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IN THIS ISSUE

University of Kentucky
College of Agriculture
Department of Veterinary Science

LLOYD'S

Commentary

The development and licensing of safe and efficacious equine vaccines have recently come into focus with the introduction of a vaccine against equine protozoal myeloencephalitis (EPM) and the increased incidence of West Nile virus activity in the northeastern states. In December 2000 the USDA Center for Veterinary Biologics issued a conditional license for an EPM vaccine, allowing data to establish efficacy and potency to be obtained.

Historically, equine vaccines received a license on evidence of safety, purity, potency and immunogenicity. More recently, evidence of efficacy has become a requirement, increasing significantly the cost and data necessary to license veterinary vaccines.

Efficacy studies involve field and/or challenge studies with a protocol agreed between the vaccine manufacturer and the licensing authority that requires adequate controls or non-vaccinated animals. Two live equine vaccines administered intranasally, against strangles and equine type-2 influenza, have recently received a full license based on challenge studies. It is also anticipated that a combined inactivated influenza and herpesvirus vaccine administered by the intramuscular or intranasal route will be licensed in 2001.

For several years it has been recognized that there is a need to improve the inactivated vaccines against strangles, influenza, and the various clinical manifestations of equine herpes virus. One of the primary limitations of these vaccines is the short duration of immunity, necessitating booster vaccinations within a twelve-month period. The lack of duration of immunity is more associated with viral as distinct from bacterial vaccines such as tetanus and botulism, which over many years have proved to be most effective.

From the manufacturer's perspective, the mergers and acquisitions that have taken place within the biologics industry have significantly reduced the number of companies involved in the production of equine vaccines. The companies remaining consider the equine as a "niche" market compared to the market for dog and cat products.

Manufacturers are wary of potential litigation consequences should a product cause a major adverse reaction in a valuable horse. Fortunately, the present generation of inactivated equine vaccines results in very few reactions.

While a claim of efficacy provides greater assurance to the purchaser of the integrity of the product, establishing it to be so poses significant hurdles. A challenge model may not exist, as occurred during the licensing of the equine rotavirus and recently for the EPM vaccine. As a consequence, field studies that involve large numbers of animals are necessary. The outcome cannot be guaranteed because of the many variables, particularly estimating disease incidence, which strongly influence the design and subsequent analysis and interpretation of the study.

Some of these difficulties can be overcome with greater collaboration between the parties involved. If field trials are deemed appropriate, horse owners, farm managers, and trainers can participate, utilizing the experience and support of their veterinarians. They will be required to accept the stringent protocols, particularly in respect to the use of non-vaccinated controls.

The research scientists, the biologics companies, and the licensing authorities must together design studies that are scientifically sound. With these in place, the ultimate goal of international harmonization for vaccine licensing becomes a distinct reality, providing safe and efficacious products for horses around the world. ■

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International

Fourth Quarter 2000

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

The respiratory form of equine herpes virus infection was diagnosed among various breeds in France. Sporadic cases of EHV- 1 abortion were reported in Ireland (2), United Kingdom (1), and central Kentucky, USA (3). Equine arteritis virus was identified in the semen of 7 stallions tested in France. Equine influenza was confirmed in France, Sweden, United Kingdom, and New York, USA.

Twenty-six cases of abortion attributable to leptospirosis were confirmed in central Kentucky, the majority typed as *L. interrogans* serovar. *pomona*. Three clinical cases of equine piroplasmosis were diagnosed in Switzerland. Strangles was diagnosed on 8 premises in Ireland, 38 premises in Sweden, and in Switzerland.

Final figures for the incidence of West Nile virus infection during 2000 in 12 northeastern states and the District of Columbia are now available. There were 21 human cases: 14 in New York, including 1 fatality; 6 in New Jersey, including 1 fatality; and 1 case in Connecticut. Fifty-nine equine cases were diagnosed in New Jersey (27), New York (18), Connecticut (7), Delaware (4), Massachusetts (1), Pennsylvania (1), and Rhode Island (1). The overall equine mortality was 23, or 39%.

A large number of dead birds was identified, the majority in New Jersey (1,289), New York (1,278), and Connecticut (1,117). Positive mosquito pools (481) were identified in 5 states, the majority in New York (360). Positive sentinel chickens were identified at 6 sites, 4 in New York and 2 in New Jersey. Clinical cases of West Nile were diagnosed in 54 horses in the south of France. ■

Foot and Mouth Disease

Outbreak in United Kingdom, February-March 2001

Horses **cannot** be infected with the foot and mouth disease virus, but it can be spread mechanically by contaminated equipment or vehicles, or distributed on the feet of horses or riders. As of press time, it has been diagnosed in Northern Ireland, France, and the United Arab Emirates. A protocol was agreed on March 1, 2001 by all sections of the British equestrian industry regarding precautions that should be taken if horses are to be transported. Further details can be obtained on the outbreak by contacting the Ministry of Agriculture, Fisheries, and Food (MAFF) Web site at *www.maff.gov.uk*. ■

National

Equine Skin Disease

The skin is one of the largest organs of the body; however, it rarely receives the attention given to many of the other organ systems. Examination of the skin is much like that of many organs, requiring a detailed history of the problem. This is followed by visual inspection and direct palpation by region: face, neck, chest, abdomen, legs, mane, and tail.

