankind as a race horse. Along with the privilege of connection to these animals comes the opportunity to give back to those which give so much to us.

The Grayson-Jockey Club Research Foundation funds research to benefit horses of all breeds and usage. Today, however, we concentrate on the race horse, while also recognizing that elements of what we discuss here today also can apply to horses of other uses.

Your attendance is testimony to your personal agreement on the importance of protecting horses to our best ability, and we thank you. As we say at Grayson, "Horses strive to be our champions. We can always be theirs."

Sincerely,

Edward L. Bowen

Edward L. Bowen
President

Agenda- Morning Session

2015 Welfare and Safety of the Racehorse Summit VI
Keeneland Sales Pavilion
Wednesday, July 8
(Live webcast will be available at the start of the summit)

8:30 – 8:45 **Welcome and Introduction**
Edward L. Bowen
President, Grayson-Jockey Club Research Foundation

Donna Barton Brothers
Master of Ceremonies

8:45 – 9:30 **Jockey Injury Database And Racing Equipment**
Dr. Carl Mattacola
Professor & Director of the Rehabilitation Sciences Doctoral Program, University of Kentucky

9:30 – 10:15 **Equine Injury Database**
Dr. Tim Parkin
Senior Lecturer and Associate Academic, University of Glasgow

10:15 – 10:35 **Break**

10:35 – 12:00 **Surfaces**
<u>Moderator:</u>
Dr. Mick Peterson
Executive Director, Racing Surfaces Testing Laboratory
Libra Foundation Professor, College of Engineering at the University of Maine

<u>Panelists:</u>
Leif Dickinson
Track Superintendent, Del Mar Racetrack

Glen Kozak
Track Superintendent, New York Racing Association

Dennis Moore
Track Superintendent, Santa Anita Race Course

Jim Pendergest
General Manager, The Thoroughbred Center

Jamie Richardson
Track Superintendent, Churchill Downs

Agenda- Afternoon Session

12:00– 1:15 **Lunch – Limestone Cafe**

1:15 – 2:00 **The Importance Of Continuing Education**

Moderator:
Dr. Scott Palmer
Equine Medical Director, New York State Gaming Commission

Panelists:
Dr. Rick Arthur
Equine Medical Director, California Horse Racing Board

Alicia Benben
Academic Coordinator/Instructor, North American Racing Academy

2:00 – 3:15 **One on One With Dr. Larry Bramlage**

Moderator:
Edward L. Bowen
President, Grayson-Jockey Club Research Foundation

With
Dr. Larry Bramlage
Surgeon and Partner, Rood & Riddle Equine Hospital

3:15 – 3:30 **Break**

3:30 – 4:45 **Proper Diagnosis: Lessons Learned From Post-Mortem Programs**

Moderator:
Dr. Mary Scollay
Equine Medical Director, Kentucky Horse Racing Commission

Panelists:
Dr. Laura Kennedy
Assistant Professor - Veterinary Pathologist,
University of Kentucky Veterinary Diagnostic Laboratory

Dan Fick
ROAP Board Member & Track Steward, Prairie Meadows

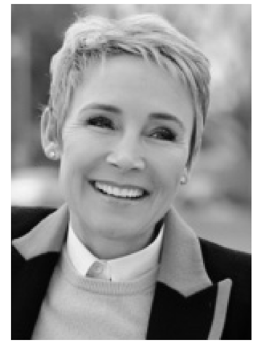
Dr. Megan Romano
Commission Veterinarian, Kentucky Horse Racing Commission

4:45 – 5:00 **Closing**

Edward L. Bowen
President, Grayson-Jockey Club Research Foundation

Donna Barton Brothers

Master of Ceremonies



Donna Barton Brothers was born with racing in her blood. Her mother, Patti Barton, was one of the first half-dozen women to be licensed as a jockey in the United States and was the leading female rider in career wins by the time she retired in 1984. Donna's father, Charlie Barton, was a rough-stock rider on the rodeo circuit and a horse shoer. Both of Donna's siblings, Leah and Jerry, were also professional jockeys. By 1987 when Donna embarked on a career as a jockey, her mother and both of her siblings had retired from the profession.

Brothers rode her first race at the Birmingham, Alabama, track during its inaugural season. Between 1987 and 1998, she rode at Birmingham Turf Club, Rockingham Park, Suffolk Downs, Canterbury Park, Remington Park, Turf Paradise, Arlington Park, Keeneland, Churchill Downs, Gulfstream Park, Hialeah, Calder, Turfway Park, Ellis Park, Dueling Grounds (now Kentucky Downs), Monmouth Park, Belmont Park, and Saratoga—to name a few. She rode for 11 ½ years and retired in 1998 as the second leading female jockey in the country by money earned after having won 1,171 races. It was also in 1998 that she began dabbling in on-air horse racing coverage with Television Games Network (TVG), ESPN, and the Fairgrounds Race Course in the fall of 1998 and then worked for Churchill Downs as an on-air racing analyst and handicapper from 1999 through 2003.

In 2000 she began working for NBC Sports as their on-track reporter and racing analyst on their thoroughbred horse racing shows and has since covered the Kentucky Derby, Preakness Stakes, Belmont Stakes, and Breeders' Cup among many other Thoroughbred races and for NBC Sports. Working for NBC, she covered the historic Triple Crown sweep by American Pharoah in 2015.

Donna has also covered the Hambletonian Stakes, the Rolex Three Day Event, the World Equestrian Games, the AQHA World Championship Show, and Professional Bull Riding (PBR) and still covers horse racing for TVG. She was named best sideline sports reporter of 2014 by Sports Illustrated.

Donna is married to former trainer Frank Brothers and both have roles with Starlight Racing, of which Donna was named chief operating officer.

Dr. Rick M. Arthur

Equine Medical Director
School of Veterinary Medicine, University of California, Davis

Dr. Rick Arthur is the Equine Medical Director at the School of Veterinary Medicine, University of California, Davis, where he is assigned full-time to advise the California Horse Racing Board (CHRB) on drug testing, veterinary practice and equine health, safety and welfare matters.

Dr. Arthur is a 1976 graduate of the UC Davis School of Veterinary Medicine and was a private racetrack practitioner for more than 30 years on the Southern California Thoroughbred circuit. He is a past president of the American Association of Equine Practitioners and Vice-president/director of the Oak Tree Racing Association, a member of the executive committee of the Racing Medication and Testing Consortium (RMTC), and the Board of Directors of the Grayson-Jockey Club Research Foundation. He serves on the RMTC Scientific Advisory Committee and the International Federation of Horseracing Authorities' Prohibited Substances and Equine Welfare Committees. Dr. Arthur has been involved with medication, drug testing and regulatory issues in Thoroughbred racing for more than 30 years. He is a member of The Jockey Club.

Alicia Benben

Academic Coordinator/Instructor
North American Racing Academy

Alicia Benben is an academic coordinator and instructor at the North American Racing Academy (NARA). A part of Bluegrass Community and Technical College, NARA trains its students to be successful in various professions in the racing industry, including jockeys, exercise riders, grooms, and trainers.

In addition to her teaching responsibilities, Benben works with the Welfare and Safety of the Racehorse Summit to produce free online educational continuing education courses available to all racing jurisdictions, licensees, and other interested individuals.

Benben is a graduate of Cazenovia College where she received a Bachelor of Professional Studies in Management, Equine Business Management specialization. Prior to joining NARA, Benben was a licensed assistant trainer in Kentucky, Indiana, and Minnesota and has held various positions in the equine industry with both Thoroughbreds and Sport Horses.

Edward L. Bowen

President, Grayson-Jockey Club Research Foundation

Edward L. Bowen became president of the Grayson-Jockey Club Research Foundation, a charitable organization that funds research on matters of the health and soundness of horses, in March 1994. Prior to accepting the post, Bowen has been a Thoroughbred racing journalist since 1963. He worked the majority of those years for *The Blood-Horse* and was editor-in-chief of that publication from 1987 through 1991. He also has had stints as editor-in-chief of *Thoroughbred Times* and *Canadian Horse* magazine.

Bowen is the author of 19 books on racing, including biographies of Man o'War and Nashua, "The Jockey Club's Illustrated History of Thoroughbred Racing in America," and "Masters of the Turf." He also wrote the script for a one hour television show on Bill Shoemaker, authored John Forsythe's script for the Eclipse Awards dinner annually from 1976-98, and is himself an Eclipse Award winner. He has received the Kentucky Thoroughbred Association's Charles Engelhard Award, National Turf Writers Association Walter Haight Award, Pimlico's Old Hilltopper Award, and the Ocala-Marion County Chamber of Commerce Magazine Award. Bowen is a trustee of the National Museum of Racing and chairman of its Hall of Fame Nominating Committee and president of the American Academy of Equine Art.

Bowen is a former board member of the Thoroughbred Retirement Foundation and a past president of the Thoroughbred Club of America. He attended the University of Florida and the University of Kentucky.

Larry R. Bramlage DVM MS

Surgeon and Partner, Rood & Riddle Equine Hospital

Larry Bramlage is a 1975 graduate of the Kansas State University College of Veterinary Medicine (DVM) and received a Master of Science degree from The Ohio State University in 1978. He holds a Diploma of the American College of Veterinary Surgery (Diplomate ACVS).

Bramlage is an internationally recognized equine orthopedic surgeon. He is a past President of the American Association of Equine Practitioners, and of the American College of Veterinary Surgeons.

In recognition of his dedication and contribution to Thoroughbred racing, Bramlage was awarded the 1994 Jockey Club Gold Medal for contributions to Thoroughbred Racing in the United States. He is also a past chairman of the Research Advisory Committee of the Grayson-Jockey Club Research Foundation and serves on the Board of Directors for that organization.

His additional honors include the 1997 Tierlink Hochmoor Prize for his work regarding the internal fixation of fractures, the 1998 distinguished alumnus award from The Ohio State University, Alumni Fellow Award from Kansas State University, a British Equine Veterinary Association's Special Award of Merit, and the American College of Veterinary Surgeons Legends award for the development of the fetlock arthrodesis procedure for horses in 2009, and the Thoroughbred Club Testimonial Award in 2014.

He has received the American Association of Equine Practioners Distinguished Service Award twice. He was elected to membership in The Jockey Club in 2002 and to Distinguished Lifetime Membership in the American Association of Equine Practioners in 2010.

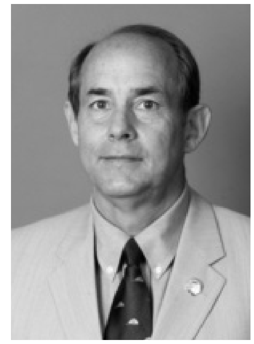
Leif Dickinson

Track Superintendent, Del Mar Racetrack

Leif Dickinson could not be more perfectly suited for his job at Del Mar. He spent 15 years working at the Santa Anita Race Track in Arcadia. He has a degree in Agriculture from the University of Maine plus a degree in horticulture from Mount San Antonio in Walnut, California. In addition, he also has a Pesticide Control License, a Pesticide Applicator’s License, as well as being a certified arborist and an irrigation technologist and certified backflow specialist.

Dan Fick

ROAP Board Member & Track Steward, Prairie Meadows



Currently, the Track Steward at Prairie Meadows, Dan has nearly 40 years' experience in the horse racing industry. As AQHA Director of Racing, Dan helped start the Stewards' Accreditation School at the Arizona Race Track Industry Program of which he is an alumnus. While Executive Director at The Jockey Club, Dan was part of the team that established the Racing Officials Accreditation Program (ROAP).

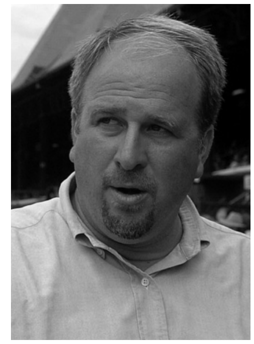
Dan lives in Granbury, Texas.

Laura Kennedy

Assistant Professor - Veterinary Pathologist,
University Of Kentucky Veterinary Diagnostic Laboratory

A native of Michigan, Dr. Laura Kennedy attended Michigan State University, earning of bachelor of science in Animal Science in 1997 and her DVM in 2001. Following graduation, she spent two years as a breeding farm veterinarian for a large, commercial Standardbred farm in Pennsylvania. Having decided in her senior year of veterinary school that she would like to pursue a career in anatomic pathology after gaining clinical experience, Dr. Kennedy attended Texas A&M University, completing her residency and achieving board certification in 2006, followed by a fellowship at the Texas Veterinary Medical Diagnostic Laboratory in Amarillo. Since the summer of 2008 Dr. Kennedy has been a faculty member at the University of Kentucky Veterinary Diagnostic Laboratory. Dr. Kennedy has been involved in Kentucky's racing necropsy program since its inception in 2009, both performing the examinations and presenting her findings in various professional regional and national settings.

Glen Kozak



Track Superintendent, New York Racing Association

Glen Kozak is the Vice President of Facilities and Racing Surfaces for the New York Racing Association since August 2008. Before working at NYRA, Kozak served in the same postion at the Maryland Jockey Club for over three years.

From 2000 thorugh 2004, Kozak served as the Track Superintendent at Suffolk Downs, and was the President of Kozak Inc. in Wakefield, Massachusetts. Kozak owned and operated a liquid bulk transportation company hauling 23 million gallons annually serving 8 New England states.

Prior to serving as the Track Superintendent he was the Barn Area Superintendent of Suffolk Downs for over 8 years.

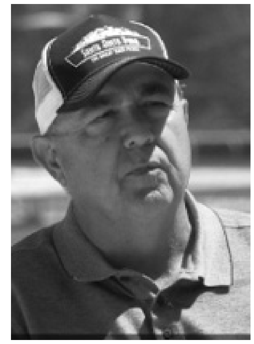
Dr. Carl Mattacola

Professor & Director of the Rehabilitation Sciences Doctoral Program, University of Kentucky

Dr. Mattacola is a Professor and serves as the director of the post-professional athletic training masters program and the Rehabilitation Sciences Doctoral Program at University of Kentucky. The doctoral program is a multi-disciplinary program consisting of Athletic Training, Communication Sciences and Disorders, Physical Therapy and Occupational Therapy. He received his bachelor's degree in physical education/athletic training from Canisius College in Buffalo, New York. He completed his doctor of philosophy degree in sports medicine and received his masters of education degree, both at the University of Virginia. Dr. Mattacola has held various positions as an athletic trainer and as a professor, including Temple University in Pennsylvania and Hampden-Sydney College in Virginia. He is Editor of the Journal of Sport Rehabilitation. His research has focused on directing research in the area of functional assessment of human function, postural control, and strength following injury and subsequent surgical procedures. He lives in Lexington Kentucky with wife Kathleen Mattacola.

Dennis Moore

Track Superintendent, Santa Anita Race Course



Dennis Moore has been working on race-track surfaces for over 42 Prior to coming to Santa Anita in November 2013, Moore held a similar position at Betfair Hollywood Park. He worked on the expansion of the Los Alamitos oval from furlongs to one mile.

In addition to his work at Hollywood Park, Moore has maintained surfaces at tracks and training centers throughout North America, Dubai, England, and Germany. He was a pioneer in working on synthetic tracks, having been superintendent at Remington Park when a revolutionary surface called Equitrack was installed for the opening of the Oklahoma City facility in 1988.

Dr. Scott Palmer

Equine Medical Director, New York State Gaming Commission

Since graduating from the University of Pennsylvania School of Veterinary Medicine in 1976, Dr. Palmer has worked as a staff clinician at the New Jersey Equine Clinic, serving as the Hospital Director since 1997. He is a two-time recipient of the New Jersey Equine Practitioners Veterinarian of the Year award, as well as a recipient of the AAEP President's Award in 2009 and the AAEP Distinguished Service Award in 2010.

Dr. Palmer is board certified in equine practice by the American Board of Veterinary Practitioners. He has authored dozens of peer-reviewed publications and is a featured speaker at veterinary conferences world-wide. He is a member of several professional organizations and has held leadership positions in many, including the American Veterinary Medical Association, the American Association of Equine Practitioners, the American Board of Veterinary Practitioners, the New Jersey Veterinary Medical Association, and the New Jersey Association of Equine Practitioners.

Dr. Palmer chaired the New York Task Force on Racehorse Health and Safety, which was formed at the request of Governor Andrew M. Cuomo in 2012 in the wake of 21 equine fatalities during Aqueduct's 2011-12 Winter Meet. The New York State Equine Medical Director position was established last year as a key recommendation of that Task Force.

Dr. Palmer serves as a Board Member for the NTRA Safety and Integrity Alliance Advisory Board and the Thoroughbred Charities of America. He previously served on the ARCI Special Task Force on Medication and chaired the International Summit on Race Day Medication as well as the Ad-Hoc RMTC Committee on Race Day Security and served two terms as member of the Grayson-Jockey Club Research Advisory Committee.

