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University of Kentucky
College of Agriculture
Department of Veterinary Science

LLOYD'S

Commentary

The data in the article on bone fractures can be compared to some extent with other published data on the frequency of fractures. The data in the literature is for clinical admissions while the Livestock Disease Diagnostic Center (LDDC) data is for postmortem accessions, creating an automatic bias.

Fractures represented 8% of the equine autopsy accessions. Even without the large number of fractures of the ribs in newborn foals, the frequency of fracture in the autopsy population is about 6%. Verhaar (1965) in the Netherlands found a clinical accession rate of 0.3%.[1] Fröhner (1905) found a clinical incidence of 1.2% of fractures in Prussian army horses during peacetime. There were 3,473 fractures among 280,000 horses.

Table 1 compares the frequency of fractures in several bones as reported by Fröhner, from the overall data at the LDDC, and the data from horses at the LDDC suffering fractures during racing or training. Not all fractures in the three venues could be compared because of the way in which the data has been recorded.

Proximal sesamoid bone fractures in the overall LDDC population were 2% while they accounted for 38% in the racing/training population. No sesamoid fractures were reported by Fröhner. This is in keeping with the well-known fact that such fractures are more common in high-speed racing horses, which the Prussian horses were not.

The frequency data are remarkably similar, though hardly exact. The incidence of tibial and pelvic fractures is, however, quite different among the three populations. Such fractures are, from anecdotal experience, more common in horses whose work involves quick turning and spinning movements such as cow ponies and rodeo horses. Such maneuvers were part of the training and working for Prussian cavalry horses as well.

The low incidence of tibial and pelvic fractures in the Kentucky population reflects the fact that the population is largely Thoroughbred race horses and breeding stock with few cow pony or rodeo animals. ■

CONTACT
Dr. J.R. Rooney
jarooney@goeaston.net

Table 1

Fröhner	LDDC	Overall	Race/train
Tibia	18%	7%	1%
Pelvis	16	9	1
Proximal Phalanx	13	3	15
Radius	8	3	1
Vertebrae[2]	14	11	1
Metacarpus	7	5	2.5
Humerus	2.5	4	3

[1]The references may be found in Rooney, J.R. and Robertson, J.L. (1996) *Equine Pathology*. Iowa State University Press, Ames, Iowa. The percent values are rounded and do not necessarily add up to 100%.

[2]The site of the vertebral fracture was not recorded in all instances and thus, only totals are given.

International

First Quarter 2000

The International Collating Centre, Newmarket and other sources reported the following disease outbreaks.

Contagious equine metritis (CEM) was diagnosed among four non-Thoroughbred horses in Sweden. Abortions attributable to equid herpes virus 1 (EHV-1) were reported from France on one Thoroughbred farm and several non-Thoroughbred farms; Japan, four farms; Germany, three farms; Switzerland, two farms, including eight horses on one farm which developed the paralytic form of the disease and were euthanized.

EHV-1 abortions were also reported from the United Kingdom on four farms, including one abortion attributable to EHV-4; and in Kentucky, USA, 16 farms, including one with nine abortions. Respiratory disease caused by herpes viruses was reported extensively in France among several breeds of horses and the United Kingdom, where EHV-4 was diagnosed among Thoroughbreds on two premises.

Equine infectious anemia (EIA) was diagnosed at an equestrian center in France containing many different breeds of horses. The outbreak resulted in 36 animals being euthanized. Equine viral arteritis (EVA) was diagnosed during March on a Thoroughbred farm in Kentucky involving 16 mares and their foals in one barn. There was no evidence of disease transmission to other animals on the farm or to other farms. The origin of the infection was suspected to be the introduction of a nurse mare.

Equine influenza was diagnosed on numerous occasions among several breeds of horses in France, in Sweden on 30 premises, and on one premise in the United Kingdom.

A Thoroughbred horse serologically positive for piroplasmosis *(Babesia equi)* was inadvertently exported to Australia from Hong Kong in March. The horse was euthanized during post-arrival quarantine in Australia. Six other horses in the consignment all tested negative.

