

Equine Fatalities: Classifying Mechanisms of Injury and Use of Occult Hoof/Impact Pattern to Assist In Injury Classification

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History

- The earliest evidence of humans riding horses is
 - 5,000-year-old fossils of worn-down horse teeth that indicate a riding bit was placed in the animal's mouth.
 - Saddle, and then the stirrup, first appeared appears in China ~ 2,000 years ago
 - The horse-loving Spaniards (word for "Gentleman" in Spanish is "caballero", or "he who rides a horse") introduced the horse to North America, with the first expeditions to Mexico after Christopher Columbus's voyages.



Equidae Family

- Odd-toed ungulate mammals - horses and horse-like animals
 - Herbivores and grazers
 - Members
 - Horses
 - Donkeys
 - Mules



Horses

- Characteristics breed dependent
 - Over 350 known breeds
 - Divided into four groups
 - Light horses
 - Heavy horses
 - Ponies
 - Feral horses
 - Weight
 - 750 to 2,200 lbs.
 - Height
 - 56 to 76 inches (14 -19 hands)
 - Speed
 - Average 40 mph
 - World record: 55 mph



Donkeys

- Domesticated donkeys
 - Domesticated long before horses
 - Shorter, slower, unable to carry as much weight
 - Can pull heavier loads with greater ease
 - Differ from horses:
 - Relative to body size, larger heads and longer ears
 - Vary in size, depending on how bred
 - About 17 breeds
 - Weight
 - 400 to 500 lbs.
 - Height
 - 36 to 48 inches (hoof to shoulder)
 - Speed
 - 30 to 35 mph



Mules

- Do not occur naturally in the wild
 - Product of arranged couplings between male donkeys and female horses
 - Appear as larger, darker, more streamlined version of donkeys
 - Working animals
 - Patient, athletic, intelligent, easily trained, and hardy
- Different breed types
 - Weight
 - 820 to 1,000 lbs.
 - Height
 - 47 to 59 inches
 - Top speed
 - 15 mph
 - Sterile



Epidemiology

- United States has the most horses in the world
 - China
 - Mexico
 - Brazil
 - Argentina
 - Columbia



Epidemiology

- Most Horses by State
 1. Texas
 2. California
 3. Florida
 4. Oklahoma
 5. Kentucky
- Illinois is ranked 31st
- Rhode island has the fewest



Epidemiology

- 9.5 Million horses in the United States
 - 3% of population own horses in the U.S.
 - Recreational horse use is the largest segment of the horse industry



Equestrian Sports Injuries

- Rate of serious injuries
 - 1/350 for every 1000 hours spent riding
- Rate of major trauma
 - Up to 53.5 /100,000 participants per year
- Annual mortality
 - 1/1,000,000
 - Highest rate for all sports
 - Football
 - Ice Hockey
 - Motorcycle and automobile racing

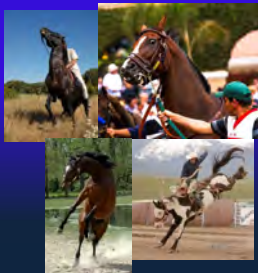
WARNING!
 Under Texas Law
 (Chapter 87, Civil Practice
 & Remedies Code)
 "An equine professional is
 not liable for an injury to or
 the death of a participant in
 equine activities resulting
 from the inherent risk
 of equine activities."



<https://rodeoabase101.weebly.com/rodeo-injuries.html>

Reason for Injuries

- Most Common reason reported
 - Horse Behavior
 - Unpredictable
 - "Spooking" is the most common cause
 - » Prey animals
 - » Constantly on the look out for whatever is out to get them
 - Startled
 - » Buck/Bolt
 - » Shy
 - » Kick/stomp
 - » Shove



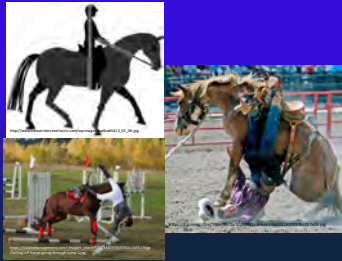
Principle Mechanisms of Horse Related Injury

1. Fall
2. Kick
3. Crush
4. Strike an object while riding (i.e. tree branch)
5. Entangled in the stirrups
6. Entangled in the reins
7. Blow from the horse's head
8. Step
9. Bite