Dr. Tim Parkin

Senior Lecturer and Associate Academic, University of Glasgow

Tim Parkin is Head of the Division of Equine Clinical Sciences and Senior Lecturer in Clinical Epidemiology at the School of Veterinary Medicine, College of Medical, Veterinary and Life Sciences, University of Glasgow.

He qualified from the University of Bristol with degrees in Zoology (1992) and Veterinary Science (1998). He immediately took up a position at the University of Liverpool and went on to complete his PhD on the epidemiology of fractures in racehorses in 2002. Since then he has worked on numerous projects with several different racing jurisdictions around the world, including the UK, Hong Kong, Japan, Australia, South America and the USA. He gained his Diploma of the European College of Veterinary Public Health in 2006 and has worked at the University of Glasgow since February 2007.

Parkin has twice been an epidemiological consultant for Racing Victoria Jumps Race Review Committees (2005 and 2008) and is a member of the Equine Injury Database Scientific Advisory Committee in the USA.

Michael “Mick” Peterson, Ph.D.

Mechanical Engineering Professor, University of Maine

Michael “Mick” Peterson, Ph.D. is a Mechanical Engineering Professor at the University of Maine in the USA. Dr. Peterson’s research links traditional understanding of engineering mechanics and materials to the biomechanics of animals. His research emphasis is on the manner in which dynamic response can be used to characterize materials.

He has been collaborating with the faculty in the College of Veterinary Medicine and Biomedical Sciences at Colorado State University for nearly two decades and is affiliated faculty in Animal and Veterinary Sciences at UMaine. He has worked on a range of equine and animal biomechanics topics including: the impact of exercise on bone density, the development of biomechanical models, durability of cetacean epidermis, the measurement of inertial properties of the equine forelimb, biomechanics of whale interaction with fishing gear, cetacean acoustic response, marine hydroacoustics and the kinematics of equine gait on treadmills and tracks.

Dr. Peterson greatest passion is for understanding of racing surfaces and equestrian surfaces. Originating in work 20 years ago on a new medical imaging technique this work has gradually grown from an interest in the effect of exercise on bone remodeling to a focus on applying concepts from manufacturing quality control to improved racing surface consistency for the protection of horses and riders.

Dr. Peterson collaborated with Dr. C. Wayne McIlwraith at Colorado State University to found the Racing Surfaces Testing Laboratory. The laboratory is a non-profit organization supported by the racing industry which is providing research, testing and materials characterization services for the horse racing industry.

Dr. Peterson currently serves as the Executive Director. He has published 80 journal articles, 3 book chapters, 81 conference proceedings, presented 67 additional papers at conferences and has received 6 patents.

James W. Pendergest, II

General Manager, The Thoroughbred Center

Jim Pendergest, currently the General Manager of Kentucky Training Center, LLC d/b/a The Thoroughbred Center, brings 29 years of management experience within the Thoroughbred industry, with expertise in human relations and project management.

Previously his work included oversight of production, installation, staffing and sales of Polytrack racing and training synthetic surface with Martin Collins Surfaces and Footings. He worked as the Executive Director of Kentucky Off Track Betting and the General Manager and Director of Operations at the Kentucky Horse Center. Jim served at General Manager of The Stallion Station and worked as a foreman at Northridge Farm. He graduated in 1983 from the University of Kentucky with a Batchelor degree in Animal Science.

Jim is the Chair of Keep Lexington Beautiful Commission and currently serves on the board of the Racing Surfaces Testing Laboratory. He is the Director of the Kentucky Field Trial Association and the Secretary/Treasurer of the Commonwealth Bird Dog Club, as well as being a member of the Thoroughbred Club of America, Lexington Rotary Club, Kentucky Farm Managers Club and Toastmasters International.

Jamie Richardson

Track Superintendent, Churchill Downs

Jamie Richardson accepted the position of track superintendent of Churchill Downs at the end of May 2015. He is only the fifth person to hold that position. In Richardson, Churchill Downs will have a new track superintendent who has served in the number two position on its track team since 2012 and a veteran of Triple Crown events.

Along with the two Kentucky Derbys he has worked at Churchill Downs, Richardson served as track superintendent for the Maryland Jockey Club ("MJC") from 1989-2008. The MJC's tracks include Baltimore's Pimlico Race Course, the home of the Preakness Stakes (GI), the second jewel of the Triple Crown.

Richardson, a 46 year-old native of Jarrettsville, Md., also served as track superintendent at Oaklawn Park in Hot Springs, Ark. for two years before he joined Churchill Downs.

Dr. Megan Romano

Commission Veterinarian, Kentucky Horse Racing Commission

Dr. Megan Romano attended the University of Florida College of Veterinary Medicine. She completed a hospital internship at Rood and Riddle Equine Hospital before entering private racetrack practice based in Lexington, KY. Her regulatory career began with a position as examining veterinarian for the New York Racing Association. In 2012 she returned to Kentucky to continue regulatory work in her current position with the Kentucky Horse Racing Commission.

Dr. Mary Scollay

Equine Medical Director, Kentucky Horse Racing Commission

A 1984 graduate of the University of Illinois College of Veterinary medicine, Dr. Scollay served for 20 years as an on-track racing regulatory veterinarian, before becoming the Equine Medical Director of the Kentucky Horse Racing Commission in 2008. She is an active member of the American Association of Equine Practitioners and has served the organization in a broad range of roles. She currently serves on the AAEP's Racing Committee and Professional Conduct and Ethics Committee. She is a member of the Racing Commissioners International Regulatory Veterinarians' Committee, the International Group of Specialty Racing Veterinarians and an associate member of the European Horseracing Scientific Liaison Committee. She is a board member of the Racing and Medication Testing Consortium and is seated on its Scientific Advisory Committee. She is a board member of the Racing Surfaces Testing Laboratory and serves as a veterinary consultant to the Jockey Club Equine Injury Database.

Jockey Injury Database And Racing Equipment

Dr. Carl Mattacola

Professor & Director of the Rehabilitation Sciences Doctoral Program, University of Kentucky

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Dr. Tim Parkin
Senior Lecturer and
Associate Academic,
University of Glasgow

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Dr. Mick Petterson
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Racing Surfaces Testing Laboratory
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Panelists:

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NOTES

The Importance Of Continuing Education

Dr. Scott Palmer
Equine Medical Director
New York State Gaming Commission

Panelists:

Dr. Rick Arthur
Equine Medical Director,
California Horse Racing Board

Alicia Benben
Academic Coordinator/Instructor,
North American Racing Academy

Cornell University

The Importance of Continuing Education

Scott E. Palmer, VMD, ABVP
New York State Equine Medical Director

Cornell University

Continuing Education

A lifetime commitment to learn current developments in the science, technology and economics of a profession.

Continuing Education

- Veterinarians
- Physicians
- Nurses
- Dentists
- Physical Therapists
- Pharmacists
- Social Workers

Cornell University

Horse Trainers Impact

- Human safety
- Equine safety
- Economic impact: $1B Annually
- Branding of horse racing

Cornell University

Goals of Trainer Continuing Education

- Increase level of trainer expertise
- Reduce equine & rider injuries
- Raise standard of equine health care
- Improve quality of horsemanship
- Improve the trainer business model

Cornell University

Continuing Education Timeline

- **2006**: WSS affirmed a need for CE for those who work with horses.
- **2009**: ARCI created a Model Rule requiring at least 4 hours of trainer CE per calendar year.
- **2013**: National HBPA survey - 87% favored trainer CE, 79% preferred on-line programs.
- **2014**: WSS announced the “Advanced Horsemanship” partnership with NARA to produce on-line CE.

Cornell University

National Continuing Education Efforts Are Underway

A. Indiana
B. Washington
C. Colorado
D. California
E. Kentucky
F. New York

Cornell University

Advanced Horsemanship Program

- A collaboration between the Grayson Jockey Club and the North American Riding Academy

Cornell University

California Racing Injury Prevention Program

- A collaborative effort between the California Horse Racing Board and the U.C. Davis School of Veterinary Medicine

Cornell University

New York Continuing Ed Program

- A collaborative effort between the New York State Gaming Commission and the Cornell University College of Veterinary Medicine

Cornell University

New York Continuing Ed Program

A. ARCI Model Rule
B. Cornell University
    A. CRES (Bimonthly Trainer & Owner CE
    B. Veritas Program
    C. eCornell

Cornell University

Veritas

- Partnership between Cornell University CVM, Texas A&M CVM & BS, and Zoetis
- Web-based, peer-reviewed CE
- State-of-the-art online teaching technology
- Interactive, experiential, case-based CE
- Fee Structure

Cornell University

eCornell

- Cornell University's online learning subsidiary
- Instructor-Facilitated
- Self-paced, Flexible online education
- Fee-based certificate program

Cornell University

Conclusions

- Trainer continuing education is a priority.
- Delivery of peer-reviewed modules by live and convenient on-line formats is now available.
- State Regulators are urged to consider adoption of the ARCI CE Model Rule & establish databases.
- Horsemen's organizations should be involved in identifying content and delivery of CE.

Cornell University

Thank You!

Continuing Education Modules

Humeral Fractures Module:
http://www.vetmed.ucdavis.edu/vorl/humeral_fractures/story_html5.html
(copy in Supplemental Materials)

Scapular Fractures Module:
http://www.vetmed.ucdavis.edu/vorl/scapular_fractures/story_html5.html
(copy in Supplemental Materials)

A Bone Physiology/Bone Training module with Drs. Stover and Bramlage is under development. Modules on fetlock/cannon bone (2) and carpal (knee) are planned as funds become available. When these 6 modules are completed, 75% of racing and training fatalities will have addressed. In total, 21 modules were originally planned on racing injuries and prevention strategies.

Other Continuing Education Material

UC Davis School of Veterinary Medicine, Veterinary Orthopedic Research Laboratory website: Racing Safety Program technical notes and additional material including at video and anatomical charts for equine racing necropsies.

http://www.vetmed.ucdavis.edu/vorl/research_programs/musculoskeletal_disease_injuries/racehorse_injury_prevention.cfm

Continuing Education Model Rules:

ARCI-008-020 Trainers

A. Eligibility…

(4) Beginning no later than January 31, 2012, in order to maintain a current license, trainers must complete at least four (4) hours per calendar year of continuing education courses approved by the ARCI or the commission in that jurisdiction

CHRB DRAFT CONTINUING EDUCATION RULE (1503.5) FOR TRAINERS AND ASSISTANT TRAINERS

1503.5 (a) As of January 1, 201X, in order to maintain a current license, trainers and assistant trainers must complete at least four (4) hours per calendar year of continuing education courses approved by the board. Trainers who are not domiciled in California and have 12 of fewer starts in California during the previous 12 months may request a waiver from the stewards.

ADVANCED HORSEMANSHIP

Welfare and Safety of the Racehorse Summit

&

North American Racing Academy

NORTH AMERICAN RACING ACADEMY

As an international equine industry workforce provider, NARA has expanded its curriculum to offer online coursework in:

- Racehorse Care
- Equine Nutrition
- Introduction to the Racing Industry
- Equine Business & Legal Principles
- Equine Physiology
- Lameness in Racehorses
- Introduction to Commercial Breeding
- Equine Health & Medications

Providing online education allows our students to continue their studies whenever and wherever their career goals take them

GRAYSON-JOCKEY CLUB & NARA ALLIANCE

*In 2014, the Grayson-Jockey Club & NARA aligned on the collaboration and production of **free** online educational programming available to all racing jurisdictions, licensees, and anyone interested*

DEVELOPMENT & CONCEPT

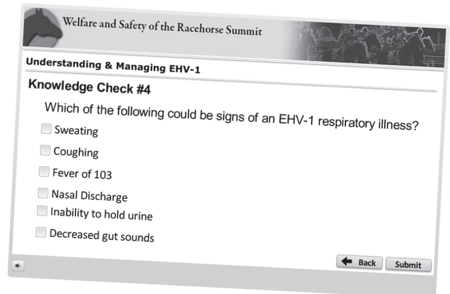
Continuing Education Goals

- Produce content that is:
  - Relevant
  - Interesting
  - Useful
- Track course completion
- Provide licensees a simple way to notify commissions about completion
- Make it easy for jurisdictions to identify course completion

DEVELOPMENT & CONCEPT

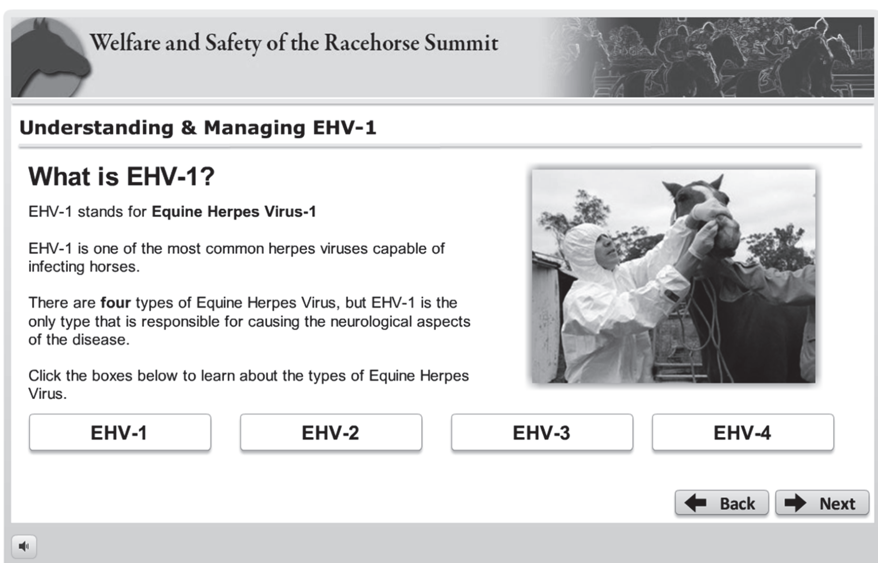
Course Development

- Courses work on a "Click & Learn", "On-Demand" design
  - Users can access content whenever, wherever with a computer & internet connection
  - Access to slides is restricted based on items with which the user must interact
    - Click a button
    - Watch a video
    - Do a Self-Knowledge Check

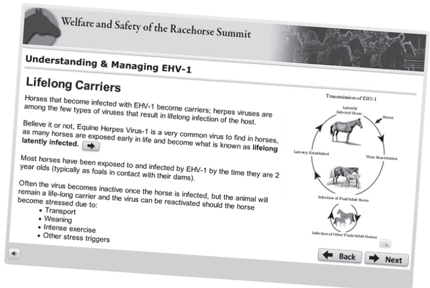


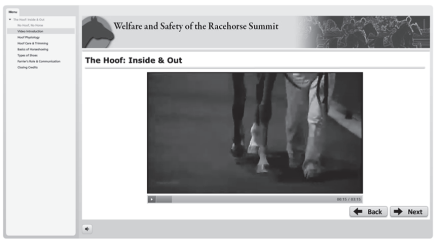
- In order to fully complete a course a user must complete **all** the required actions
  - About 1 hour in length

UNDERSTANDING & MANAGING EHV-1



TRACKING & SUBMISSION





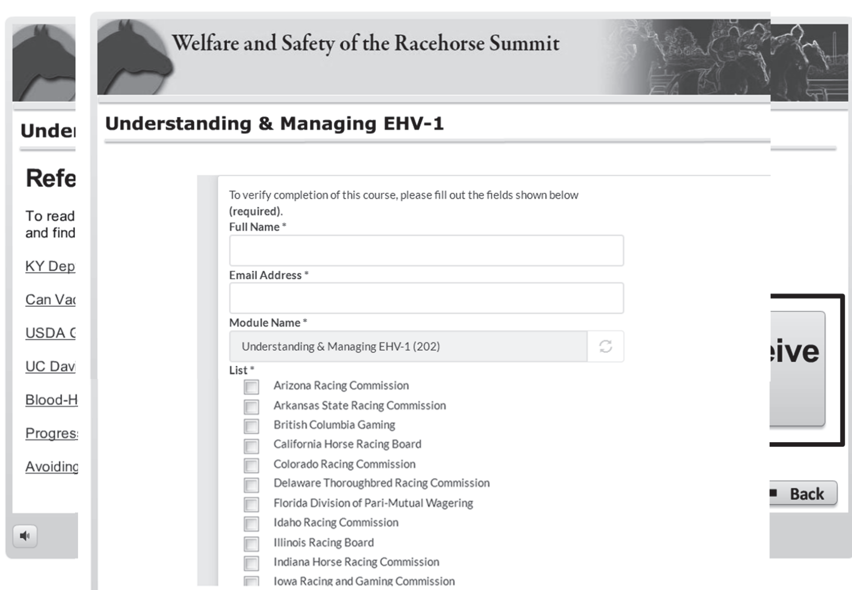
End Result

The last "slide" of a course is a submission form page that users fill out and submit to selected racing commission(s), notifying them of course completion