Retrospective studies confirmed the horse was serologically positive when it arrived in Hong Kong from South Africa in January 1999. Extensive serological testing of the equine population of Hong Kong has not revealed any additional positive animals.

Strangles continued to be widely reported from Australia, Ireland, Italy, Norway, Sweden, Switzerland and the United Kingdom. The Centers for Disease Control (CDC) in the United States reported that during January and February, West Nile virus had been isolated from *Culex* spp mosquitoes collected in New York. ■

National

Equine Protozoal Myeloencephalitis

and the Prospects for an Effective Vaccine

During the past decade, equine protozoal myeloencephalitis (EPM), caused by the protozoan parasite *Sarcocystis neurona*, has been one of the most visible and controversial diseases in the area of equine health. While disease awareness is always viewed as advantageous, it unfortunately has been somewhat counter-beneficial in the case of EPM since misdiagnoses with this disease have become common in horses that exhibit signs of neurological deficit.

In addition to the diagnostic challenges, chemotherapeutics for EPM are expensive, somewhat unreliable, and may not provide a satisfactory outcome since treatment is often initiated after irreversible damage to the central nervous system (CNS) has occurred. Consequently, EPM is too often a death sentence for a beloved and/or valuable animal.

These problems illustrate the significant need for an effective vaccine that can protect against *S. neurona*-induced CNS pathology, thereby reducing the concerns associated with diagnosis and treatment of this disease.

Vaccination is a prophylactic tool that is designed to stimulate an immune response to a particular infectious agent such that a subsequent exposure to the pathogen results in minimal infection and little or no disease. In simple terms, development of a vaccine involves identifying pathogen antigens that will elicit

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Editors
Roberta Dwyer
David Powell
Neil Williams

Staff
Diane Furry
Linda Millercox
Libby Noble

Correspondence should be addressed to the editors, Department of Veterinary Science Gluck Equine Research Center University of Kentucky Lexington, KY 40546-0099 Telephone (859) 257-4757 Fax (859) 257-8542.

Internet address: gopher.ca.uky.edu or http://www.uky.edu/Agriculture/VetScience/gluck1.htm

protective immunity and determining how best to present these antigens to the animal in order to induce the proper response.

However, the mammalian immune system and the molecular composition of most pathogens (including *S. neurona*) are far from simple; as a consequence, the interplay between the immune system and the parasite is exceedingly complex. Therefore, considerable aid in designing an effective vaccine is gained by obtaining a basic knowledge of the infectious agent and the pathogenesis associated with disease.

Unfortunately, there remains a distinct lack of information about *S. neurona*, the events that occur in the horse during exposure to the parasite, and the factors that influence the progression from simple infection to full-blown neurological disease. While a comprehensive understanding of EPM is not an absolute necessity for vaccine development, the current deficiency in data about this disease represents a considerable barrier to the rational design of an effective vaccine.

Consequently, efforts toward identifying immunization methods that protect against EPM will be significantly benefited by basic research on *S. neurona* and the equine immune system.

So what are the prospects for the development of an effective EPM vaccine? Although the problem can be viewed with some optimism, it is revealing that no commercial vaccine against an apicomplexan parasite (the phylogenetic group that contains *S. neurona*) is currently available.

It is possible that protection against EPM will be provided by crude vaccines that have been developed with a minimum of effort and little additional knowledge about the disease, and there is just reason to pursue these simple approaches.

Past experiences with vaccine development for related parasites, however, suggest that these attempts will have limited success because of incomplete protection and/or undesirable side-effects. More likely, the development of a safe and effective EPM vaccine will come from a substantial foundation of basic research that provides a better understanding of the disease, some trial and error in the laboratory and in the field, and perhaps a small measure of luck. ■

CONTACT
Dr. Daniel K. Howe, (859) 257-2437
dkhowe2@pop.uky.edu
Maxwell H. Gluck Equine Research Center

Nurse Mares

A mare produces no milk, rejects the foal, becomes seriously ill or dies, and management of the newborn foal now presents a considerable problem. Either the owner embarks on many sleepless nights of bottle feeding the foal for weeks, or obtains the services of a nurse mare. These maternal equines are mild-mannered, high lactating mares that often accept any foal placed in their stalls. The convenience of this surrogate mother sometimes comes at a high price.