Mechanism of Injury

- Fall
 - Rider's head
 - 8 to 10 feet above ground
 - Direct fall from this height typically results in skull fractures unless rider is wearing a helmet



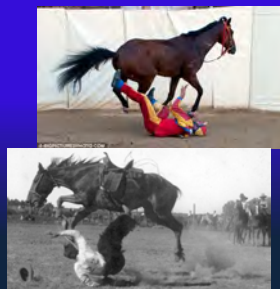
Mechanism of Injury

- Kick
 - Generally occurs when behind the horse
 - Cleaning/shoeing hoof
 - Checking a leg injury
 - Standing too close
 - Sexual intercourse with horse



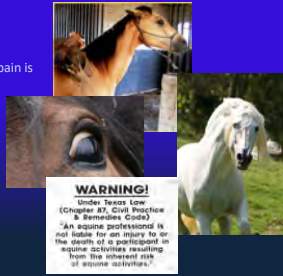
Mechanisms of Injury

- Stepped on
 - Rider was either bucked off or the horse fell with the rider
 - Horse steps on the rider who is on the ground
 - As horse stands up – steps on the rider on the ground
 - Location of injuries
 - Range from crushing of head, torso and abdomen to fractures of the extremities



Reason For Kicks

- Illness/disease
 - Can change attitude resulting in acting out
- Sour attitude
 - Don't like repetition in their routine especially if pain is involved
- Pain
 - Back, hip, legs, hoof
 - Kicks out when manipulated
- Fear
 - Long memories with fear response of kicking
- Warning
 - Kicking a way of establishing dominance
- Playfulness
 - Sign they feel good or want to play



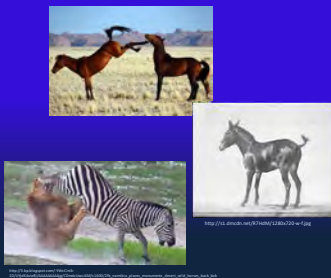
Kicks from Rear Legs

- Very Quick - little to no warning
- Three types
 - Forward
 - Toward belly
 - Associated with irritation (i.e. Insect)
 - To the Side
 - "Cow Kicking"
 - Unexpected
 - Straight Back
 - Most power associated with




Force of Equine Kicks

- Horses
 - 8,000 to 10,000 Newtons
 - Force is equivalent to 1.8 times their body weight
- Donkeys
 - Not studied
 - Zebras
 - Estimated 15,000 Newtons




Equine Related Injuries

- 1986 – 2018
 - Two Counties in the United States
 - Travis County, Texas
 - Cook County, Illinois
- 39 cases
 - Travis County: 21 cases
 - Cook County: 18 cases
 - Roughly 1 per year




TRAVIS COUNTY, TEXAS

- 1,023 sq miles
- Population: 1,024,266
- Population density:
 - 1,034 /sq mile
- 5th most populous county
- Largest city: Austin
- County seat: Austin
- Medical Examiner's Office contracts with 42 surrounding counties



Cook County, Illinois

- 5,530 sq miles
- Population: 5,194,675
- Population density:
 - 5,686 people/sq mile
- Largest county in Illinois
- 2nd largest county in the U.S.



Review of Equine Related Fatalities

- Male: Female
 - 23 Males
 - Travis County: 14
 - Cook County: 9
 - 16 Females
 - Travis County: 7
 - Cook County: 9
- Type of Equine
 - Horses: 38
 - Herd of Bulls: 1
 - Donkey: 1

Review of Equine Related Fatalities

- Mechanism of Injury
 - Falls: 62%
 - Kicks: 25%
 - Stepped on: 5%
 - Crushed: 6%
 - Getting on horse: 2%
- Activity
 - Riding: 79%
 - Grooming: 5%
 - Pitched/bucked: 5%
 - Intercourse with horse: 3%
 - Unknown: 8%

Review of Equine Related Fatalities

- Types of Injuries
 - Trauma to the head and neck – 68%
 - Trauma to the chest/abdomen – 27%
 - Trauma to the lower extremities – 5%
- Toxicology
 - Alcohol – 13%
 - Marijuana – 3%
 - Methamphetamine – 3%
 - Morphine – 3%
 - Negative – 36%
 - Not determined – 42%



Investigation

- Investigating these uncommon deaths is difficult
 - Unwitnessed
 - Partially Witnessed
 - In ranching situations there can be more than one equine and more than one hooved animal involved
- Differentiation of fall vs. kick can be difficult
 - Large irregular bruises
 - Internal injuries can look very similar
 - Recognition of hoof/impact pattern can be helpful