It is important to define the types of lesions observed, with crust or scaling, papule, pustule, vesicle, bulla, wheal, macule, and nodule being among the most common.

Skin diseases are often grouped into categories that cause these specific lesions and a differential diagnosis is pursued from that category. For example, crusting skin diseases may be due to fungal agents (dermatophytes or ringworm), bacterial infections (dermatophilus or "rain scald"), or immune-mediated disorders (pemphigus foliaceous). Nodular skin diseases may lead the examiner down a different track, such as sarcoid, allergic collagenolytic granulomas, or other tumors involving the skin.

The pattern or distribution of skin lesions is

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also helpful in determining a cause. Certain hypersensitivity reactions to insects might involve the mane and tail region, whereas nodules resulting from allergic collagenolytic granulomas are most commonly found on the chest wall just behind the elbow.

Once the type of lesion and pattern of distribution have been determined, the next step is to decide if ancillary testing is required. Common skin disorders such as ringworm or rain scald do not require additional testing. Alternatively, if a skin problem fails to respond to therapy, additional testing may be necessary to rule out an underlying problem or another diagnosis.

The most common ancillary diagnostic tests include skin scrapings for cytology and culture, skin biopsy, and allergen testing. Culture and cytology are generally used to determine a specific bacterial or fungal pathogen and its sensitivity to specific antimicrobial drugs. Cytology may be useful in pointing to an immunological cause (acantholytic squamous epithelial cells and non-degenerate neutrophils in cases of pemphigus foliaceous).

Skin biopsy can be used to determine the histological distribution of the skin problem as well as any structural alterations of specific components of the skin (epidermis, dermis, hair follicles, adnexa, sweat glands, dermal connective tissue, and dermal blood vessels).

The skin biopsy may point to a particular mechanism, but not a particular etiology. In other situations, the skin biopsy may provide a definitive diagnosis.

Congenital skin disorders are occasionally seen. Some are common to many breeds, while others are breed specific. Epitheliogenesis imperfecta is a fatal condition seen in several breeds, but American Saddlebreds may be over-represented. Large regions of skin may be completely missing with exposure of the underlying soft tissue.

Another congenital condition is mechanobullous disease (also known as epidermolysis bullosa), a disorder of the connection between the epidermis and underlying dermis. It is most commonly inherited in Belgian foals and is fatal. The skin is easily torn loose from the underlying tissues and vesicles or bulla may be observed over much of the body, including the oral cavity, and hooves may separate from the underlying laminae.

A condition seen primarily in Quarter Horse foals involves a congenital defect of the dermal collagen (known as hyperelastosis cutis, cutaneous asthenia, or Ehlers-Danlos syndrome after the human counterpart). It may not be recognized until the foal is older, but presents as hyperextensible skin that is easily torn or as separation of large areas from the underlying dermal connective tissue forming seromas. All these conditions would be confirmed by skin biopsy.

Infectious conditions of the skin include the commonly recognized ringworm (dermatophyte) infections and "rain scald" (dermatophilus congolensis). Routine therapy usually resolves these problems, but severe infections may require prolonged treatment or reassessment with skin culture, cytology, or biopsy to make sure there is no other underlying problem.

Often included in the infectious category is lymphangitis, which is presented as an acute inflammation of the soft tissues of a lower limb. Occasionally, it becomes a chronic problem, with extensive scarring of the sub-dermal tissues resulting in an enlarged, stiff limb. The prognosis becomes poor as the condition becomes more chronic.

Papilloma, a contagious skin problem in young horses, is often self-limiting, as the animal's immune system will attack and destroy it. Surgical removal may speed healing and provide a more rapid cosmetic result.

Urticaria or hives is probably the most common immunological skin disorder and represents systemic hypersensitivity to drugs, feed components, or insect allergy, or following equine arteritis virus infection. Pemphigus foliaceous is occasionally seen as a severe, diffuse, crusting skin disorder that can be confirmed by skin biopsy but often requires prolonged immunosuppressive medication. It can occur in foals, which seem to have a better prognosis than adults.