By restricting a user's ability to progress through a course, reaching the submission form means they have successfully completed course requirements

Users cannot jump ahead or access this form outside of the course

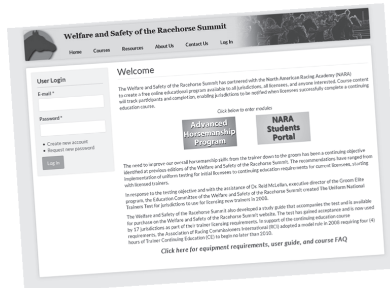
UNDERSTANDING & MANAGING EHV-1

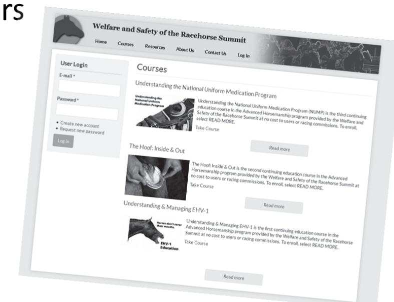


COURSE WEBSITE

Course Location & User Access

- Continuing education courses are located at http://courses.grayson-jockeyclub.org/
- To access courses, users must create a user account:
  - Simple registration process
  - Support documents available to assist users
- Currently 3 courses are available:
  - Understanding & Managing EHV-1
  - The Hoof: Inside & Out
  - Understanding the National Uniform Medication Program





LOOKING AHEAD

Goal is to provide four new continuing education courses every year

Potential topics include:

- Equine Health
  - Bone Physiology & Development
  - Medications
- Business Principles & Practices
- Immigration / Temporary Foreign Worker Visas

As users begin to access course content, we will continually review areas for improvement to make continuing education a seamless and user-friendly experience

Thank You

NOTES

One on One With Dr. Larry Bramlage

Edward L. Bowen
President,
Grayson-Jockey Club Research Foundation

Dr. Larry Bramlage
Surgeon and Partner,
Rood & Riddle Equine Hospital

NOTES

Proper Diagnosis: Lessons Learned From Post-Mortem Programs

Dr. Mary Scollay

Equine Medical Director,
Kentucky Horse Racing Commission

Panelists:

Dr. Laura Kennedy

Assistant Professor - Veterinary Pathologist,
University of Kentucky Veterinary Diagnostic Laboratory

Dan Fick

ROAP Board Member & Track Steward,
Prairie Meadows

Dr. Megan Romano

Commission Veterinarian,
Kentucky Horse Racing Commission

UKY
University of Kentucky Veterinary Diagnostic Laboratory
1490 Bull Lea Rd.
Lexington KY 40511
Phone: (859) 257-8283 Fax: (859) 255-1624

Report Date: 6/15/2015

Final Report

Date Received: 5/18/2015 10:51 AM
Collection Date.
Case Coordinator: Dr. Laura Kennedy
Accession No: K15

KENTUCKY HORSE RACING COMMISSION
DR. MARY SCOLLAY
4063 IRON WORKS PARKWAY
LEXINGTON KY 40511

Phone: (859) 246-2040
Fax: (859) 246-2039
Email: Mary.Scollay@ky.gov

Associated Parties
Other: Kentucky Horse Racing Commission

Other: William Farmer; Kentucky Horse Racing Commission
Veterinarian: Dr. Mary Scollay; Kentucky Horse Racing Commission Vet Code:

Animal Information
Farm IDs:

..quine - Thoroughbred; Neutered; Adult 6 Years

Diagnosis
Fracture, left front medial sesamoid.

Pathologic Anatomic Findings
Visceral examination:
Presented for necropsy is a 6 year old, bay Thoroughbred gelding identified by the lip tattoo There are no white markings. The gelding is in good body condition, weighing 515 kg (1,132 lbs). Postmortem preservation is poor. The lungs are congested. The contents of the stomach are liquid and yellow with a sweet smell.

Musculoskeletal examination:
The distal left forelimb is expanded by a moderate amount of edema and hemorrhage. There is a medial, basilar sesamoid fracture with significant soft tissue damage (see notes).

Bulletin(s)
Confidential and privileged information - not for publication.

Accession number: K15

Horse information: 6 y.o. gelding, racing

Fracture information: LF medial sesamoid.

Associated soft tissue pathology:

Palmar annular: R	Proximal digital annular: T	
Suspensory ligament: I	Lateral ext. susp: T	Medial ext susp: T
SDF: I	DDF: T	
Straight sesamoidian: T	Oblique sesamoidian: T	Intersesamoidian: R

*I=intact, T=torn, R=ruptured

Preexisting pathology:

Right forelimb, fetlock:

Articular cartilage scoring: 2

Right forelimb, third metcarpal bone:

Palmar osteochondral disease: 2

Cartilage loss, MC3: 2

Parasagittal groove scoring MC3: 1

Right forelimb, sesamoids:

Cartilage loss: 2

Marginal remodeling: 1

Right forelimb, dorsal impact:

Arthrosis of P1: 2

Villinodular pad proliferation: 3

Remodeling of MC3: 2

Right forelimb, palmar impact:

Condylar flattening: 2

Palmar pouch hyperplasia: 1

MC3 remodeling: 1

Notes, left forelimb: Some pre-existing pathology can be identified despite the fracture. The villinodular pad is thickened with remodeling of the third metacarpal bone to the same extent as the right forelimb. Scoring of the articular cartilage of the third metacarpal bone is scored as a 2 and palmar arthrosis is evident, though scoring is not possible due to acute traumatic artifact.

Notes, hind limbs: Bilaterally, there are score lines in the parasagittal grooves. The medial groove of the right limb scores as a 3, the lateral as a 1. On the left, both grooves score as a 2.

Left carpus: There is significant arthrosis and articular cartilage scoring of the bone composing the proximal intercarpal joint, with mild lesions in the radiocarpal joint.

Right carpus: There is mild to moderate arthrosis and articular cartilage scoring on the proximal intercarpal joint and mild lesions in the radiocarpal joint.

KHRC NECROPSY ACCESSION FORM

Date of Death | Time of Death :

Euthanized

KHRC Submitting Veterinarian

Attending Veterinarian

Name

Phone

Track | Race | Condition

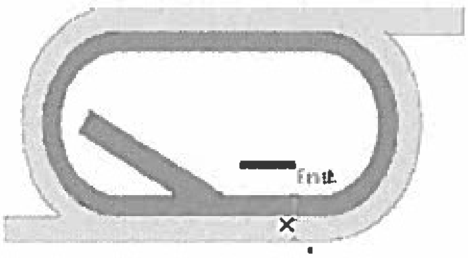
Breed

Horse	Tattoo	Color	Sex	Age

Case Information

[X] Racing [ ] Training

Location injury observed on track:



Other	
Distance of race/work	1 1/16 mile
Surface	Dirt
Condition (dirt/syn)	Fast
Condition (turf)	Firm

Furosemide	Yes

Injury/Trauma	Yes
Rabies suspect	No
Sudden Death/Unknown	No

Systems affected (select all that apply)
For multiple selections, hold down Ctrl key and click selection.

- Musculoskeletal (selected)
- Neurologic
- Cardiovascular
- Respiratory
- Liver
- Gastrointestinal
- Genitourinary

Other

Shoeing (select all that apply)
For multiple selections, hold down Ctrl key and click selection.

RF	LF	RH	LH
Plain/Queens Plate	Plain/Queens Plate	Plain/Queens Plate	Plain/Queens Plate
QXT (selected)	QXT (selected)	QXT (selected)	QXT (selected)
Rim shoe	Rim shoe	Rim shoe	Rim shoe
Toe grab-QH	Toe grab-QH	Toe grab-QH	Toe grab-QH
Toe grab-HIGH	Toe grab-HIGH	Toe grab-HIGH	Toe grab-HIGH
Toe grab-MED	Toe grab-MED	Toe grab-MED	Toe grab-MED
Toe grab-LOW	Toe grab-LOW	Toe grab-LOW	Toe grab-LOW
Mud nails	Mud nails	Mud nails	Mud nails
Jar caulks	Jar caulks	Jar caulks	Jar caulks
Blocked heels	Blocked heels	Blocked heels	Blocked heels
Stickers	Stickers	Stickers	Stickers
Bent shoes	Bent shoes	Bent shoes	Bent shoes
¾ shoe	¾ shoe	¾ shoe	¾ shoe
Full/rim pad	Full/rim pad	Full/rim pad	Full/rim pad
Bar shoe	Bar shoe	Bar shoe	Bar shoe
Spider plate	Spider plate	Spider plate	Spider plate
¼ crack patch	¼ crack patch	¼ crack patch	¼ crack patch
Hoof wall reconst.	Hoof wall reconst.	Hoof wall reconst.	Hoof wall reconst.
Unknown	Unknown	Unknown	Unknown

Medications Administered: (check all that apply)

- [X] Euthanasia Sol'n (CIII)
- [ ] Succinylcholine
- [ ] Acepromazine
- [ ] Butorphanol
- [X] Detomidine
- [ ] Flunixin
- [ ] Phenylbutazone
- [ ] Pred sodium succinate
- [ ] Xylazine

Other ketamine, telazol

Injury management: (check all that apply)

- [X] Ambulance
- [ ] Kimzey splint
- [ ] Compression boot
- [ ] Robert Jones Bdg

Other

Antemortem diagnostics performed:

- [ ] Radiology
- [ ] Ultrasound

Imaging/other

- [ ] CBC
- [ ] Chemistry
- [ ] Serology
- [ ] Virus isolation
- [ ] Bacteriology

Clinical Observation, comments

Horse abruptly stumbled near the wire, but remained on his feet. It was immediately apparent there was an LF open mid-cannon fx. On palpation both medial and lateral condyles appear to be intact. The LF mid-cannon bone is highly comminuted and compound. The horse was loaded in the ambulance and due to grave prognosis humanely euthaninzed.

Racing Officials Accreditation Program

Catastrophic Review Protocols

There is the potential to learn from catastrophic injuries to horses at the racetrack, if catastrophic review protocols are developed and implemented.

1. **The jurisdiction must be entering all equine injuries and other pertinent equine examination information in the InCompass Equine Injury Database System.**
2. **All deaths at the racetrack must undergo a necropsy examination by an equine veterinarian, preferably at the state veterinary school, with testing of blood, urine and tissue samples as directed by the Regulatory Veterinarians**

Racing Officials Accreditation Program

A Catastrophic Review Committee should be appointed to review the circumstances involved with every equine mortality.

The members of this committee should include:

- **Board of Stewards**
- **Director of Racing Operations**
- **Racing Secretary**
- **Track Veterinarian**
- **Track Superintendent**
- **Chief Commission Veterinarian**
- **Regulatory Veterinarians**
- **Jockey Guild Representative**
- **Horsemen’s Association Representative**

The trainer, jockey and practicing veterinarian of the horse should also be included in each case.

The following information should also be collected and distributed to the committee members:

- Race Video Replay
- Equibase Race Chart
- Past Performance Information with Pertinent Race Charts
- EID Injury Report
- EID Injury History
- Daily Veterinarian Medication Reports
- Equibase Starters' Comments
- Autopsy Report
- Recent Veterinarian Bills
- Radiographs
- Trainer's Training Records
- Track Maintenance Records
- Lab Drug Test Report
- Pre-Race Exam Findings
- Insurance Status of the Horse

The following interviews should be conducted by the Commission Investigator, Board of Stewards and Commission Veterinarian.

- Trainer
- Jockey
- Practicing Veterinarian
- Farrier
- Owner
- Groom
- Exercise Rider
- Previous Owner, Trainer & Jockey, if recent change in ownership has transpired such as a claim.

- **The Chief Commission Veterinarian or the Board of Stewards should be the responsible for collecting and maintaining the case study file.**
- **When the preliminary autopsy report, drug testing lab results and all the other Resource Review Records have been collected, a Catastrophic Review Committee meeting should be convened as soon as possible, but in no case less than two weeks after the incident.**
- **The Catastrophic Review Committee determinations (if any) and recommendations to assist in the avoidance of any future catastrophic incidents (if any) should be appropriately circulated and initiated.**

NOTES

Supplemental Materials

Racing Surfaces Testing Laboratory Bulletins

Racing Surfaces Testing Laboratory
Orono, Maine USA

The Role of Clay in Racing Surfaces

Christie A. Mahaffey, M.Phil. and Michael "Mick" Peterson, Ph.D.

The risks to horses and riders are the result of many factors. Racing surfaces are only one aspect and likely are not the most critical factor. However, surfaces impact every horse on a day at the track and should be managed to ensure that they help improve the safety of racing.

Introduction

The amount of clay in a dirt racing surface is perhaps the most important composition issue and impacts performance of horse and rider. The effects of clay influence a wide range of performance attributes, including the amount of slide in a surface, the tendency of the surface to compact and get hard, the formation of clods that can fly up at the riders, and the sensitivity of the track to small variations in the moisture content. While the importance of clay is well accepted, the challenge arises in getting an accurate measurement of the amount of clay in a racing surface and in determining what the correct amount of clay should be for a particular surface and its geographic location.

How Clay Works

To understand the function of clay in a material, it is important to realize that while a particle of sand is rounded like a small rock, a particle of clay is typically flat like a sheet of paper. Clay particles can be folded like the image shown in Figure 1. These particle surfaces have very specific characteristics that distinguish them from sand or silt. In fact, while it is possible to create clay from sand and silt, the process takes thousands of years (Targulian 2007).[1] Therefore, the amount of clay in the surface can only be changed by physically adding or removing clay; the sand itself will not turn into clay. Furthermore, the addition or loss of clay is dependent on the local materials interacting with the surface, the maintenance methods used on the surface, and the climate and weather that the surface endures.

Figure 1 The folding of flat clay particles.

The Laboratory Measurement of Clay

To understand data of clay in a racetrack, it is useful to understand the most common methods for testing clay in soils.

Wet sieve

The simplest, least expensive, most common soils test used in civil engineering is called a **wet sieve test**. In this test, the material is soaked and a dispersant (typically the chemical-equivalent of Calgon) may be added to separate the clay particles. The wet material is then washed on a fine mesh with holes of approximately 0.5 mm diameter. The starting weight of the soil minus the weight remaining on the sieve equals the weight of fine particulates that pass through the sieve, thus revealing the percentage of the soil sample that is not sand. Fine particles that pass through the sieve are the very smallest rounded particles (silt), along with the flat clay particles. While this information is useful, the wet sieve test does not distinguish the individual amounts of silt and clay in this finer particulate.

[1] Targulian, V. O. P. V. K. (2007). "Soil system and pedogenic processes: Self-organization, time scales, and environmental significance." Catena 71:373-381.

Hydrometer

The hydrometer test is significantly more complex and less reliable than the wet sieve test. The hydrometer requires a large amount of time to perform properly (approximately 4 days), and repeatability is dependent upon precise temperature control. However, it does have the advantage of the ability to grade the finer particles. Like the wet sieve test, the hydrometer test cannot distinguish the shape of the particle, but by making use of the settling rate of fine particles in a cylinder of water, particles as fine as .002 mm can be separated. The hydrometer is the most common method of measuring the amount of clay material in a soil sample. However, the test does not precisely distinguish between clay and silt and the test is influenced by factors other than the mineralogy of the track material. Reliability of this test can be established by repeating the test of a sample material or by comparing the test results to historical, regular test data.

X-ray Diffraction

Currently, the only truly effective approach to knowing the amount of clay in a soil sample is the use of **x-ray diffraction**. Details about this technique will be discussed in a later technical bulletin, but it is important to understand that through x-ray diffraction it is possible to know both the percentage and the particular type of clay that exists in a surface. Clay types can differ dramatically in their response to water and loading. Consequently, it is clear that with the safety of the horses and riders at stake, these more sophisticated tools are required for correctly planning and maintaining the properties of a track surface.

Correct Clay Percentage for a Track

Once we have measured the amount of clay in a surface, the next question is, "How much is the correct amount?" Research has demonstrated that the answer depends on a number of factors. For example, if the climate at a particular track is sufficiently dry, more clay may be required to hold the track together during a period of drought. On the other hand, areas with high rainfall need a fast-draining track with less clay. However, two things are clear:

1) If the percentage of clay changes over time, watering and other maintenance must be adapted, and
2) The percentage of clay throughout the surface material should be consistent around the track.

Making every track the same would be a mistake given the impact of differences in climate at each location. Understanding the type and amount of clay in a surface is the fundamental basis for the development of the best maintenance strategy for a track. To gauge and respond to surface material changes appropriately, regular wet sieve and hydrometer tests provide timely and cost-effective monitoring, while scheduled X-ray diffraction tests provide more detailed information to observe changes. Systematic examination of the clay surface provides the opportunity to respond to changes in the material in order to successfully reduce risk and improve the safety of racing.

