

Equine Biological Risk Management

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TABLE OF CONTENTS

Introduction	3
Risk Perception	3
Hazard Identification	3
Risk Assessment	4
Risk Management	5
General Farm Practices	5
Health Protocols.....	7
New Introductions & Animals Returning to the Farm.....	8
Visitors and Human Foot Traffic	9
Disease Transmission Management	10
Aerosol.....	10
Oral	11
Direct Contact	13
Reproductive	13
Fomites.....	14
Traffic	14
Vector.....	15
Eliminating the Insect	15
Separating Host/Vector	16
Breeding Area Control.....	16
Zoonotic Disease and Health Concerns of Employees	16
Risk Communication	17
Conclusion	18

Introduction

The equine industry is a major economic force in the U.S.

- 7.1 million people involved in the equine industry.
- 6.9 million horses in the U.S.
- Total impact of \$112.1 billion on the U.S. Gross Domestic Product.

Few farm or facility owners have plans in place or understand the basic practices that can be implemented to minimize the risk of infectious agents to their animals.

- This document highlights the importance of BRM in equine facilities through risk analysis.

Risk Perception

Risk perception is what those involved with the operation believe about the real and potential risks of infectious and zoonotic disease.

- Influenced by past encounters, and media.

Obstacles and challenges to educating about risk management may be encountered.

- Negative perceptions based on perceived lack of necessity or economics.

Hazard Identification

An important step in the process of risk management is the identification of the diseases most likely to affect an operation.

- Owners will already have an idea of infectious agents they have encountered.
- Some diseases have widespread geographic distribution and should be included on any farm list.
- Be aware of foreign animal disease, emerging animal disease, bioterrorism, and agroterrorism agents.

Risk Assessment

Risk assessment deals with the likelihood of disease introduction and the estimation of potential consequences.

- Includes illness or death of animals, and loss of client confidence, public image and staff morale.

It is important to evaluate the facility and identify unique characteristics that may provide unique risks to infectious agents.

- Boarding and training facilities have a high volume of horses with a rapid turnover rate.
- Breeding farms have a high number of horses with a high turnover rate.
 - Young, susceptible foals are present.
- Farm and ranch settings have working horses that remain in the same facility until sold or deceased.
 - Animals may leave periodically but generally remain in the same facility.

Horses will vary on their ability to carry or transmit disease based on their age, sex, work load, and other factors

- High performance horses have a high workload and are exposed to many other horses from different backgrounds thereby increasing the risk of disease transmission.

Risk of zoonotic disease

- Human population must be considered as potential vectors or victims of infectious/zoonotic diseases.
- *Leptospira*, rabies, and *Salmonella* are a few of the zoonotic diseases that can be carried by horses.
- Owners, workers, and visitors should all be aware of the potential of zoonotic and equine specific agents that could be carried to and from horses.

Risk Management

Risk management is the process of identifying, selecting, and implementing measures that can be applied to reduce the level of risk.

Risk management plans should include management aimed at general farm practices, modes of transmission for disease agents and individual operation guidelines that are geared towards individual facility issues.

General Farm Practices

Foaling represents a significantly higher disease risk period for both the mare and the foal.

- During late gestation the mare's immune system is reduced.
- The neonatal foal has limited immune capabilities for many months.
- Provide a clean, hygienic foaling environment.
- Disinfect the navel soon after birth.
- Ensure every foal ingests an adequate amount of quality colostrum.
- Test the foal at 24 hr of age to check for adequate blood IgG levels.
- Limit contact between very young foals and older animals.

The foaling area:

- Pastures should be well drained and away from bottomlands, with no standing water.
- If foaling stalls are used:
 - Ideally, each mare should have her own foaling stall.
 - Stalls should be promptly cleaned after foaling to minimize contaminants in the newborn foal's environment.
 - Stalls should be meticulously cleaned and disinfected in between each use.

The weaning period:

- One of the greatest periods of stress and disease.
- The environment in which weaning takes place greatly impacts the likelihood of disease.
 - Stall or small paddock results in increased stocking density, enhancing the transmissibility of disease. However, feed and water sources are better controlled.

- Pasture weaning offers lower stocking density, but it is more difficult to control water quality and exposure to other animals including wildlife.
- Ideally, the mare is removed and the foal is left in familiar surroundings.
 - Limits the exposure of the foal to new pathogens.
- Co-mingling of groups of foals should be avoided.

House horses based on age and stage of performance.