In summary, an organized approach to skin disorders can bring about a specific diagnosis with a subsequent treatment plan and prognosis. ■

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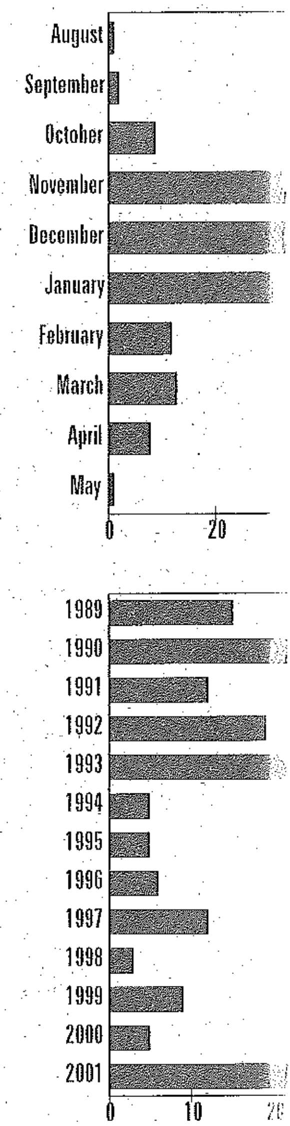
Figure 1.
Confirmed cases of le
abortion, 1989 - Febru



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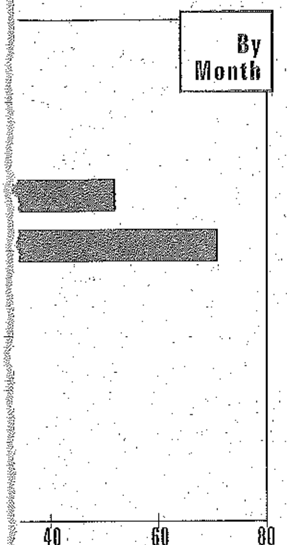

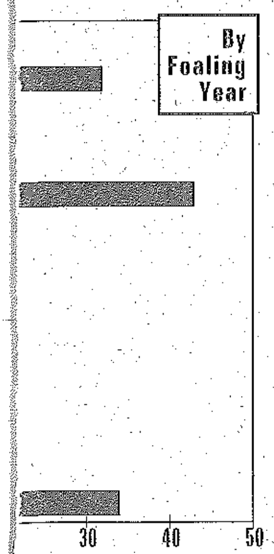

Reproductive Success in Broodmares

The goals of most horse-breeding operations include understanding and implementing factors that ultimately will increase the efficiency and decrease the cost of obtaining live foals. The more that is learned about normal reproductive success in horses, the easier it is to determine if a given farm's success is better or worse than normal and, importantly, why.

When it is understood why certain results are obtained, then decisions can be made to improve success. By considering both biological and management factors, the performance of the breeding animals can be optimized.

What is Reproductive Success?

Per-Cycle vs. Per-Season Success Rates

The reproductive cycle of mares is described as being "seasonally polyestrous." This means that during the breeding season (*i.e.*, periods of long days, either natural or artificially induced), mares have multiple estrous or ovulatory cycles. Nonpregnant mares will normally ovulate approximately every 21-24 days during the breeding season. These estrous cycles provide repeated opportunities for a mare to be mated and hence opportunities for the establishment of pregnancy.

The opportunities to establish pregnancy are advantageous for survival of the species. The 11-month gestation period ensures that offspring will be born in the late spring or early summer, a time when food is most readily available.

Because the mare's reproductive cycles respond to day length, her breeding season can easily be manipulated by altering the duration of light to which she is exposed. For example, if a mare's subjective day length is increased by putting her under lights in November, she can be fooled into entering the breeding season in January.

Accepting that mares are seasonally polyestrous and that the seasonal cycles can be manipulated, how is reproductive performance assessed? For broodmares, that is usually done by documenting foaling rates in two ways: per season and per cycle. There are only two ways to increase foaling rates (for a mare or for a farm): increase foaling rates per season or per cycle. With these being the only choices, what is the difference?

Per-Season Reproductive Success. For a given mare, her reproductive success is either that she produced a live foal or did not. This per-season success rate does not take into account how many times the mare was bred in order to produce a live foal. She may have been bred once (you like this mare) or 6 times (you may want to sell).

Likewise, for a farm, the reproductive success for a season is frequently reported as the percentage of mares that produced a live foal. If 85 of 100 mares produced a live foal, then the per-season success rate would be 85%, which is pretty good. But again, this does not tell anything about how many times (during how many estrous cycles) mares were bred in order to produce those 85 foals. A better way to assess reproductive success is by cycle.