This technical bulletin is based on the white paper "Racing Surfaces," available at the Racing Surfaces Testing Laboratory website: racingsurfaces.org/white_papers and at the Jockey Club website: grayson-jockeyclub.org/resources/White_Paper_final.pdf

The white paper and report are the result of efforts by The Racing Surfaces Committee that was formed at the inaugural ***Welfare and Safety of the Racehorse Summit*** *in 2006.*

This Racing Surfaces Testing Laboratory Technical Bulletin for Track Surface Education is the first in a series of papers directed toward a general audience with a common interest in developing consistent and reliable track surfaces. This and subsequent bulletins can be found at the Racing Surfaces Testing Laboratory website: racingsurfaces.org/bulletins

Racing Surfaces Testing Laboratory encourages the distribution and use of these bulletins. For further information, contact:

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Ph: 207-409-6872 racingsurfaces.org mick@bioappeng.com

Racing Surfaces Testing Laboratory
Orono, Maine USA

Synthetic Racetrack Surfaces Temperature Changes

John Bridge, Ph.D. and Michael "Mick" Peterson, Ph.D.

Introduction

Changing temperatures of synthetic racetracks have been shown to have a marked effect on horse racing performance. In Figure 1, the effect of sunlight on the track is shown for the Del Mar racing surface in California. Over the course of six days in August, the temperature of the track at a 1-inch depth (the blue line) varied between 70ºF (21ºC) and 125ºF (52ºC) when the track was not cooled with water. Figure 2 shows that on the same track the 6-furlong Thoroughbred race/work times vary from morning to afternoon with times trending slower with higher temperatures. Clearly, something significant happens with temperature changes on a synthetic racing surface.

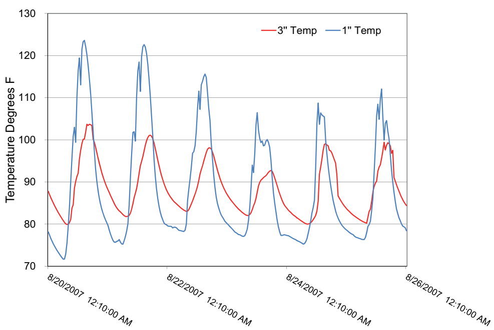

Figure 1 Temperature of a synthetic racetrack surface over a six day period.

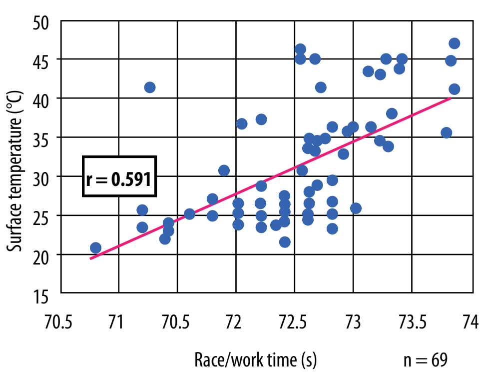

Figure 2 Race and work times are influenced by temperature.

Peterson, M. L., Reiser II, R. F., Kuo, P. H, Radford, D. W. and McIlwraith, C. W. (2010). "The Effect of Temperature on Race Times on a Synthetic Surface", Equine Vet. J. 42 (4), 351-357.

The Role of Wax in Racing Surfaces

The function of the wax is to coat and bind together the sand, polymer fiber, and rubber particulate that make up the other components of a synthetic track material. The wax coating makes up between 4% and 9% of the total track mass. The wax consistency and the ability of the wax to coat the sand are influenced by the relative amounts of paraffin and microcrystalline wax solids and the amount of oil present in the wax. Unlike paraffin wax used in candles, these waxes melt over a wide range of temperatures that may include the operational temperatures seen at many racetracks.

Wax Thermal Effects on Mechanical Properties

Wax, in many ways, acts like clay in a dirt track. As with high clay content, wax can lead to clods of material known as "balling up", but also like clay, a desirable proportion of wax is needed to help hold the material together to support the hoof of the horse. Wax has a second very important role in synthetic racing surfaces; the wax coats the sand and other materials and repels water, making the track hydrophobic. This effect is seen most clearly during a period of heavy rain. Initially the rain may pool on the synthetic track due to surface tension, but often a single pass with a harrow will lead to quick drainage of the water from the top of the track. The key is to use a mixture of wax that does not ball up under the hooves of the horse or result in kickback during races, while at the same time, ensuring that the water-repelling characteristics of the surface are retained.

Good Wax

Just as clay must be carefully controlled in a dirt track, wax must be controlled in a synthetic track. The challenge with a synthetic track is that unlike clay, which can only be added or removed by mechanical means, some of the lighter wax components simply evaporate over time. Environmental effects can also change the wax over time.

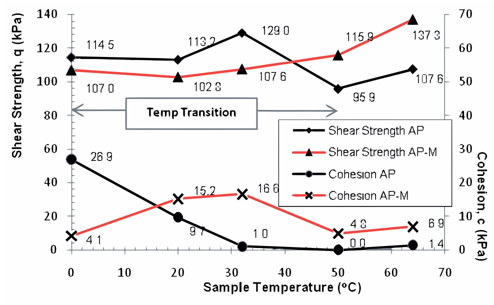

Figure 3 Triaxial shear strength of a synthetic track surface as a function of temperature.

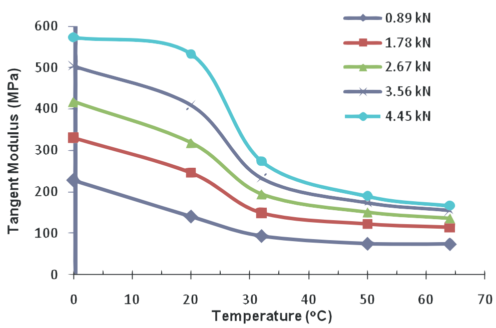

Figure 4 The effect of temperature on the tangent modulus at a range of loads.

Ideally, a wax surface would experience minimal and gradual changes in properties throughout the operational temperature range. A pure wax would have a distinct change in properties over a very narrow temperature range. However, wax modifiers can be added to the surface to help make the changes more gradual over a wider range of temperatures. Additionally, oil can be added to the wax to reduce stickiness. Two standard laboratory tests used for synthetic racing materials are the tangent modulus, which represents the hardness of the surface, and the triaxial shear, which determines the resistance of the surface to slide. Figure 3 shows the effect of temperature on shear strength and cohesion before and after the addition of a wax modifier. In Figure 3, the shear strength (top black line) initially increases as the track wax is melting, but then decreases as the temperature continues to rise.

The cohesion or "stickiness" (bottom black line) simply decreases as the temperature increases. The result is a track that is more prone to balling up at lower temperatures. In Figure 3 the red lines show the effect of adding a wax modifier to the track to improve consistency through temperature changes.

In Figure 4, the hardness of the track rapidly decreases after the predominant melting temperature is reached at five different loads. Most racing surfaces warm through a couple of common critical temperatures, such as 25ºC (77ºF), in which potentially significant changes in mechanical properties can occur.

Good Maintenance

While modification of waxes is one way to avoid these sorts of changes, almost any track can be managed with regular monitoring and proper maintenance. Simply watering the track to avoid reaching the temperature at which the changes occur will keep the track more consistent. Similarly, a deep harrowing or a cultivator in the morning can soften the track during the cooler morning hours. Water can also be used to help manage the stickiness that can be a problem on cold winter mornings.

While changes to the wax in synthetic surfaces present challenges, the temperature of the surface is generally the same on the entire surface. In contrast, moisture content of a dirt track can vary between locations. This important distinction makes synthetic surfaces an appealing option for some tracks.

This technical bulletin is based on the white paper "Racing Surfaces," available at the Racing Surfaces Testing Laboratory website: racingsurfaces.org/white_papers and at the Jockey Club website: grayson-jockeyclub.org/resources/White_Paper_final.pdf

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Racing Surfaces Testing Laboratory
Orono, Maine USA

Loading of the Hind Hoof Track Loading

Lars Roepstorff BVM, Ph.D. and Michael "Mick" Peterson, Ph.D.

Introduction

The 2000 pounds of force transferred from the front leg of the horse onto the track is often cited as the most extreme case for the loading of the track surface. However, the loading of the hind limb is also critical and may be more complex than the loading from the front leg. Since a horse primarily propels itself forward using its rear legs, not only does each leg sustain large vertical loads, but the leg, and therefore the surface, must also support propulsive forces or horizontal loading. In fact, when considering the performance of the horse, the hind limbs may be more important than the front limbs. In this technical bulletin, we discuss the force that the track surface must support for the safe performance of the thoroughbred horse at a gallop.

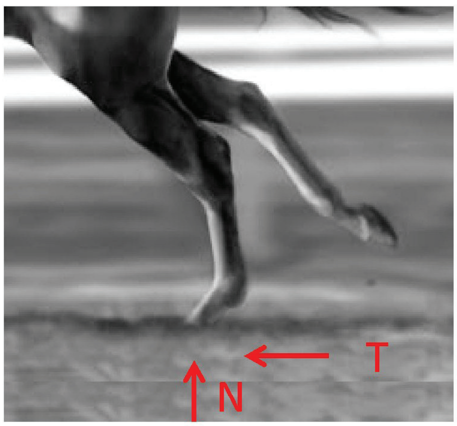

Figure 1: Forces in the tracks due to hind limb loading

Combined Vertical and Horizontal Loads

The two phases of the gait most relevant to the loading of the track are stance and breakover. During the stance phase of the gait, the hoof loads the soil with the entire dynamic weight of the horse, which may be divided between one or more legs at any moment in time. The track surface provides support for the hoof through normal force in the soil (N in figure 1), which may result in permanent or plastic deformation of the surface in the form of a hoof print as well as an elastic surface deflection that will rebound as soon as the load is removed. The amount of elastic response and the time it takes the surface to respond are sometimes referred to as "the bounce" or "the liveliness" of the track surface.

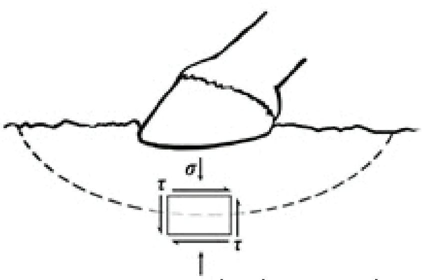

Figure 2: Stress in both axes is load divided by hoof area

The other critical phase of the gait for understanding the track surface is the horse's propulsion. During propulsion, the hind legs will push the horse forward with resistance or support provided by the racing surface. This force is horizontal, the shear force T in the figure 1, and is resisted by a supporting resistance to sliding in the track material. The force is applied over the area of the hoof to create a horizontal force per unit area, which is the shear stress, τ in the figure 2, or the vertical load per unit area which is the normal stress, σ, in the track surface. In synthetic, turf, and dirt surfaces, the support provided by the track surface may be

measured by the resistance to failure due to shear stress which exceeds the resistance of one layer of the track material to sliding on the adjoining layer. In the case of a highly compacted material, slip may occur on the top surface - similar to friction of a shoe on a hard floor. However, the track is sufficiently soft that the hoof penetrates the top of the surface and the sliding of the material typically occurs below the top surface where the shoe is in contact with the track.

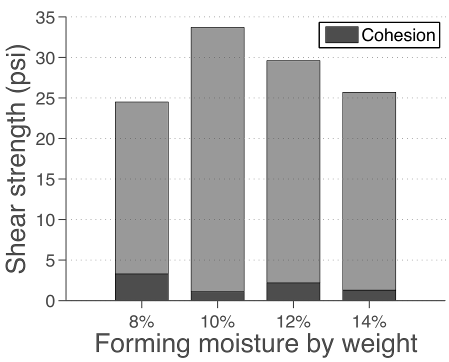

Figure 3: Dirt track material changes with moisture

Vertical and Horizontal Load and Soil Strength

The characteristic of the track that is of most interest for the support of the hind limb, both for safety and performance of the horse, is the shear strength. The

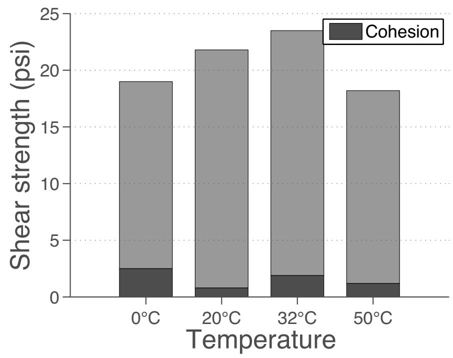

Figure 4: Synthetic track material changes with temperature

shear strength is the resistance of material slipping when loaded with the weight of the horse. Loading that is applied to samples of track material tested in the laboratory match these conditions during use. Test materials are loaded vertically (as with the weight of the horse), and then the resistance of the material to sliding is measured. Failure, or sliding of the material, replicates the slide that can occur in the soil beneath the hoof during the propulsion phase. The test used is called the triaxial shear test.

This test has been the subject of a recently published scientific paper that compared the response of several synthetic racing surfaces at different controlled temperatures in the laboratory (Bridge et. al. 2010). It also allows us to understand the effects moisture has on dirt tracks relative to shear strength. It is not unusual for a dirt surface to decrease its ability to support the propulsion of the horse by as much as 25% when only a 4% change in moisture content is exhibited (see figure 3). In synthetic racing surfaces, this effect is mirrored by a similar change of shear strength due to temperature (figure 4). Currently, no one can say that a particular measurement of shear strength leads to a safer surface. However, it is generally accepted that changes in shear strength due to changes in moisture or temperature should not be abrupt. It is also likely that a dramatic change between surfaces varying in shear strength used by a particular horse should be avoided. As more tracks are characterized, it is likely that trends will emerge so that triaxial shear strength will be one more tool used by racetrack superintendents to maintain a consistent surface and owners, trainers, and jockeys may utilize this information to make better choices for their horses. By controlling moisture and avoiding variation due to heating from the midday sun, a consistent track should be achievable for trainers and to help protect the safety of the horses and riders.

Footnote:

J. W. Bridge, M. L. Peterson, C. W. McIlwraith, and R. M. Beaumont, 2010, "Temperature Effects on Triaxial Shear Strength of Granular Composite Sport Surfaces", Journal of ASTM International, Vol. 7, No. 9 DOI: 10.1520/JAI103139

This technical bulletin is based on the white paper "Racing Surfaces," available at the Racing Surfaces Testing Laboratory website: racingsurfaces.org/white_papers and at the Jockey Club website: grayson-jockeyclub.org/resources/White_Paper_final.pdf

The white paper and report are the result of efforts by The Racing Surfaces Committee that was formed at the inaugural ***Welfare and Safety of the Racehorse Summit*** *in 2006.*

This Racing Surfaces Testing Laboratory Technical Bulletin for Track Surface Education is the first in a series of papers directed toward a general audience with a common interest in developing consistent and reliable track surfaces. This and subsequent bulletins can be found at the Racing Surfaces Testing Laboratory website: racingsurfaces.org/bulletins

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Predicting Horse Performance on Turf Using Three Commercially Available Monitoring Tools

Tamara R. Thomson, Christie A. Mahaffey, Ph.D.

Introduction

To accommodate differences in climate conditions and usage, there is variation in grass type, soil conditions and maintenance procedures between turf racetracks across North America and in Europe. On average turf tracks in North America are more heavily used than those in Europe, and the softer turf that is common in Europe likely could not withstand the racing frequency experienced in North America. However, horses will commonly travel to and race on different turf surfaces. Therefore, a standard rating method would be useful to help owners and trainers understand the surface on which a horse is training and racing.

In order to assess the usability of different turf rating methods, this report considers the influence of track conditions measured with three turf evaluation devices on race performance. While the top priority of the Racing Surfaces Testing Laboratory is the safety of the horse and rider, performance data is more readily tested. Over a period of one month, the pace of the winning horse or fastest work time was compared to measurements taken by three devices: a time domain reflectometry moisture meter, a penetrometer similar to those used in France and Australia, and a Going Stick, a device used by British Horse Racing that has also been adopted in a number of other countries. In this bulletin, the relationship between turf track condition measurements and horse performance for a semi-arid coastal climate is explored.

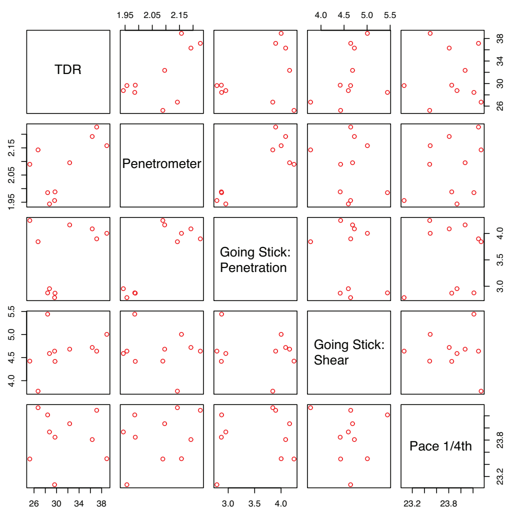

Figure 1 (shown above) is a multiple regression graph of the daily averages of the data.