- Foals, yearlings, and pregnant mares are at greatest risk.
- Rigorous performance training and transportation can increase stress levels and decrease immunity.
- The extent and effectiveness of segregation measures will depend on physical proximity, and other factors.
 - Fence line contact may reduce transmission of some orally acquired diseases, but will not stop transmission of aerosol or direct contact pathogens. Multiple fence separation is better.
 - Sharing of feed or water sources can pose a risk, such as a stream running through multiple pastures or common use of feed buckets.
 - Contact with neighboring operations and wildlife presents a threat to all animals on an operation.
 - Risks are minimized by providing greatest protection to the most susceptible population(s).

Establish an order of susceptibility for the populations on the farm.

- All animal work and facility design should proceed from lowest risk-most susceptible populations to highest risk-greatest resistance populations.

Geriatric horses also have increased disease susceptibility.

- Four main factors that influence a geriatric horse's ability to stay healthy: decreased nutrient absorption, poor teeth, decreased immune response and age-related disease.
- Decreased absorption of phosphorus, vitamins, and protein.
- An increase in dental problems also contributes to nutritional problems.

- Proper nutrition of the geriatric horse becomes an integral part of managing disease in this population.
- Antibody response to vaccination is decreased and T cell function is lowered.
- Prone to develop age-related disorders such as liver failure, kidney disease, tumors, and anemia. Although these are not considered infectious diseases, they can influence the immune system and thus contribute to a geriatric horse's increased susceptibility to disease.

Health Protocols

The greatest impact on disease management is determined by the measures directly taken to prevent and treat disease.

- Develop a standard (and preferably written) health protocol.
- Define goals and outline specific means of ensuring the objectives are achieved.
- Include standard operating procedures for: identifying, examining, separating and treating sick animals; administration of routine health procedures and schedules (vaccinations, deworming, castration, etc.); and general husbandry procedures.

Handling sick animals:

- Frequently observe animals for signs of disease.
- Promptly separate potentially unhealthy animals.
- Duration of isolation will depend on the disease, the facility and the animals at risk.
- Treatment areas for sick animals should not be used for healthy animals.
- Treat, feed, or handle the most susceptible animals first and sick animals last.
- When disease diagnosis is uncertain or a disease of severe consequence is suspected, have a veterinarian examine affected animals, collect and submit proper diagnostic samples, and perform necropsies.

Vaccination:

- All horses should be vaccinated for diseases that are prevalent in the area.
- Not all diseases can be vaccinated against.
- Vaccines are not 100% effective for disease prevention.

- Vaccination protocols should be reviewed annually.

New Introductions and Animals Returning to the Farm

Risks can be minimized by limiting the frequency and number of new introductions and by establishing a strict isolation procedure for new arrivals.

- Continual introductions results in social stress and repeated exposure to new pathogens.
- Purchases should be from a known and trusted horse health program.
 - Request records of vaccinations, illness and treatment of purchased animals.
- A veterinary purchase exam or health certificate examination ensures that animals are not showing any outward signs of disease at the time of purchase.
 - Horses can be ill and shedding pathogens prior to the time they exhibit outward clinic signs of illness.
- New purchases should ideally arrive with a health certificate, negative coggins test, and be vaccinated for diseases of concern at least 2-4 weeks prior to arrival.

There are inherent risks associated with purchasing animals of certain ages.

- Purchasing young (less than 2 yrs of age) animals has a greater risk of introducing illnesses such as diarrhea and respiratory diseases.
- Horses that have been previously bred could introduce reproductive diseases such as contagious equine metritis.
- Older animals are more likely to have contracted chronic or latent infections.
- Susceptibility and/ or clinical signs can also change with age.
 - Younger naive horses are often more likely to show clinical signs than are many older animals.
 - Some diseases cause more severe symptoms in older animals.
- Older animals can develop tolerance to a disease and may not show clinical signs but could be a carrier (ex. *Streptococcus equi*)

Isolation/Quarantine:

- Newly acquired animals should be quarantined.

- Also applies to animals returning to the operation, whether it is returning from a weekend show, or from months away at a training facility.
- Isolation facility should prevent contact with all other animals, including those in the herd of origin, neighboring operations and wildlife.
- Isolation facility must protect from all of the potential routes of transmission.
- The isolation area should be cleaned and disinfected between uses.
- Length of isolation will depend on the degree of risk considered acceptable and the diseases of concern.
 - If health status is unknown, quarantine times as long as 30 days are recommended.
 - If health status and history are known and indicate low risk, quarantine periods of three to seven days have been recommended.
- In general, quarantine periods should exceed the incubation period of the disease of concern.

Measures should be taken while horses are away to limit contact with other horses at the new facility.

- Prohibiting sharing of trailers, stalls, and feed or water with animals from other operations.
- Other items to consider include: halters and lead ropes, grooming supplies, feed and water containers, reproductive equipment (artificial vaginas for semen collection, speculums, etc.), saddle pads and blankets, among others.
- Properly clean and disinfect shared items between uses.
- Prevent fecal contamination of feed, water or the immediate environment by other animals.
- Direct contact with other animals should be minimized.