In one report from Japan, a nurse mare broke with strangles shortly after being delivered to a farm for an orphaned foal. Within the next six weeks, three foals and four yearlings developed clinical signs of strangles. In Kentucky, nurse mares have been implicated in outbreaks of respiratory disease shortly after arriving on recipient farms.

Whatever "gift" a new mare may bring onto the farm, the results can be highly significant.

Just as any new equine acquisition to the farm, nurse mares can be the source of any infectious disease. Isolating new horses prior to mixing them with the resident herd is just common sense.

The resident farm

Farms needing nurse mares often accept the mare with the bill, a contract, and the promise to return her in foal to the nurse farm owner after weaning. Vaccination and deworming records, EIA test results, and other health history information are often lacking.

In every case, a nurse mare should always be kept in isolation with the foal for a minimum of 7 days, and preferably 21 days, after arrival on the farm. This will guard against the nurse mare spreading pathogens to resident horses, including equine herpes virus-1 which could cause an abortion outbreak.

In all cases, farm owners should have their veterinarian examine the mare and determine an appropriate vaccination and deworming schedule. This is not only for the health of the nurse mare, but also for the protection of resident mares from the risk of contracting certain infectious diseases. Since teasers are usually used to breed back these mares, they should be vaccinated against equine viral arteritis (EVA) prior to the breeding season.

Figure 1
35 Kentucky Rabies Cases - 199

Bats—6
Bovine—4
Dogs—2
Fox—1
Horse—1
Skunks—21

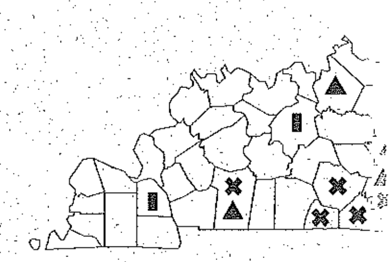
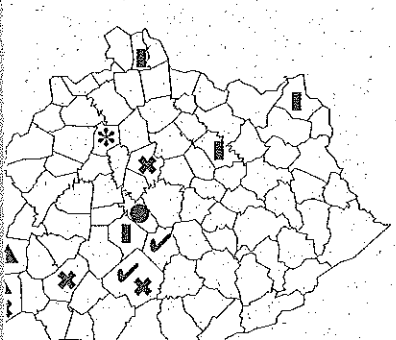
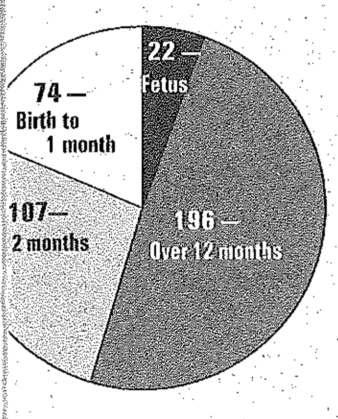


Figure 2
Fracture Cases by Age of Horse





The nurse mare owner

The nurse mare owner also should be concerned about where the mares are going and what "bugs" they might bring back with them after weaning. Therefore, having a rigorous preventive health program that includes vaccination against the more significant equine pathogens is in the best interest of the nurse mare owner as well.

The entire industry would benefit from nurse farm owners providing an individual mare health "passport" to their clients documenting the vaccinations, dewormings, breeding dates, feeding routine, and regulatory test results for EIA. This would enhance the nurse mare owner's reputation and quality of their "product" and would assist the nurse mare's renter in determining if any additional preventive health care was needed based on their own farm's disease history.

Health care communication between nurse mare owner and renter would also reduce duplication of vaccinations and dewormings for the mare.

Nurse mare owners should ask for records of preventive health care that had been provided on the farms where their mare was in use, so that they can update their vaccination and deworming schedules when the mare is returned post-weaning.