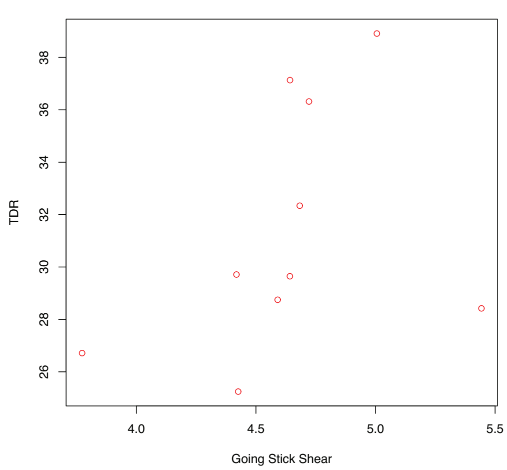

Figure 2 (shown above) is the portion of the grid graph that shows TDR on the Y-axis and shear on the X-axis.

Measurements

Moisture content, shear strength, and penetration resistance measurements were taken over a period of 23 days on a North American turf Thoroughbred racetrack.

Measurements were taken with three devices. The Going Stick measures both penetration resistance and shear strength by plunging a probe into the surface and then rotating about the base. The Time Domain Reflectometry (TDR) probe measures moisture content. The device consists of two spikes that are pushed into the surface and the moisture content is measured based on the transit time of the electromagnetic wave over the length of the spikes. The penetrometer measures penetration resistance. This device consists of a weight dropped onto a 1-cm2 rod, which penetrates into the surface. The depth of penetration is read off of the shaft.

All data collection began in the chute of the turf track. Data locations were spaced evenly in the chute and around the oval. The locations consisted of three individual data points taken at 3 ft, 7 ft, and 12 ft from the rail. With 51

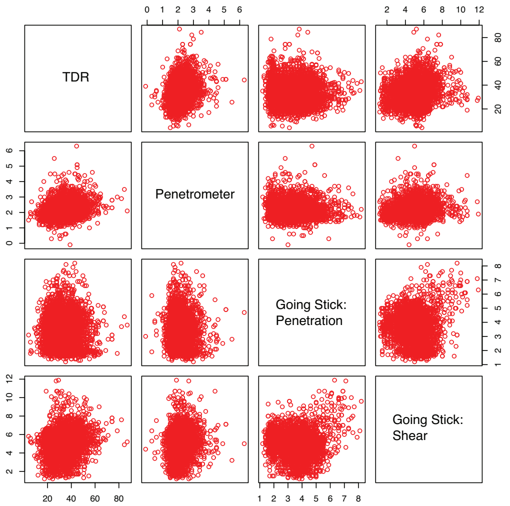

Figure 3 (shown above) is a multiple regression graph of the data.

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locations around the track, a total of 153 data points were measured daily with each device. Each device was used with a consistent technique to minimize variation in the data collection. The Going Stick was pushed into the surface by a foot on the device and then pulled back to a 45 degree angle. The TDR probe was pushed into the surface with the one hand and then the data collection button was pressed. The penetrometer data was collected by pushing the plate onto the surface by foot and then triggering the weight to fall. Over the same period, the winning sprint times for all races 8.5 furlongs or shorter were recorded, as well as the fast work times for each day with the pace of each horse determined.

Statistical Analysis

Using these measurements and times, a correlation matrix was built using the averages of the measurements and times for each day. This showed that there was no correlation between the pace and the measurements. In addition, the test showed that there was no correlation among any of the measurement variables. A multiple regression was also run on the data. In this test, the pace was the dependent variable and the various measurements were independent variables. This test showed no linear or quadratic relationship between any of the variables and the pace.

Matrix graphs provided a visual check for these findings. Figure 1 is a matrix of graphs based on average values for each day. Each individual graph is the intersection of the two variables of interest. Figure 2 is an enlarged version of the graph located at the intersection of TDR moisture data and Going Stick shear strength data. The graphs below the diagonal are duplicates of those above the diagonal. Figure 3 is a grid of graphs that displays all of the measurement data. From these graphs no relationship is evident between the measurements. The data points form blotches with no discernible connection or dependence.

Conclusion

Based on the statistical analyses, horse performance cannot be predicted from these measurements of track conditions. While track conditions impact horse performance, most of these changes are related to moisture content. With data collected over 23 days from a racetrack in a semi-arid region with no rainfall, there is no evidence of a link between track condition and horse performance. It is likely that this result would not apply to areas with regular rainfall, but in this particular case, the predictions of performance are not supported.

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RACING SURFACES TESTING LABORATORY
Technical Bulletin #5 for Track Surface Education (February 2015)

Racing Surfaces Testing Laboratory
Orono, Maine USA

The Durability of Sand Constituents in Dirt Racetrack Surface Materials

Julia Bradson, Eliza M. Cronkite, M.S., Christie A. Mahaffey, Ph.D.

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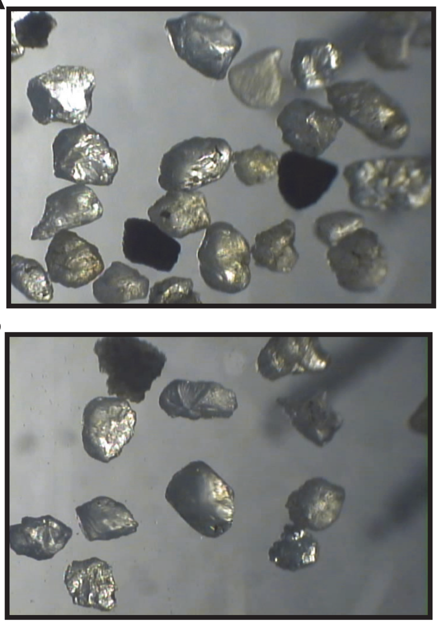

FIGURE 1: Sand with high percentage of quartz (~80%). A) Before abrasion resistance test and B) after.

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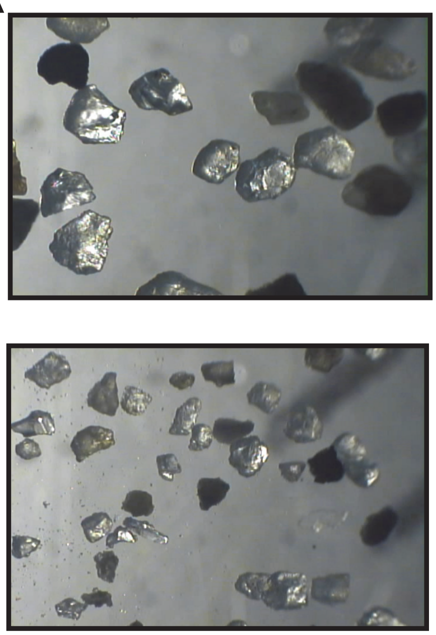

FIGURE 2: Sand with low percentage of quartz (~3%). A) Before abrasion resistance test and B) after.

Introduction

Amending and replacing racing surface material are necessary parts of track maintenance. Documentation of this process is often limited and material types differ between racetracks based on climate and local conditions. Therefore having improved data regarding the constituents of the surface material can help track superintendents better justify materials needed for track maintenance.

The mechanics of dirt racing surfaces are dependent on the moisture content and the composition of the material. Sand mixtures with smaller pores behave differently than sand mixtures with larger pores, retaining more moisture between grains. As a surface material changes due to wear, the moisture content necessary to maintain shear strength and compaction also changes. The sand becomes smaller and the fine material from the wear process can fill the pores. The change in the mechanical properties of the surface materials is critical to providing the required biomechanical properties for the horse.

The rate at which changes in the sand occur depends on mineral content and the shape of the sand grains. Sand with a high percentage of silica, typically in the form of quartz, is much more resistant to weathering and abrasion due to the level of hardness of quartz. More rounded sand will also tend to be more durable. With the frequent harrowing and heavy traffic on a racetrack, the changes to the sand grains from abrasion can occur quickly depending on the type of sand. The selection of more durable sand, if available, is usually the preferred method of avoiding these issues. However, if more durable sand is not available, frequent amendment of material and management of lost fine material is critical to the maintenance of a consistent racing surface.

Abrasion Resistance Testing

The selection of more durable and consistent sand can dramatically reduce changes to a track surface. Racing Surfaces Testing Laboratory (RSTL) has adopted and revised a sand durability test using a Micro-Deval apparatus, commonly used by the Department of Transportation. This abrasion resistance test allows for quantification of the durability of dirt track surface materials.

Abrasion resistance testing measures the abrasion resistance and durability of the sand used in a track surface. The quality of the sand is determined by the abrasion loss when a material is combined with water and an abrasive force. Track material undergoes mechanical abrasion using calibrated steel balls in the Micro-Deval apparatus. This allows for calculation of the percentage of material lost by comparing the weight of the sample before and after abrasion. Like the wear processes of the sand on the racetrack, the metal balls wear in the test apparatus and lose material in the same way that the harrow teeth and horse shoes wear. This

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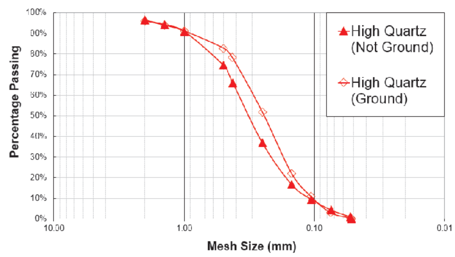

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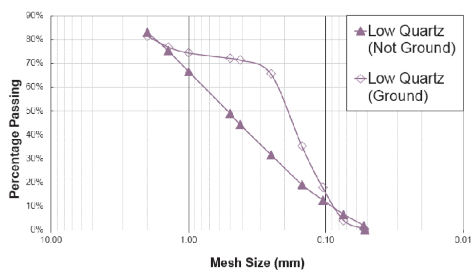

FIGURE 3: The amount of change in a track material as a result of abrasion resistance testing. A) Sediment with a high percentage of quartz (approximately 80%), and B) low percentage of quartz (approximately 3%).

wear is addressed by weighing the balls before and after each test.

These test results are useful when evaluating the hardness of a material like the sand on a track which is worn by abrasive processes such as harrowing and horse traffic. By measuring changes in the size and the type of material created from the wear, it is possible to determine if the material used on a track will require frequent amendments. Abrasion resistance testing also reveals some interesting information on the effects of abrasion when looking at mineral shape and grain size. In the scientific literature, it has been demonstrated for samples of the same mineralogy, flat or angular particles will have more material loss due to abrasion. Wear of the particles is due to chipping of corners.

Mineralogy

Test results indicate the mineralogy of a sample as a key component to the abrasion resistance of a track surface material. The mineralogy is determined using x-ray diffraction (XRD). Quartz is one of the hardest minerals in sand, and therefore resists abrasion. Sand with a high percentage of quartz is less likely to lose material due to abrasion than those with low percentages of quartz. The particle size distribution before and after abrasion testing for two track materials is shown in Figures 1 and 2. Figure 3 compares percentages of quartz and the amount of changes to the sediment sample as the result of testing. Sand with a higher percentage of quartz is clearly more durable and results in less generation of fine materials.

Conclusion

Dirt tracks with higher percentages of quartz and sub-rounded sand grains are more resistant to abrasion and therefore resist degradation of the track surface. Conversely, track surfaces with lower percentages of quartz or angular grains will require replacement of the surface material more frequently and may generate fine material that leads to compaction of the surface. XRD and abrasion resistance testing, in combination with sieve and hydrometer testing, provides highly valuable data as to how readily a track surface material degrades. Dirt tracks in North America have a wide range of quartz content (40-90%). Quantifying the durability of the sand used for the tracks can help determine the proper maintenance and required monitoring of the surface. The result can help to improve the consistency of the surface and provide trainers, riders and jockeys a fair and consistent surface for racing and training.

Acknowledgements

Support from the Los Angeles Turf Club Inc. for the development of the sand durability protocol and the purchase of durability test equipment is greatly appreciated.

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Equestrian Surfaces Part I – Sand Specifications

Maren Stavermann, Ph.D and Elin Hernlund, D.V.M.

Introduction

Sand is the key footing component of most horse-riding arenas. In this respect, fundamental knowledge of sand specifications is essential for a deeper understanding of the mechanical properties of equestrian surfaces. Sand is a complex material comprising variable fractions of sand grains with a distinct mineralogy and pore space filled with air and water. The relative fractions of these components greatly influence the mechanical properties of the arena surface and thus distinguish good from bad arena sands. In this context, sand shape, size, sorting and mineralogy plays an important role.

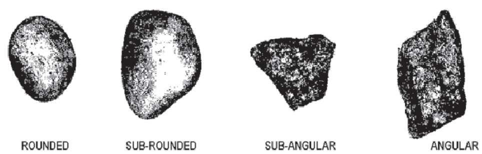

FIGURE 1 Variations in sand shape, a schematic overview of main categories.

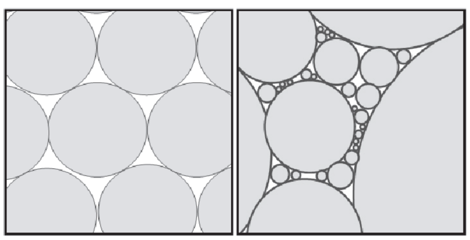

FIGURE 2 Different sand size and distributions lead to variations in pore size.

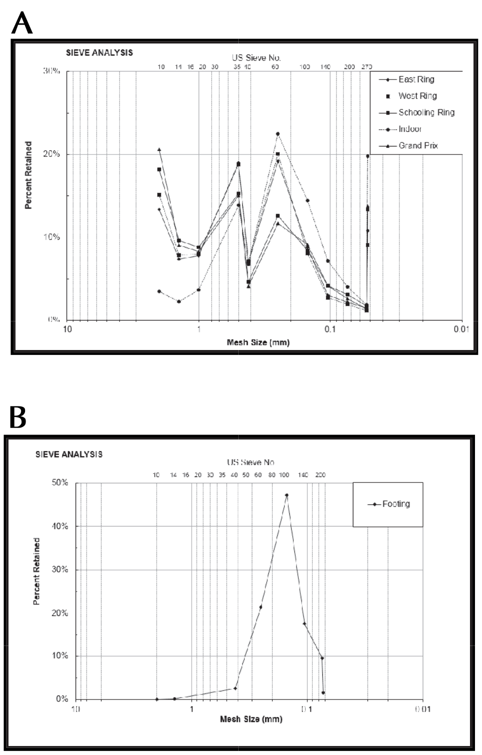

FIGURE 3 Sieve analysis examples.
a) Sand arena surface with poor performance properties. b) Well-functioning sand and artificial fiber arena surface.

Sand Shape

Microscope analysis is used to identify sand shape and divide it into four main categories as shown in Figure 1. In a natural environment, sand originates from eroded rocks. Prolonged time spent on transport and tumbling by water during deposition typically forms a sub-rounded to round shape of the grain. Manufactured sand is artificially produced by crushing rocks mechanically into smaller fractions forming more angular grains. The shape of sand grains influences the cushioning of the footing and the resistance of the surface to slip when loaded with the horse's weight (shear strength). Angular grains increase the friction between grains compared to more round ones. This results in increased shear strength but also in increased abrasion on hooves or hoof shoes due to their sharp surfaces. Furthermore, the more angular-shaped the grains are the higher is the tendency to break and introduce fine materials which will cause the surface to compact and create harder footing. Sub-angular particles offer a good solution to prevent rolling effects but promote elasticity.

Sand Sizes

The sand size refers to the diameter of the particle denoted in mm or U.S. sieve size. Sand is larger than clay (diameter ≤0.002 mm) or silt (0.002-0.063 mm), also denoted as "fines", and smaller than gravel (2-63 mm). It is important to note that the crucial parameter of arena sand is the size of the pore space between sand grains, which directly depends on the sand grain size and size distribution (Figure 2). Smaller pores are a result of either having very small grains evenly distributed or of having particles ranging from large to very small grain sizes. The size of pores influences the ability of water to permeate the surface and will also influence the way in which water will hold the grains together. In general, sand with small pore spaces will compact more easily with negative impacts on drainage and elastic properties of the footing. Larger pores formed by large rounded sand grains of the same size lead to a very unstable surface with poor shear strength. Thus, finding a good compromise between too small or too large pore sizes is desirable. Hence, careful consideration not only of sand grain size but also of sand sorting is essential for achieving optimal mechanical properties of the arena footing.