Per-Cycle Reproductive Success. As the name implies, the per-cycle success rate takes into account the number of estrous or heat cycles a mare was bred in order to produce the foal, or the average number of estrous cycles mares on the farm were bred in order to produce foals. If 100 mares were bred, on average, two cycles each in order to produce 85 foals, then the per-cycle foaling rate is 42.5%:
(85 foals/[100 mares x 2 cycles each]) x 100.

What is Normal Reproductive Performance?

In order to estimate "normal" or average reproductive performance for broodmares, records were obtained from The Jockey Club of America that included all of the Thoroughbreds registered in the United States, Canada, and Puerto Rico over a five-year period. This population data represent 40,512 stallions that were bred to 408,275 mares, producing 241,958 foals.

Breeding records over two years were also obtained from four well-managed Thoroughbred farms in the central Kentucky area. These farm data are, of course, included in the population data. The farm data represent 96 stallions that were bred to 4,775 mares, producing 3,442 live foals.

The per-season live foaling rates were 72% for the farms and 59% for the population. The per-cycle live foaling rate for the farms was 42%. Because The Jockey Club does not record each cycle that a mare is bred, it was not possible to calculate the per-cycle success rate for the population. Based on per-cycle live foaling rates reported in the literature, it is unlikely that the per-cycle foaling rate for the population would differ much from that of the farms.

Factors contributing to the normal reproductive performance and to the differences between the population and the farms' performances will be discussed in the next issue of the *Equine Disease Quarterly*. ■

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Equine Leptospirosis

During the past two foaling seasons (through February 20, 2001), 39 cases of leptospira-induced abortion or neonatal death have been diagnosed at the Livestock Disease Diagnostic Center. Five cases occurred during the 2000 season and 34 during the 2001 foaling season. ***Figure 1*** gives the number by month and by foaling year of confirmed cases of leptospira-induced abortions or neonatal deaths for the past 13 foaling seasons.

Two (both Standardbreds) of the five mares diagnosed during the 2000 foaling season were located on the same farm and both were infected with *Leptospira* serovar kennewicki; one of these mares aborted in November and the other in December. Two mares (one Standardbred, one Thoroughbred) were infected with serovar grippotyphosa and one aborted in November and the other in December. The fifth case was a Thoroughbred infected with serovar kennewicki that aborted in April.

Through February 20 of the 2001 foaling season, 34 cases of leptospirosis have been diagnosed, including mares from 29 different farms. Twenty-six farms had one mare, one farm had two mares, and two farms had three mares diagnosed with leptospirosis.

All 34 of the mares were Thoroughbreds. One abortion occurred in August, nine in November, 18 in December, five in January, and one in February.

Four mares that were located on different farms were infected with grippotyphosa and aborted in December. The other 30 mares were infected with *Leptospira* serovar kennewicki.

The gestation age of the fetuses ranged from six months to full term.

The number of cases of leptospirosis diagnosed thus far during the 2001 foaling season is much higher than the numbers seen since the 1993 foaling season (range of 3-12 cases). There is no readily apparent explanation for this increased number of cases. The weather during the year for central Kentucky has been average, with no prolonged wet or dry periods. ■

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EIA Surveillance, 2000

During 2000 a total of 102,453 samples were tested for equine infectious anemia (EIA) in Kentucky. Private testing accounted for 85,624 samples to comply with state regulations regarding the sale and exhibition of equines in Kentucky (see ***Figure 2***). Another 16,829 samples were collected through the Market Surveillance Program or for epidemiological reasons resulting in a further 4 animals testing positive. The number of positive animals, represents a prevalence of 0.06 positives per 1,000 samples. The Kentucky Department of Agriculture made a determined effort in 2000 to advise veterinary practitioners, horse owners and farm managers of the risks of vector-borne diseases, and to increase surveillance for EIA. The number of samples tested in 2000 represents a rise of 5% over 1999. ■

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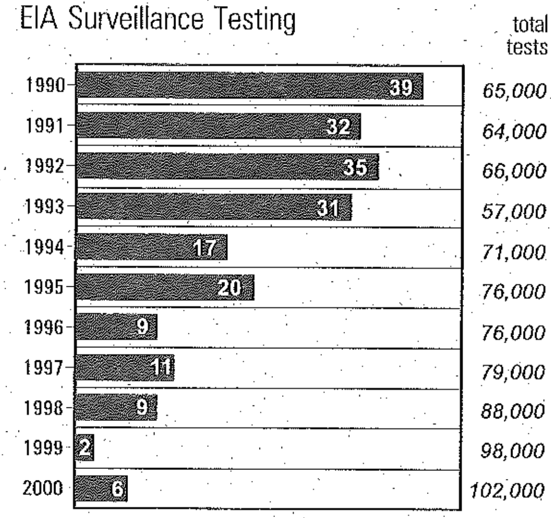
Figure 2.
EIA Surveillance Testing



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