Investigation

- Hoof Print Can Be Matched to a Particular Animal
 - Hoof prints are unique among a species
 - Hoof prints are unique to an individual equine within the species
- Recognizing occult hoof/impact patterns in conjunction with the pattern of internal injuries can help determine if the incident occurred when the individual was mounted or unmounted

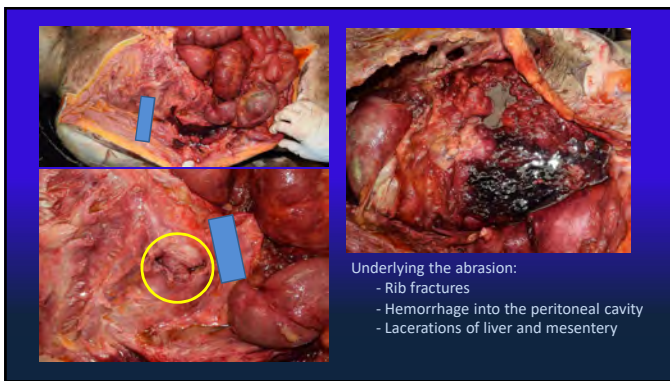


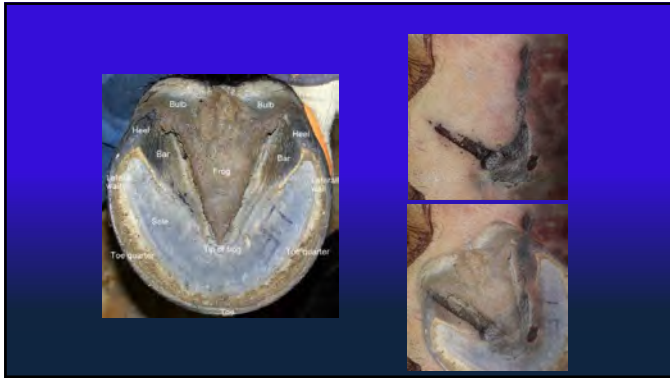
- 75 year old male found unresponsive in a pasture near a horse trailer
- Decedent was moderately decomposed
- No human witnesses to the incident



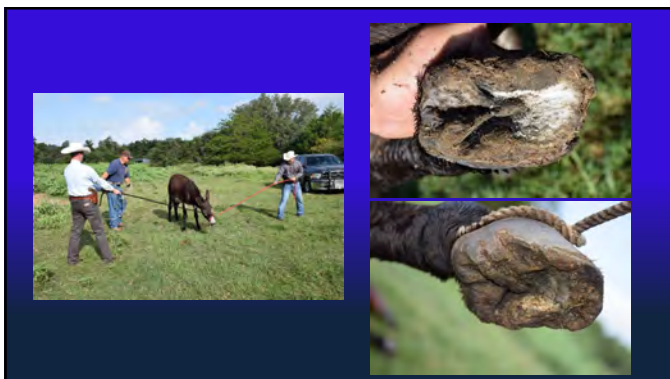


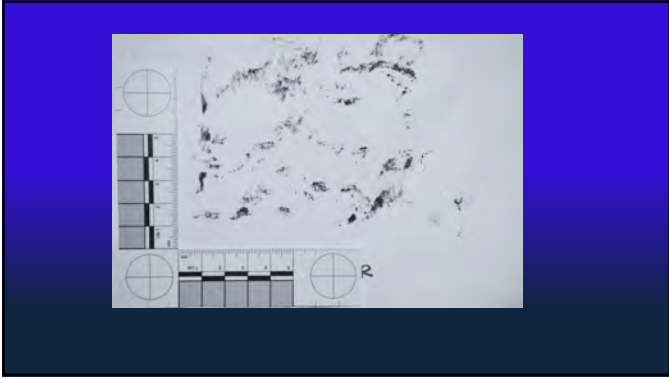














- Cause of Death: Blunt force injury of the chest and abdomen
- Manner of Death: Accident
- Bull was accused and sent to slaughter
- Arnold still roams free in the wilderness of Texas

- 25 year old white male found unconscious on ground of horse stall at racetrack where was formerly employed
- Was reportedly intoxicated and was found with his pants pulled down
- Taken by EMS to a local hospital and diagnosed with cerebral concussion and abdominal and intestinal injuries
- Underwent emergency surgery and later expired