Sand Sorting

A standard method to determine the particle size distribution is the sieve

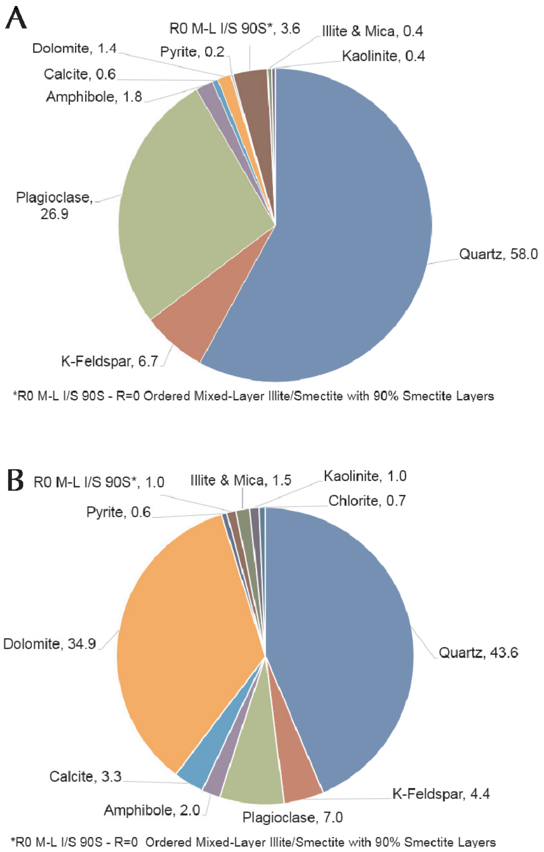

FIGURE 4 X-ray diffraction analysis of sand mineralogy. a) High percentage of hard silica minerals such as quartz, feldspar (including plagioclase), amphibole, and phyllosilicates (clay) creates durable sand. b) Less durable sand is formed by grains with a high proportion of soft carbonate minerals such as calcite and dolomite.

This technical bulletin is part of a series of papers directed toward a general audience with a common interest in developing consistent and reliable surfaces for equestrian sports. You can find more information on the subject in the Equine Surfaces White Paper and in Equestrian surfaces –a guide. Both documents are published by the Fédération Equestre Internationale (FEI) available on the FEI Website http://www.fei.org/fei/about-fei/publications/fei-books

These documents are a collaboration between experts from the UK, the United States, Sweden, Canada and Germany representing six universities, three equine research and centers, and sport representatives. The latest data and published scientific papers on arena and turf surfaces, and the effects on horses in training and in competition are summarized for a general audience.

separation test using a series of sieves as described in standard test methods (ASTM 2007). The mass of sand in each sieve is recorded at each step until the remaining particles in the lowermost catch pan (< 0.0037 mm) are assumed to be fine silt and clay sized particles. These parts can be further analyzed using the wet sieve test, hydrometer test, or x-ray diffraction method discussed in technical bulletin #1 for track surface education. Results of the sieve separation test are commonly presented as a chart showing the percentage distribution of the material that has passed through the sieves as a function of the respective sieve size (Figure 3). Footings with sand particles that are all nearly the same size resist compaction but may have insufficient grip and the tendency to feel deep. In contrast, sandy materials with a broader grain size distribution which may include a larger proportion of very fine silt or clay will have high shear strength but will compact, leading to a hard surface with poor drainage properties.

Most sand arenas use sand size distributions with no more than 2 peaks in the range of sieve #10, 35, 60 and 100 (Figure 3a). To achieve both, low compaction and high shear strength, artificial fibers can be used. Fiber allows the arena to have higher shear strength by increasing the binding between sand particles while maintaining open pores. Arenas which use fine and coarse fibers (usually around 2.5 % mass percentage) and a very small amount of fine material (clay <2 %, silt <6 %) can both minimize compaction and minimize dust. A typical sieve analysis chart of such an arena shows only one peak of sand distribution in the range of 0.06-0.2 mm, sieve #70-230. Figure 3b shows an example of a very well-functioning dressage arena footing with a peak at 0.15 mm, sieve #100.

Sand Mineralogy

Sand originally derives from rocks with certain mineralogy depending on the regional geology. The mineralogical composition of sand can be analyzed by x-ray diffraction (Figure 4). According to the hardness of the source mineral, wearing from maintenance and horse traffic can either break large grain particles into smaller angular particles or grind angular into rounded grains. These effects lead to an increased production of smaller sized particles that tend to compact and harden the surface. A high portion of quartz (SiO_2) forming hard silica sand makes the surface more resistant to wear. Hence, many well respected arenas use a high amount of sub-rounded silica sand (up to 98 %) which is very consistent in size. This is then mixed with fiber to produce a surface with adequate shear strength and a low risk of compaction.

Conclusion

Choosing the “right” sand for an optimal arena is not straight-forward. This is not only because the type of available sand is limited to what is regionally supplied. An additional important role is played by the arenas design and purpose as well as the types of additives used in the footing. Moreover, the maintenance of the footing is key. This intricate matter is the subject of an upcoming consecutive series of publications in these technical bulletins.

ASTM, 2007, Standard Test Method for Particle-Size Analysis of Soils, ASTM Standard D422 – 63, West Conshohocken, PA.

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The Importance of Continuing Education

The Importance of Continuing Education
The New York Racing Continuing Education Program

Scott E. Palmer, V.M.D., A.B.V.P.
New York State Equine Medical Director

Continuing education is a lifetime commitment by individuals to learn current developments in the science, technology and economics of a profession. Currently continuing education is required of most health professionals, including veterinarians, physicians, dentists, pharmacists, nurses, physical therapists, technicians and social workers. These individuals are responsible for making daily job-related decisions that impact the health and welfare of their patients. Horse trainers routinely make daily decisions that impact the health and welfare of horses and jockeys, yet in most jurisdictions there is currently no requirement for racehorse trainers to obtain continuing education.

The goals of trainer continuing education are (1) to generally increase the level of trainer expertise (2) to help reduce equine and rider injuries (3) to raise the standard of equine health care (4) to improve the general quality of horsemanship in the stable and (5) to provide information that will help horse trainers to be successful in an increasingly complex and challenging business environment.

Nine years ago the Welfare and Safety Summit identified a need for continuing education for those who work with horses. In 2009 the Association of Racing Commissioners International approved a Model Rule that requires at least 4 hours of trainer continuing education per calendar year. In 2013 a National Horseman's Benevolent Protection Association survey reported that 87% of their members favored trainer continuing education and that 79% preferred on-line programs. In 2014 the Welfare and Safety Summit reported the formation of the "Advanced Horsemanship" program, an alliance between the Grayson Jockey Club and the North American Racing Academy to produce on-line continuing education. At this time there are efforts being made to create trainer continuing education programs in Indiana, Washington, Colorado, California, Kentucky and New York.

In January of 2014 the New York State Gaming Commission (NYSGC) began discussions with the Dean and the faculty of the Cornell University College of Veterinary Medicine to create a continuing education program for trainers. During that same year Cornell University opened the Cornell Ruffian Equine Specialists (CRES) facility adjacent to Belmont Park, an affiliate Center for Equine Sports Medicine & Critical Care. In the past 18 months 7 live continuing education topics have been presented at the CRES facility or at Belmont Park. Topics presented at these programs included lameness, colic, regenerative therapy, upper airway conditions, fracture repair, understanding risk factors and prevention of breakdown injuries.

The current NYSGC plan for providing trainer continuing education includes the following steps:

- Adopt the ARCI Model Rule for trainer continuing education to take effect in January of 2016.

- Collaborate with Cornell University to provide free bi-monthly live continuing education events in 2015 for owners and trainers at the CRES facility in Elmont New York and at race tracks throughout the state.

- Enlist the Cornell faculty who present these live continuing education sessions to work with the staff of the Advanced Horsemanship program to create on-line modules on these subjects for general use nation-wide.

- Explore a partnership with Veritas, a current collaboration between Cornell University College of Veterinary Medicine, Texas A&M College of Veterinary Medicine and Zoetis Corporation in creating web-based, peer-reviewed continuing education modules, using interactive, experiential, case-based technology (www.veritasdvm.com).

- Investigate the potential for creating a horse trainer continuing education program as a component of eCornell, Cornell University's online learning subsidiary(www.ecornell.com). eCornell is a fee-based certificate program that provides instructor-facilitated, self-paced, flexible online education.

The current priorities of the New York Racing Continuing Education Program are to present live continuing education events in New York and to collaborate with the Advanced Horsemanship Program to create an inventory of free training modules to supplement those already available. In the future, the Commission will explore the potential for collaborating with existing distance learning programs at Cornell University to produce more sophisticated fee-based educational opportunities.

After 9 years of discussion, planning and consensus-building, it is clear that trainer continuing education is a priority for the racing industry. At this point the core elements are in place to organize a successful national program. Peer-reviewed content is now available. State Regulators are urged to consider adoption of the ARCI Model Rule requiring trainers to acquire at least 4 hours of continuing education per calendar year and to establish databases to house the certificate information. Horseman's organizations should be encouraged to help identify subjects for new training courses and to provide opportunities for presentation of live continuing education sessions during their regular meetings.

Bone and Bisphosphonates

One on One with Dr. Larry Bramlage

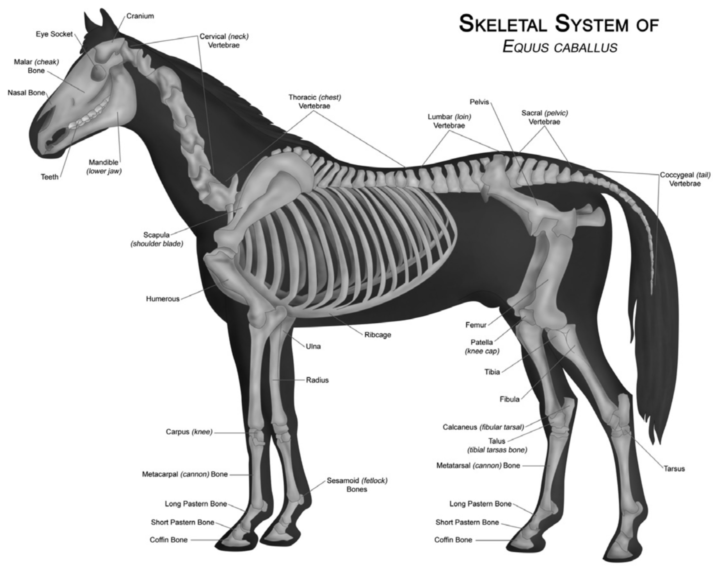
Bone and Bisphosphonates

Published by Grayson-Jockey Club Research Foundation co-sponsor
of the July 8th Welfare and Safety of the Racehorse Summit

Bone is a very dynamic and metabolically active tissue. This metabolic activity supports a continual turnover of bone that is essential for its function of supporting the horse's body through a wide range of activities. Exercise is an essential ingredient for the development of a robust skeleton through bone remodeling. Remarkably, bone is both strong and pliable. This apparent contradiction occurs as a result of a critical balance between the mineral (calcium) and organic (collagen and chondroitin sulfate) components of bone. An increase in mineral content can make the bone stronger, but may also make the bone increasingly brittle as the high mineral content displaces organic components making the bone less pliable.

The forces that bones experience, in the form of exercise, largely determine the balance of mineral and organic content. There are two types of cell within bone that balance the "teeter-totter" of bone turnover. These cells, osteoblasts and osteoclasts, are the gatekeepers of bone turnover and essential for bone remodeling. Osteoblasts are the builders of bone – easy to remember as the B's go together. These cells synthesize new bone. Osteoclasts resorb bone to enable osteoblasts lay down new bone matrix where it is needed. Bone remodeling requires time and the bone to be conditioned to withstand the forces placed upon it. For example, research has demonstrated that intermittent short bursts of fast exercise allowed the shins of young racehorses to remodel more appropriately than with daily slower work, resulting in a significantly lower incidence of bucked shins.

Recently, two drugs new to the equine veterinary field have been licensed by the FDA. These bisphosphonate drugs are named Tildren® (tiludronate) and Osphos® (clodronate). Both of these drugs are older generation bisphosphonates, but newer, more potent 'family members' are emerging. This class of drug has been used in recent decades in post-menopausal women with osteoporosis and younger patients with very severe bone diseases to stop bone resorption.



Bisphosphonates are drugs that mimic the substances cells need to make energy. After administration they are rapidly excreted from the body through the kidney. A fraction of the drug becomes tightly adhered to the vast mineral component of bone. These molecules lodge there unchanged for several months to years. Osteoclasts absorb the attached bisphosphonate molecules as they resorb bone matrix as part of the natural remodeling and turnover process. The absorbance of bisphosphonate results in the death of the osteoclasts – thus debilitating one arm of the bone turnover and remodeling process for months to years.

In elderly women with the crippling disease of osteoporosis and cancer patients with erosive metastatic bone tumors, bisphosphonates have provided significant relief by reducing bone resorption. However, over time the side effects of these drugs that have been noted have led physicians to prescribe them less liberally.

Side effects include atypical long bone fractures, jaw necrosis, atrial fibrillation, and kidney disease. The unusual long bone fractures, mostly of the femur, have caused grave concern in the medical profession as some have been life threatening. These fractures have been attributed to abnormal bone density and pliability as a result of bisphosphonate inhibition of the normal bone turnover process. The other major side effect seen in bisphosphonate patients has been profound jaw necrosis, many times being noted some considerable time after the drug was administered. These patients have suffered with dramatic and seemingly unstoppable loss of jaw bone tissue and the teeth residing in it. The finding of an unexpectedly high incidence of atrial fibrillation in bisphosphonate patients is equally of concern, if less common. The mechanism of this side effect is also poorly understood, but off target activity of bisphosphonates cannot be ruled–in, or ruled-without further research. Bisphosphonates are excreted by the kidney. Like many drugs excreted by the kidney, bisphosphonates can cause kidney damage. Life-threatening or extremely painful diseases that have few effective treatment options, can mean that the risk of unpleasant side effects must be accepted. However, these severe side-effects have led to more circumspect use of bisphosphonates in the human medical field.

In horses, tiludronate has been explored as a drug to modify pain and bone pathology related to navicular syndrome. The research was performed on horses four years and older and suggested that some horses may have experienced relief at the higher dose used in the study. No research has been performed looking at the effects of these drugs on younger horses or racehorses in training. Recently, bisphosphonates have gained some 'off-label' use in younger horses for sesamoiditis. Given the duration that bisphosphonates remain present in the bone, administration at this early age has the potential to subvert the essential bone remodeling that must occur during training.

Disarming one side of the delicate balance of bone turnover and remodeling could have far reaching consequences on racehorses long after the drug's administration. From our present, very limited understanding of bisphosphonates we do not know how safe they are in the short-, medium-, and long term for young horses or the racehorse population. Physiologically, bones need both osteoblastic and osteoclastic cell activity to attain the dynamic and delicate balance of mineral density and pliability necessary for healthy, training adapted bones.

FDA approval of any drug can be a welcome event, however, the specific details of the licensure and the appropriate clinical application always require careful consideration. Bisphosphonates have been approved for use in humans for decades, and analysis of cumulative data has refined their clinical application. At the present time the short, medium, and long term effect of bisphosphonates on the skeleton of racing age horses is undetermined. It is critically important that the ramifications of these drugs in racing age horses are understood to prevent their use from becoming the horse's nemesis.

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Post Mortem Panel

Evaluation of catastrophic musculoskeletal injuries in Thoroughbreds and Quarter Horses at three Midwestern racetracks

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Objective—To determine the incidence of and compare the types of catastrophic musculoskeletal injuries (CMIs) sustained in Thoroughbreds and Quarter Horses during racing at 3 Midwestern racetracks from 2000 to 2006.

Design—Retrospective cohort study.

Animals—139 Thoroughbred and 50 Quarter Horse racehorses euthanized because of CMIs.

Procedures—Veterinary officials from 3 Midwestern racing jurisdictions provided injury reports for Thoroughbreds and Quarter Horses that sustained CMIs (which required euthanasia) and the total number of race starts for each year. The number of CMIs/1,000 starts was determined for each racetrack. Past performance reports for each horse with a CMI were evaluated.

Results—The total number of race starts (both breeds) at the 3 racetracks from 2000 through 2006 was 129,460, with an overall incidence of 1.46 CMIs/1,000 race starts. Incidences of CMIs among racetracks were similar. Of horses that sustained a CMI, the median age of Thoroughbreds at first race was 3 years, compared with a median age of 2 years for Quarter Horses. A larger proportion of Thoroughbreds sustained a CMI in a claiming race than did Quarter Horses, and a larger proportion of Quarter Horses sustained a CMI in a futurity trial than did Thoroughbreds. The most common site for CMIs in Thoroughbreds was the left forelimb (69/124 [55.6%]), whereas most CMIs in Quarter Horses involved the right forelimb (18/30 [60.0%]).