Why bother?

Why should nurse mare owners go to the extra effort and expense in preventive health care and record-keeping? Not only is their reputation on the line, but their mares will be exposed to the resident pathogens of the renters' farms. Vaccination is a two-way street: helping to prevent the nurse mare from delivering pathogens to the new farm, and helping to prevent pathogens from returning with her at the end of the foaling season. Ditto for deworming. ■

SAMPLE PREVENTIVE CARE PROTOCOL FOR NURSE MARE FARMS

- Test all nurse mares for EIA; vaccinate for EVA.
- Veterinary consultation for vaccinations against major diseases including: tetanus, Eastern and Western equine encephalitis (EEE, WEE), influenza, equine herpesvirus (EHV) 1 & 4, rotavirus (3 vaccinations), strangles.
- In certain regions of the country: rabies, botulism (3 initial vaccinations/annual booster), Potomac horse fever (PHF).
- Deworming schedule determined by the veterinarian, to include anthelmintics effective against tapeworms.
- Also include information in the nurse mare's "passport" regarding feed requirements, breeding records and unusual habits.

FOR NURSE MARE FARM STALLIONS

- Blood test all stallions that have not been previously vaccinated for titers to equine arteritis virus.
- Vaccinate those with negative titers in November; have semen examined from seropositive stallions with no vaccination history for evidence of equine arteritis virus.

EVA REGULATIONS IN KENTUCKY

Kentucky law states that a nurse mare shall be:

- EVA seronegative,
- officially vaccinated against EVA in accordance with regulations, or
- isolated from other equine on the farm.

Teaser stallions shall be officially vaccinated against EVA.

CONTACT
Dr. Roberta M. Dwyer, (859) 257-4285
rmdwyer@pop.uky.edu
Maxwell H. Gluck Equine Research Center

K e n t u c k y

Rabies in Kentucky - 1999

The Division of Laboratory Services (Frankfort) and the Breathitt Veterinary Center received 1,431 animal specimens for testing in 1999. Of these, 80 samples were unsuitable for testing because of decomposition or extreme traumatic damage to the brain. There were 35 (2.4%) specimens that tested rabies positive: 7 in domestic animals and 28 in wildlife.

The annual total of 35 rabies cases is slightly higher than the preceding 5-year mean of 32.4 rabies cases. The statewide distribution pattern of positive rabies cases shown in **Figure 1** may not be completely representative of rabies activity in the state, since it reflects the distribution of samples submitted.

Almost all the samples tested were due to some form of suspicious interaction between the animal tested and a human or domestic animal.

As expected, skunks accounted for the majority of rabies-positive animals in Kentucky. Unlike most of the states east of the Appalachian Mountains, Kentucky does not have a raccoon rabies strain epizootic. The laboratories tested 184 raccoons in 1999, and all were negative. However, the Centers for Disease Control and Prevention consider Kentucky at risk for the introduction of the raccoon rabies variant from West Virginia.

Multiple federal and state agencies are actively engaged in preventing the spread of raccoon rabies westward from the Eastern seaboard, as discussed in the April 2000 issue of the *Equine Disease Quarterly*.

In January 2000 a horse from Trigg County was confirmed rabies positive. The horse exhibited abnormal behavior which progressed to aggressiveness, neurologic signs, seizures, recumbency and death. As of June, this is the only known rabid horse in Kentucky for 2000.

The Kentucky Department for Public Health, Division of Laboratory Services is preparing to begin rabies-variant testing. This will enable scientists to determine the origin of the rabies virus in tested animals, and provide valuable information about the wildlife sources of rabies in Kentucky. Rabies vaccination is highly recommended for all horses in the state. ■

CONTACT
Dr. Michael Auslander, (502) 564-3418
Division of Epidemiology and Health Planning
Frankfort, Kentucky

Fractures in Horses

Bone fractures are commonly diagnosed in horses submitted to the University of Kentucky Livestock Disease Diagnostic Center (LDDC). During a 3-year period (1995-1997), there were 5,440 total equine necropsy accessions. Four hundred and sixty-six of the cases were diagnosed with a fracture. Fractures were encountered in all age groups **(Figure 2)** with no predominant location or fracture type **(Table 2)**.