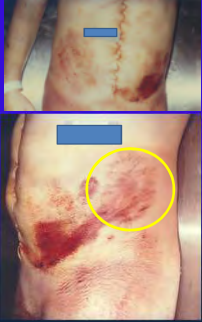



"Choice Dancer"



Reportedly was attempting to have intercourse with the horse when he was kicked in the abdomen and either while collapsing, or, on the ground was kicked in the head


- **Autopsy:**
 - External examination:
 - Lacerations of chin injuries of the head
 - Multiple bruises and abrasions on the chest, abdomen and lower extremities
 - One abraded area exhibited a horse shoe shape
 - Internal examination:
 - Diffuse subarachnoid hemorrhage
 - Fractures right side of mandible
 - Contusions of the mesentery and small intestines





- By comparing the horseshoe to the injury were able to determine that the decedent had been kicked by the horse
- Cause of Death: Cerebral injuries due to blunt trauma caused by a horse
- Manner of Death: Accident

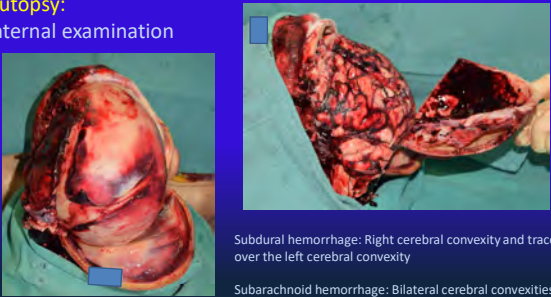
- 57 year old white male
- Drinking with friends and stated wanted to "ride that horse"
- Witnesses agree he get on horse, but how injury occurred unclear – witnesses intoxicated
 - Bucked
 - Fell off horse
 - Struck head on a rock after fall or was kicked in the head after fall
- Transported to hospital, diagnosed with skull fractures, subdural and subarachnoid hemorrhage
- Underwent a craniectomy and expired the following day



Autopsy:
External examination

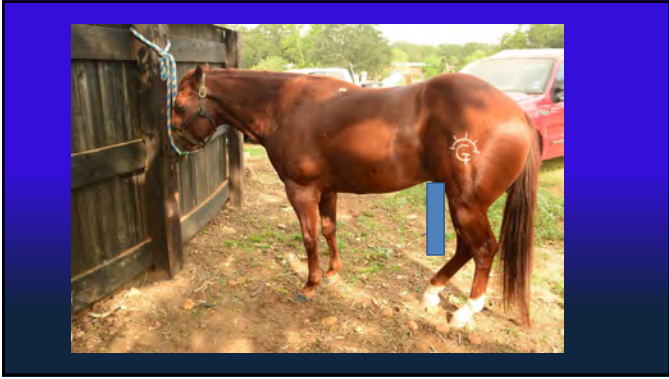


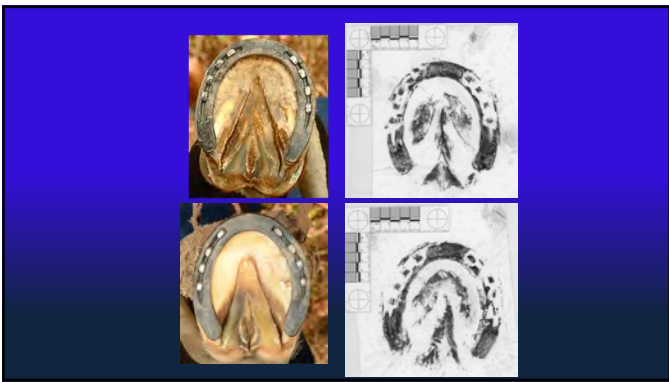
Autopsy:
Internal examination



Subdural hemorrhage: Right cerebral convexity and trace over the left cerebral convexity

Subarachnoid hemorrhage: Bilateral cerebral convexities









- Comparing prints of the hooves to the decedent's wound pattern it was determined that decedent was kicked by the horse
- Cause of Death: Blunt head trauma
- Manner of Death: Accident

- ### Conclusion
- Correct classification of the injury mechanism
 - May provide useful information for injury prevention
 - Use/efficacy of protective equipment
 - Increase public awareness how injuries occur
 - Fall instruction: Release reins and roll away from animal