Conclusions and Clinical Relevance—Differences identified between CMIs in Thoroughbred and Quarter Horse racehorses should allow veterinarians to focus on horses and anatomic regions of greatest risk of CMI during racing. (*J Am Vet Med Assoc* 2011;239:1236–1241)

Injuries sustained by equine athletes in the Thoroughbred and Quarter Horse racing industries are a concern to those within the business and to the public viewers of the sport. Catastrophic injuries to racehorses have encouraged jurisdictions to determine their CMI incidence and have stimulated investigation in an attempt to identify the factors that may contribute or predispose these horses to severe injuries.[1–9] A number of racing jurisdictions have been thoroughly studied[3,4,10–12]; however, there is little information published from the smaller racing jurisdictions in the Midwest.[13,14] Midwestern racing jurisdictions catering to smaller breeding and training operations are important to consider in gauging the health and safety of racehorses across the country.

Midwestern horseracing venues are jurisdictions that often have smaller racing stables and where the horses are of lesser financial value. To date, there has been minimal information available about CMIs in these smaller racing jurisdictions. The CMI incidence of this population may be different than those previously reported.

The purposes of the study reported here were to describe the incidence of CMIs for both Thoroughbred and Quarter Horse racehorses at 3 Midwestern racetracks and to determine whether there are differences in the incidence of CMIs among these 3 facilities. Additional purposes of this study were to evaluate a number of factors that may affect the occurrence of CMIs, describe the horse populations, compare Thoroughbred and Quarter Horse racehorses that sustained a CMI, and determine whether there are differences between these populations for the factors evaluated. Each of the 3 racetracks included in this study conducted both Quarter Horse and Thoroughbred race meets either jointly or at separate times during the year. There is little information available concerning CMIs in Quarter Horse racing,[15,16] and the facilities evaluated in this study provided an opportunity to compare Thoroughbred and Quarter Horse racing injuries.

ABBREVIATION

CMI	Catastrophic musculoskeletal injury

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Materials and Methods

Three Midwestern racetrack facilities (ie, Prairie Meadows Racetrack in Altoona, Iowa; The Woodlands Racetrack in Kansas City, Kan; and Remington Park Racetrack in Oklahoma City, Okla) were chosen for this study on the basis of their interest in participating and willingness to provide complete injury records. Records from 2000 through 2006 for Prairie Meadows Racetrack and Remington Park Racetrack and from 2002 through 2006 for The Woodlands Racetrack were obtained. For both Thoroughbreds and Quarter Horses, information on total race starts and CMIs and additional information for each horse with a CMI and each race during which a CMI occurred were documented. For this study, a CMI was defined as an injury necessitating euthanasia by the attending racetrack veterinarian either during or immediately following a race. Catastrophic musculoskeletal injuries that occurred during training hours were not included. Horses not euthanized were considered to have noncatastrophic injuries and were not included. Catastrophic musculoskeletal injuries included those involving bones, tendons, and ligaments. Racing fatalities due to pulmonary hemorrhage or cardiac problems were not included in this study. Horses must have started the race (left the race gate) before incurring the injury to be included in the study. A past performance history was acquired for each horse with a CMI from a national Thoroughbred and Quarter Horse racing reporting system.[a] In addition, each racetrack or their referring veterinary institution supplied available documentation on pathologic findings detailing the type of musculoskeletal injury sustained and the total number of Thoroughbred and Quarter Horse starters for the race meets included in the study.

The following variables were recorded for each horse entered in the study: study identification number, horse information (name, owner, trainer, and jockey), date of injury, breed (Thoroughbred or Quarter Horse), racetrack (Prairie Meadows Racetrack, The Woodlands Racetrack, or Remington Park Racetrack), sex (sexually intact male, gelding, or female), age when the CMI occurred (years), racetrack surface (dirt or turf), racetrack condition (dirt: fast, good, sloppy, or muddy; turf: firm or good), race distance (yards for Quarter Horses and furlongs for Thoroughbreds), number of horses in field, type of race (maiden or maiden special weight, maiden claiming, allowance, claiming, derby or futurity trial, and stakes race or handicap), purse (dollars), weight carried (pounds), post position in the race where injury occurred, lifetime earnings (dollars), total lifetime race starts, age at first race start (years), limb injured, type of injury (fracture or soft tissue), anatomic structure injured, and prerace medication (phenylbutazone, furosemide, or both).

Statistical analysis—All data were entered into a spreadsheet[b] and imported into a statistical software package[c] for analysis. The overall CMI incidence per racetrack, year, and breed were calculated by dividing the number of CMIs of each group by the total race starts for the group and multiplying by 1,000. Then, the binomial response of the number of CMIs/1,000 race starts was analyzed by use of logistic regression, with racetrack, year, and breed as explanatory variables. Multiple linear regression was used to analyze the relationship between the number of CMIs and the explanatory variables including racetrack, year, breed, and the number of race starts. An ANOVA model was used to analyze the number of race starts, with racetrack, breed, and their interaction as explanatory variables.

To identify differences for categorical variables between Thoroughbred and Quarter Horse racehorses with CMIs, the Fisher exact test was used. For comparison of quantitative variables, equality of the variance was determined. For those with similar variance between groups, 2 sample *t* tests were applied and the Satterthwaite *t* test with unequal variance was reported for those with unequal variance. Values of $P \leq 0.05$ were considered significant.

EQUINE

Results

CMI incidence—The total number of race starts at the 3 racetracks from 2000 through 2006 was 129,460 for Thoroughbreds and Quarter Horses combined, with an overall incidence of 1.46 CMIs/1,000 race starts. There were a total of 139 CMIs in Thoroughbreds for a CMI incidence of 1.48 and 50 CMIs in Quarter Horses for a CMI incidence of 1.36.

There were 54,279 race starts at Prairie Meadows Racetrack from 2000 through 2006 with 70 total CMIs, yielding an incidence of 1.29 CMIs/1,000 race starts. The total number of Thoroughbred race starts at Prairie Meadows Racetrack during the study period was 42,615 with 56 CMIs, yielding an incidence of 1.31 CMIs/1,000 race starts. At the same racetrack, there were 11,664 Quarter Horse race starts with 14 CMIs, yielding an incidence of 1.20 CMIs/1,000 race starts.

There were 12,212 race starts at The Woodlands Racetrack from 2002 through 2006 with 20 total CMIs, yielding an incidence of 1.64 CMIs/1,000 race starts. The total number of Thoroughbred race starts at Prairie Meadows Racetrack during the study period was 8,645 with 15 CMIs, yielding an incidence of 1.74 CMIs/1,000 race starts. At the same racetrack, there were 3,567 Quarter Horse race starts with 5 CMIs, yielding an incidence of 1.40 CMIs/1,000 race starts.

There were 62,949 race starts at Remington Park Racetrack from 2000 through 2006 with 99 total CMIs, yielding an incidence of 1.57 CMIs/1,000 race starts. The total number of Thoroughbred race starts at Prairie Meadows Racetrack during the study period was 41,433 with 68 CMIs, yielding an incidence of 1.64 CMIs/1,000 race starts. At the same racetrack, there were 21,516 Quarter Horse race starts with 31 CMIs, yielding an incidence of 1.44 CMIs/1,000 race starts.

When the number of CMIs/1,000 race starts were analyzed, there was no significant effect of year ($P = 0.908$), racetrack ($P = 0.407$), or breed ($P = 0.420$) on CMI incidence. The only significant ($P < 0.001$) effect on the number of CMIs at a racetrack was the number of race starts at a racetrack. There was a significant ($P < 0.001$) difference in the number of race starts among racetracks, a significant difference ($P < 0.001$) between the number of Thoroughbred race starts versus Quarter Horse race starts, and a significant ($P < 0.001$) interaction between the breed (Thoroughbred and Quarter

Horse) and racetrack. At The Woodlands Racetrack, there were fewer race starts than at Prairie Meadows Racetrack ($P < 0.001$) and Remington Park Racetrack ($P < 0.001$) and overall fewer Quarter Horse race starts than Thoroughbred race starts ($P < 0.001$).

Characteristics of injured horses—Complete information was available for 124 of 139 Thoroughbreds and 30 of the 50 Quarter Horses that had a CMI. Thoroughbreds had equal numbers of geldings (49/124 [39.5%]) and females (49/124 [39.5%]) and fewer sexually intact males (26/124 [21.0%]) that sustained a CMI. The distribution of Thoroughbreds was not significantly (P = 0.248) different from that of Quarter Horses, for which the highest number of CMIs occurred in geldings (17/30 [56.7%]), compared with females (9/30 [30%]) and sexually intact males (4/30 [13.3%]). Thoroughbreds were older (median, 4 years; range, 2 to 9 years) than Quarter Horses (median, 3 years; range, 2 to 7) at the time of CMI, but this difference was not significant (P = 0.056). Only 6.5% (8/124) of CMIs in Thoroughbreds occurred when they were 2 years old, with most occurring at 3 years of age (51/124 [41.1%]) and fewer at 4 years of age (33/124 [26.6%]). Two-year-old Quarter Horses sustained 30% (9/30) of the CMIs among this breed, with 26.7% (8/30) of CMIs occurring at 3 years of age and 23.3% (7/30) of CMIs occurring at 4 years of age. There were 10 CMIs in Thoroughbreds that occurred on a firm turf course, which constituted all of the data included in this study for turf events. Among the CMIs that occurred on a fast-racing dirt racetrack surface, 89.4% (102/114) occurred in Thoroughbreds and 83.3% (25/30) occurred in Quarter Horses (P = 0.434).

As expected, there was a significant ($P < 0.001$) difference in race distance between Thoroughbreds and Quarter Horses. The races in which Thoroughbreds sustained a CMI were longer (median, 6 furlongs [1,320 yards]; range, 5 to 10 furlongs [1,100 to 2,200 yards]), compared with those of the Quarter Horses (median, 350 yards; range, 100 to 870 yards). Most Thoroughbreds that sustained CMIs were in 6-furlong races (46/124 [37.1%]), compared with Quarter Horses, in which CMIs were greatest at 350 yards (14/30 [46.7%]). The field sizes were similar (P = 0.2169) for Thoroughbreds (median, 9 horses; range, 5 to 13 horses) and Quarter Horses (median, 9 horses; range, 6 to 11 horses).

Most CMIs in Thoroughbreds occurred in claiming races (68/124 [54.8%]). For Quarter Horses, both the stakes-handicap (12/30 [40.0%]) and maiden-maiden special weight (7/30 [23.3%]) racing categories were most common in terms of CMIs. The distribution of race type was significantly ($P < 0.001$) different between Thoroughbreds and Quarter Horses with CMIs. Data were also evaluated as maiden races versus all other types, claiming races versus all other types, and futurity trials versus all other types. There was not a significant (P = 0.175) difference in the incidence of CMIs between Thoroughbreds and Quarter Horses for maiden races; however, there was a significantly ($P < 0.001$) larger proportion of CMIs in Thoroughbred claiming races than in Quarter Horse claiming races and a significantly ($P < 0.001$) larger proportion of Quarter Horses than Thoroughbreds with CMIs sustained in futurity trials.

The purse value of the race in which the CMI occurred for Thoroughbreds (median $9,000; range, $1,680 to $75,000) was not significantly (P = 0.999) different than that for the Quarter Horses (median $7,500; range, $1,600 to $65,000). The weight carried by Thoroughbreds (median, 53.6 kg [118 lb]; range, 49.5 to 56.4 kg [109 to 124 lb]) was significantly ($P < 0.001$) different from the weight carried by Quarter Horses (median, 55.5 kg [122 lb]; range, 54.5 to 57.7 kg [120 to 127]).

Median Thoroughbred lifetime earnings was $13,886 (range, $0 to $359,977), and the Quarter Horse median earnings was $6,251.50 (range, $42 to $267,989), which were not significantly (P = 0.397) different. There was a significant (P = 0.049) difference in the number of lifetime race starts between Thoroughbreds (median, 11 race starts; range, 1 to 110 race starts) and Quarter Horses (median, 7.5 race starts; range, 1 to 51 race starts). The median age at first race start for Thoroughbreds that sustained CMIs was 3 years (age range, 2 to 5 years), whereas the median age for first race start for Quarter Horses that sustained CMIs was 2 years (age range, 2 to 5 years; P = 0.001).

Most CMIs in Thoroughbreds occurred in the left forelimb (69/124 [55.6%]), whereas most CMIs in Quarter Horses involved the right forelimb (18/30 [60.0%]). There was a significant (P = 0.029) difference between Thoroughbreds and Quarter Horses in terms of the limb in which the injury most commonly occurred. The left forelimb was significantly (P = 0.008) more likely to be involved than any other limb in Thoroughbreds (right forelimb, 37/124 [29.8%]; both forelimbs, 12/124 [9.7%]; right hind limb, 4/124 [3.2%], left hind limb 1/124 [0.8%]; and both hind limbs, 1/124 [0.8%]), and the right forelimb was significantly (P = 0.003) more likely to be involved than any other limb in Quarter Horses (left forelimb, 8/30 [26.7%]; both forelimbs, 3/30 [10%]; right hind limb, 1/30 [3.3%], and left hind limb, 0). Neither breed was significantly (P = 1.0) more likely to have multiple limbs involved.

Fractures accounted for most CMIs in both breeds, occurring in 92.7% (115/124) of Thoroughbreds and 90% (27/30) of Quarter Horses, which was not significantly (P = 0.703) different. Injuries were recorded in 10 categories, and there were no significant (P = 0.072) differences between breeds in the type of CMI sustained. The most frequent injury for both breeds was proximal sesamoid bone fractures occurring in 38.7% (48/124) of Thoroughbreds and 30% (9/30) of Quarter Horses. This was followed by carpal bone fractures in 21.8% (27/124) of Thoroughbreds and 23.3% (7/30) of Quarter Horses. Third metacarpal bone fractures occurred in 20.2% (25/124) of Thoroughbreds and 10% (3/30) of Quarter Horses. Metacarpophalangeal joint disruption with proximal sesamoid bone and third metacarpal bone fracture occurred in 8.1% (10/124) of Thoroughbreds and 6.7% (2/30) of Quarter Horses. When injuries of the metacarpophalangeal joint were grouped together (proximal sesamoid bone, suspensory ligament, and a combination of proximal sesamoid bone and third metacarpal bone fracture), they accounted for 48.4% (60/124) of the injuries in Thoroughbreds and 40% (12/30) of the injuries in Quarter Horses (P = 0.4242). There were only 2 Thoroughbreds (2/124 [1.6%]) with humeral fractures, compared with 4 Quarter Horses (4/30 [13.3%]) with humeral fractures. When humeral fractures were compared between breeds versus all other injuries, Quarter Horses were overrepresented ($P = 0.014$). Most Thoroughbreds (105/124 [84.7%]) and Quarter Horses (22/30 [73.3%]) raced after premedication with both furosemide and phenylbutazone ($P = 0.178$).

Discussion

In the present study, the combined CMI incidence for Thoroughbreds of 1.48 CMIs/1,000 race starts is consistent with overall CMI values reported for other Thoroughbred racing jurisdictions including Florida,[3] Kentucky,[4] California,[5] New York,[11] and Ontario, Canada.[12] The incidence of CMIs in Quarter Horses in the present study was 1.36 CMIs/1,000 race starts. The only comparable data are those from the study by Cohen et al,[15] who reported 0.8 catastrophic injuries and 2.2 musculoskeletal injuries/1,000 race starts. In that study,[15] a regulatory official determined whether it was likely that the horse could be saved, while the present study included all horses that were euthanized, which may have included some horses that were euthanized on the basis of economic consideration. To the authors' knowledge, the present study is the first to evaluate Quarter Horse racehorses at the same facilities as Thoroughbred racehorses. Our data indicate that the incidence of CMIs for both Thoroughbred and Quarter Horse racehorses is not significantly different.

Our interpretation of a CMI needs to include understanding study details. In the present study, we included only CMIs associated with an actual race from which the horse successfully left from the race gate to begin racing and did not include cardiovascular events. Other studies have incorporated training injuries,[12] have separated horses that are injured in the race gate,[15] or may have used a definition or timeframe of a CMI different than that used in the present study. This study excluded nonmusculoskeletal issues such as cardiovascular failure and exercise-induced pulmonary hemorrhage, similar to other studies.[4,7,15]

The retrospective data to describe CMIs in the present study were used to compare data between Thoroughbreds and Quarter Horses at these racetracks. There was no effort to evaluate the data on the basis of how the types of races to run were determined (ie, written) for each racetrack. Clearly, a number of differences including distance and weight carried would be expected between breeds on the basis of how races are written for the 2 breeds. Some potential differences could be related to more claiming races being provided for Thoroughbreds. Additionally, there were a higher number of futurity trials and futurities for the Quarter Horses, which did not occur in Thoroughbred racing. The present study did not evaluate risk factors on the basis matched controls; comparisons were limited to differences between Thoroughbred and Quarter Horse racehorses. Another limitation of this study was that data beyond the recording of a CMI in all Quarter Horse races were not available for 20 Quarter Horses early in the period studied.