One hundred and twenty-eight (27%) cases involved the axial skeleton (skull, vertebrae, and pelvis). Skull fractures typically resulted from the horse rearing and falling over to strike its head on the ground, often when the horse was being handled. This usually resulted in sudden death or a period of neurologic dysfunction accompanied by bleeding from the nasal passages or an ear, with the horse dying soon afterward or being euthanized.

Most often the skull fractures involved the basisphenoid bone or basilar portion of the occipital bone with associated fracture of the parietal or frontal bones. Vertebral fractures most commonly involved the cervical vertebrae (33), which may be expected with the range of motion of the neck and reduced muscular and bone support compared to other spinal segments.

There were 12 thoracic vertebral fractures, 6 lumbar, and 2 of the sacral vertebrae. Vertebral fractures were most often the result of trauma. Pelvic fractures were also traumatic in origin and usually resulted from a fall or foaling accident.

Rib fractures were the single most common fracture (65 or 14% of all fractures). These typically involved multiple ribs on a side and were the result of trauma such as a foaling injury, a fall, a collision with another horse or object, or a kick from another horse.

The vast majority of the rib fractures (80%) were seen in foals one month of age or less. Many of the fractures in foals had occurred during delivery. The fractures resulted in decreased pulmonary function and often lacerated the lung or heart. On average 5 ribs were fractured with a range of 1 to 11 ribs being broken. The third to the tenth ribs were most commonly involved and the fracture was usually in the mid-portion of the rib.

Leg fractures were the result of a fall, kick, collision, or, in many cases, an unknown traumatic event for the horse being found with the fracture. Fractures were slightly more common in the front legs than the rear legs.

The most commonly fractured bone in the front leg was the third metacarpal bone and the most common fracture of the rear leg involved the tibia. Fractures of bones below the fetlock joint were uncommon compared to other sites.

Sixty cases of fracture occurred in horses during a race or training and resulted in death or necessitated destruction. The fracture involved a front leg in 49 cases (left front, 23; right front, 26) and a rear leg in 9 cases (left rear, 4; right

Table 2
Location of Fractures

Location	Number
Rib	65
Proximal phalanx	17
Vertebrae	53
Carpus	13
Pelvis	43
Scapula	7
3rd Metacarpus	40
Elbow	5
Proximal sesamoid	37
Hock	3
Tibia	37
2nd Phalanx	2
Femur	34
3rd Phalanx	1
Skull	32
Ulna	1
3rd Metatarsus	24
Navicular bone	1
Humerus	23
Mandible	1
Radius	18

rear, 5). Two suffered fracture of both a front and rear leg.

The most common fracture involved the proximal sesamoid bones (23). All proximal sesamoid fractures occurred in a front leg. The sesamoid bones were fractured in the right leg in 11 and the left leg in 12. Both the medial and lateral sesamoid bones were fractured in 18 cases. The medial sesamoid only was fractured in 3 and the lateral only in 1.

Fractures of the third metacarpal bone (15) were virtually equally distributed between the left and right legs, while 4 carpal bone fractures involved the right leg. Proximal phalanx fractures (9) were virtually equally distributed between left and right legs, and were twice as common in the rear as the front legs. Of horses suffering a fracture during racing or training, 21 were female, 17 were colts, and 16 geldings.

The findings reported here are somewhat biased since only fractures that resulted in death or destruction of the horse are included. Fractures that could be resolved by conservative therapy or surgery are not represented.

Nonetheless, this report shows that fractures are a common occurrence and that a variety of bones are subject to being fractured with no one site or bone predominating. ■

CONTACT
Dr. Neil M. Williams, (859) 253-0571
nmwillia@ca.uky.edu
Livestock Disease Diagnostic Center
Lexington, Kentucky

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Department of Veterinary Science
Gluck Equine Research Center
University of Kentucky
Lexington, Kentucky 40546-0099

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