The present study did not identify a difference in sex distribution of CMI incidence between breeds. Three previous studies[5,6,12] indicated that sexually intact male Thoroughbreds were more likely to sustain a CMI; however, sex was not found to influence the risk of CMI in a previous Quarter Horse study.[15] There was a difference in age for when CMIs occurred between Thoroughbred and Quarter Horse racehorses, but this difference was not significant ($P = 0.056$). The highest percentage of CMIs occurred in 3-year-old Thoroughbreds and 2-year-old Quarter Horses. When evaluating the risk factor data published to date, it has been reported that the older the horse, the higher risk of a CMI. This may be related to more exposure to racing.[5,17] It has also been reported that 4-year-old Thoroughbreds are at twice the risk of having a CMI, compared with 3 year olds.[5] A descriptive study[16] of racing Quarter Horses in California included 39% of 3 year olds and 32% of 2 year olds that developed CMIs. A Texas study[15] reported more 2-year-old than 3-year-old Quarter Horses with CMIs, but the difference was not significant. In the present study, there was an even distribution of 2-, 3-, and 4-year-old Quarter Horses. The total number of horses of each breed and age racing on these racetracks is unknown. It is possible that more 2-year-old Quarter Horses were racing and that the incidence per group would increase with age. This would be comparable with the reported incidence of increased risk of more race starts with age.

In the present study, the median race length for Thoroughbreds that sustained CMIs was at a distance of 6 furlongs (46/124 [37.1%]). This finding is similar to that reported in New York,[11] which revealed the highest incidence of CMIs occurred for Thoroughbreds in races with a distance of 6 furlongs. Distance has been reported as being a significant risk factor for injury in Thoroughbreds,[4] with a greater risk in shorter races that would appear similar to the horses in the present study. Horses racing shorter distances would likely be racing at a higher speed, which places more force on the forelimbs.[18] However, data on race speed were not included in the present study. In the present study, 46.7% (14/30) of CMIs in Quarter Horses were in races of 350 yards.

There were significant ($P < 0.001$) differences between Thoroughbreds and Quarter Horses in the types of races where CMIs occurred. In the present study, there was a predominance of CMIs among 2-year-old Quarter Horses running in nonclaiming races, compared with Thoroughbreds over age 3 years competing in claiming races. This could have been due to differences in races being run at these racetracks. Younger Quarter Horses may be more commonly raced in 2-year-old futurities, and there may be more races available for older Thoroughbreds with a predominance of claiming races.

Most (68/124 [54.8%]) CMIs in Thoroughbreds occurred in claiming races. It has been documented that Thoroughbreds in claiming races are at a relatively high risk of developing CMIs.[6,14] This is likely the result of lower quality or injured racehorses with a higher risk for developing a fracture being placed in these races.[19] In contrast to Thoroughbreds, the predominance of CMIs among Quarter Horses (12/30 [40.0%]) occurred in stakes-handicap racing categories. Our data are similar to those reported for Quarter Horse racing in Texas, where significantly fewer injuries occurred in claiming races than in nonclaiming races,[15] and different from California where most (60%) of the CMIs in Quarter Horses occurred in claiming races.[16] This difference may be attributed to the quality of horses and the types of races provided for these jurisdictions.

The median lifetime earnings for the Thoroughbred and Quarter Horse racehorses sustaining CMIs were relatively low ($13,886 and $6,251, respectively). Reasons for low lifetime earnings may differ between breeds. Thoroughbreds had significantly more race starts, were older, and were running in relatively short claiming races. This may indicate that Thoroughbreds sustaining CMIs were less-talented horses. The Quarter Horses in the present study were predominantly 2 year olds (9/30 [30%]). Many of these injuries occurred in futurity trials and futurities. This could indicate that Quarter Horses are being pushed hard as yearlings and 2 year olds to reach the higher paying 2-year-old futurity races.

It has been shown in a number of studies[4,5,8,12,15,19] that forelimbs are most commonly injured in racehorses. Some studies[4,5] have shown the left forelimb is more commonly affected, and others have shown no limb predilection.[8,12,15] The predilection for forelimbs is expected in relation to how horses load the forelimbs. In the present study, there was a significant (P = 0.029) difference between the left forelimb involvement in Thoroughbreds and the right forelimb involvement in Quarter Horses. A potential explanation may be that the injury is associated with the lead limb when the injury occurs. Additionally, as Quarter Horses are slowed at the end of the race, a horse in the right lead are entering a left-hand turn that could affect limb loading and balance, which could also contribute to CMIs of the right forelimb.

Peak vertical force is greatest in the lead forelimb followed by the nonlead forelimb.[18] In video analysis, 66% of horses with a forelimb fracture fractured the limb they were using as the lead forelimb at the time of fracture,[20] and most limbs injured were lead forelimbs, irrespective of direction of racing.[19] Thoroughbreds in the United States race counterclockwise and are typically on the left lead in the turns. Quarter Horses running sprint races will typically take a single lead from the gate to the finish. If more Quarter Horses break from the gates on the right lead rather than the left lead, this could account for the difference in forelimb injuries between Thoroughbreds and Quarter Horses.

Some previous studies[5,6,10] have had predetermined categories for injuries and multiple injuries in the same horse and were ranked on the basis of relevance by a single pathologist. In the present study, predetermined definitions of injury sites were not available and numerous veterinarians were responsible for postmortem examination. It is possible that some horses in the present study had multiple anatomic structures involved, but only 1 primary area of injury was recorded on the necropsy report. However, data compiled in the present study are similar to that of other studies. The most frequent injury for both breeds was proximal sesamoid bone fractures (48/124 [38.7%] for Thoroughbreds and 9/30 [30%] for Quarter Horses), followed by carpal bone fractures (27/124 [21.8%] for Thoroughbreds and 7/30 [23.3%] for Quarter Horses). When the injuries of the suspensory apparatus at the metacarpophalangeal joint were grouped together, they accounted for 48.4% (60/124) of injuries in Thoroughbreds and 40% (12/30) of injuries in Quarter Horses. All of these findings are consistent with those of previous studies[4,7,8,15,21] in both Thoroughbred and Quarter Horse racehorses. The high occurrence of humeral fractures (4/30 [13.3%]) in Quarter Horses was significantly (P = 0.014) overrepresented, compared with the occurrence in Thoroughbreds, and higher than those reported by others.[15,21] The reason for this is unknown. No vertebral body fractures in Quarter Horses, which accounted for 9% to 10% of CMIs in previous studies,[15,21] were identified in the present study.

This study provided updated information regarding CMI incidences at Midwestern horse racing facilities and shows these incidence rates are similar to those of larger racing jurisdictions. Undoubtedly, there are complex interactions and risk factors associated with the development of CMIs in racehorses, which may be different among venues. This study reveals that there are a number of differences to consider when evaluating CMIs in Thoroughbred and Quarter Horse racehorses. Future studies need to investigate these differences and continue to identify risk factors associated with CMIs of the racing equine athlete.

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From this month's *AJVR*

November 2011

Serologic response to *Mannheimia haemolytica* in calves concurrently inoculated with inactivated or modified-live preparations of *M haemolytica* and viral combination vaccines containing modified-live bovine herpesvirus type 1

Victor S. Cortese et al

Objective—To assess the serologic response of calves to inactivated and modified-live (ML) *Mannheimia haemolytica* (MH) preparations given alone and concurrently with combination viral vaccines containing ML bovine herpesvirus type 1 (BHV-1).

Animals—642 calves seronegative for BHV-1.

Procedures—In experiment 1, 192 calves received 1 of 3 MH preparations alone or concurrently received 1 of 3 MH preparations and 1 of 4 combination viral vaccines. In experiment 2, 450 calves received 1 of 4 MH preparations alone or concurrently received 1 of 4 MH preparations and 1 of 5 combination viral vaccines. Pretreatment and posttreatment blood samples were processed to obtain serum, which was analyzed to detect concentrations of antibodies against MH leukotoxin and BHV-1.

Results—In experiment 1, antibody titers against MH leukotoxin in calves receiving MH and ML virus vaccine appeared decreased, albeit nonsignificantly, compared with titers for calves receiving MH preparations alone. In experiment 2, all groups (except for 1) concurrently receiving an MH preparation and viral vaccine had a significant decrease in antibodies against MH leukotoxin. In both experiments, there was a significant decrease in the number of calves responding to MH leukotoxin when ML viral vaccine was coadministered.

Conclusions and Clinical Relevance—Coadministration of ML BHV-1 and MH preparations interfered with the serologic response to MH leukotoxin in calves seronegative for BHV-1. Serologic response to MH leukotoxin may be substantially improved in seronegative calves when MH vaccination is delayed until after calves have received a dose of ML BHV-1 vaccine. (*Am J Vet Res* 2011;72:1541–1549)

See the midmonth issues of *JAVMA* for the expanded table of contents for the *AJVR* or log on to avmajournals.avma.org for access to all the abstracts.

Industry Initiatives Descriptions and Websites

Industry Initiatives

(Found via *jockeyclub.com* Advocacy/Promotion tab)

Welfare and Safety of the Racehorse Summit
Thoroughbred Safety Committee
Horse Racing Reform
America's Best Racing
Equine Injury Database
Jockey Health Information System

NTRA Safety and Integrity Alliance – *ntraalliance.com*
Racing Officials Accreditation Program – *horseracingofficials.com*
Racing Medication & Testing Consortium – *rmtcnet.com*

Aftercare Initiatives
Tattoo Identification Services
Thoroughbred Connect
Thoroughbred Incentive Program
Thoroughbred Aftercare Alliance

Below is a brief overview of each of the above programs:

The Welfare and Safety of the Racehorse Summit, coordinated and underwritten by Grayson-Jockey Club Research Foundation and The Jockey Club and hosted by Keeneland Association, was held for the first time in October 2006. The two-day workshop, which brought together a wide cross-section of the breeding, racing and veterinary community, was designed to improve safety and soundness for the Thoroughbred racehorse.

The summit was historically held every two years since 2006 and in 2015 went to an annual schedule.

During the original summit, committees were formed and began working on various aspects of Thoroughbred welfare and safety. These committees include On-Track Injury Reporting, Education and Licensing, Shoeing and Hoof Care, Racing Surfaces, Durability, Race Conditions and Racing Office, and Health and Medical Records.

Among the major accomplishments that have evolved from the previous four summits are the Equine Injury Database; the Jockey Injury Database; the Racing Surfaces Testing Laboratory, which provides science-based testing of racing surfaces to enhance safety for horse and rider; a uniform trainer test and study guide; the racing surfaces white paper and publication of educational bulleting for track maintenance; the publication of stallion durability statistics; the hoof DVD, available in English and Spanish; a model rule banning toe grabs greater than 2 mm and elimination of all traction devices on front shoes approved and passed in August 2008; and the movement by state racing commissions to create regulations that void the claim of horses suffering fatalities during a race.

Thoroughbred Safety Committee

The Thoroughbred Safety Committee, which issued its first set of recommendations in June 2008, continues to issue recommendations and is a standing committee of The Jockey Club.

The Thoroughbred Safety Committee was created in May 2008 to review every facet of equine health and to recommend actions the industry can take to improve the health and safety of Thoroughbreds.

The committee convenes to discuss myriad safety issues with a cross section of industry representatives, including jockeys, trainers, veterinarians, chemists, pedigree experts, handicappers, owners, breeders, blacksmiths, racing commissioners, racetrack executives and geneticists.

Committee members are Stuart S. Janney III (chairman), John Barr, James G. (Jimmy) Bell, Dr. Larry Bramlage, Christopher J. McCarron, C. Steven Duncker, Dell Hancock and Dr. Hiram C. Polk Jr. Each is a member of The Jockey Club.

Horse Racing Reform

Horse Racing Reform is a national movement of veterinarians, breeders, trainers, owners, bettors, and fans for uniform medication, testing and safety regulations that will provide for safer competition for both human and equine.

America's Best Racing

America's Best Racing is a multi-media new fan development and awareness-building platform, initiated by The Jockey Club, designed to increase the profile and visibility of North America's best Thoroughbred racing events, with a primary focus on the sport's lifestyle and competition.

Equine Injury Database

A Safety Initiative of The Jockey Club

The Equine Injury DatabaseTM is the Thoroughbred industry's first national database of racing injuries and seeks to identify the frequency, types and outcome of racing injuries using a standardized format that will generate valid statistics, identify markers for horses at increased risk of injury, and serve as a data source for research directed at improving safety and preventing injuries. The Equine Injury Database is funded entirely by The Jockey Club, through its commercial subsidiaries InCompass Solutions Inc. and The Jockey Club Technology Services Inc., as a service to the industry.

NTRA
SAFETY & INTEGRITY
ALLIANCE

The health and safety of our human and equine athletes and the integrity of our sport are horseracing's top priorities. To accomplish these important priorities, the National Thoroughbred Racing Association ("NTRA") has organized the NTRA Safety and Integrity Alliance ("Alliance").

Alliance membership includes racetracks, owners, breeders, horsemen, jockeys, sales companies, veterinarians, racing fans, breed registries and the associations that represent these stakeholders who agree to uphold and support the goals and objectives of the Alliance ("Members"). The Alliance's purpose is to establish standards and practices to promote safety and integrity in horseracing and to secure their implementation. Alliance Members individually and collectively are committed to ensure that the sport of horseracing is pursued in a manner consistent with high ethical standards and compliance with applicable laws and regulations.

The NTRA Safety and Integrity Alliance is a standing organization whose purpose is to establish standards and practices to promote safety and integrity in horseracing and to secure their implementation.

JOCKEY HEALTH INFORMATION SYSTEM
A Safety Initiative of The Jockey Club

The Jockey Health Information System™ (JHIS) is a central database that stores jockeys' current medical records so that they are immediately available to medical personnel at racetracks in the event of injury.

The JHIS debuted at Keeneland's 2008 fall meeting. There are no fees for a track or jockey to participate. The creation and development of the JHIS featured collaboration among InCompass Solutions, Inc., The Jockey Club Technology Services Inc., the Jockeys' Guild, Keeneland Association and Dr. Barry Schumer, Keeneland's medical director, who developed the original concept and consulted on the project.

The JHIS is a module of the InCompass Race Track Operations software. To access and use the JHIS module, a jockey must be at least 18 years of age, have a valid e-mail address and obtain a user name and password from InCompass.

RMTC
Racing Medication & Testing Consortium

The Racing Medication and Testing Consortium develops, promotes and coordinates, at the national level, policies, research and educational programs that seek to ensure the fairness and integrity of racing and the health and welfare of racehorses and participants. In doing so, it protects the interests of the racing public.

The Racing Officials Accreditation Program accredits and provides continuing education to all racing officials, stewards and judges in the horse racing industry. By doing so ROAP is enhancing the image and upholding the integrity of horse racing at all levels. ROAP is a collaborative effort of many organizations representing all types of racing.

To encourage the retraining of Thoroughbreds into other disciplines upon completion of careers in racing or breeding, in 2012 The Jockey Club launched the Thoroughbred Incentive Program (T.I.P.). T.I.P. offers sponsorship for Thoroughbred-only classes and divisions, high point Thoroughbred awards at open horse shows and competitions, a Thoroughbred of the Year Award and a Young Rider of the Year Award.

Thoroughbred Connect™ is a free online service designed to assist with placement of Thoroughbreds following the conclusion of their racing or breeding careers.

A component of The Jockey Club's Interactive Registration™, Thoroughbred Connect enables Registry customers to express their willingness to be contacted by the possessor of a horse in the event the horse is in need of placement. Those interested in providing assistance or aftercare have the ability to attach their name and contact information to the electronic records of Thoroughbreds within The Jockey Club's database using Thoroughbred Connect.

Similarly, a person who is seeking placement for a Thoroughbred in his possession can log into Thoroughbred Connect and request the contact information attached to the horse. The possessor of the horse may then contact that prospective owner directly to perform due diligence and discuss potential arrangements to transfer the horse.

The Thoroughbred Aftercare Alliance (TAA) is an organization designed to serve as both the accrediting body for aftercare facilities that care for Thoroughbreds following the conclusion of their racing careers and a fundraising body to support these approved facilities.

The TAA will accredit aftercare facilities based on a Code of Standards covering operations, education, horse management, facility services and adoption policies. Simultaneously, the TAA will raise funds on behalf of accredited facilities via institutional contributions that are to be directed 100% to program services rather than to fundraising or general administrative costs.