Visitors and Human Foot Traffic

Vehicles present a tremendous opportunity for transporting many organisms and efficiently delivering them to susceptible animals in a short time.

- Understand who brings vehicles onto the operation, what vehicles, where have they been, where (at the facility) they go, why, and how often.
- Applied to all arrivals, including facility owners and family members, employees, buyers, veterinarians, delivery and service vehicles and visitors.
- All vehicle types should be examined, from cars and trucks to tractors and other equipment, trailers, and any other mobile objects that are brought on the property.

Visitors:

- Everyone who does not reside at the facility should be required to sign a visitor's log book.
- Visitors should be instructed on what areas are acceptable or unacceptable for foot traffic.
- Inquire about visitors' contact with animals on other operations,
- Consider requiring all visitors to put on clean coveralls and overboots.
- Install a foot bath at the main entrance with a requirement that all visitors disinfect their footwear. A footbath that is not properly maintained creates a false sense of security while providing little to no protection.

Disease Transmission Management

Pathogenic agents can be spread from animal-to-animal or animal-to-human and vice versa, through five main routes of transmission: aerosol, oral, direct contact, fomite, and vector.

Aerosol

- The ability of pathogens to survive and be transmitted varies by organism as well as other factors such as temperature, humidity, and wind speed.
- The greater the distance of separation between an infected and a susceptible animal, the less likely transmission will occur.
- Appropriate ventilation is extremely important in reducing airborne disease transmission.
 - Ensure that the enclosure has as little moisture and odor as possible.
 - Ideal humidity is 50-75%.
 - For average temperatures and humidity there should be 8-10 air exchanges per hour (all air in the building replaced every 6-7 minutes).

- Avoid the temptation to completely close up a barn during cold weather.
- Stocking density influences not only the direct contact of susceptible animals with infected individuals, but it also influences the airborne pathogen load.
- Excitement and stress play a role in aerosol transmission. Increased activity in a confined space creates dust, and raises the respiratory rate of the horses, leading to more coughing, increased respiratory effort, and decreased efficacy of clearance mechanisms.
- Stocking density should be kept at the minimum acceptable level,
 - General rule is 2-4 acres of pasture per horse if turnout time is unlimited.
- Overhead sprinkler systems help reduce airborne pathogen load by decreasing dust, pollen, and fungal spores that often cause upper respiratory tract problems.
 - Ensure that the sprinklers are adjusted properly so as to not create a muddy and overly moist environment where pathogens would thrive.

Oral

Feed:

- Oral transmission can occur through contaminated feed, water, or objects in the environment that horses may contact with their mouth.
- Important to control the source of feed and the feed quality.
- Efforts to protect pasture include avoiding fertilization with high risk materials (non-composted manure), frequently dragging the fields to break up fecal piles (organisms die more rapidly when exposed to heat, sunlight, and wind), and avoiding overgrazing (forces animals to graze closer to the ground and nearer to fecal piles).
- Hay, grain, mineral mixes, and other supplements should be evaluated.
- Feed should be handled and stored correctly.
 - Prevent access and contamination from any animals, including wildlife, birds, vermin and scavengers, as well as dogs, cats, horses and other livestock which may urinate, defecate or otherwise introduce disease.
 - Proper storage also means protection from weather (to prevent spoilage and mold growth).
- Use of hay rings or similar feeding methods congregates horses in a small area and can lead to environmental contamination with feces and urine.

Water:

- Natural sources are often used because of convenience and reduced expense. However, artificial sources are preferable because of the increased ability to control water quality and prevent contamination.
- Water containers should be examined regularly for functionality and cleanliness.
- Containers should be cleaned of all organic debris, including manure, bedding, feed, leaves and other plant material.
- Water sources (whether natural or well/faucet) should be tested yearly.
 - Tests for total dissolved solids should be below 1,000 ppm.
 - Coliform bacteria counts should also be completed.
- Natural water sources have the risk of contamination by wildlife, fecal material, urine, and environmental toxins. Streams pose an additional threat, due to the potential contamination from upstream.

Manure:

- Waste management is vitally important in controlling oral pathogens.
- Waste should be transported to a designated storage or disposal area that is out of contact with animals.
- Storage areas should be well-drained, level areas that prevent pooling of polluted runoff.
- Manure should be composted to destroy bacteria and parasite eggs.
- Waste management equipment should be designated for that sole purpose; equipment should not be used for other purposes, such as feed delivery.
- Waste from other facilities can contaminate the premise by streams and waterways, or direct runoff.
- Generally speaking, the risk of spreading disease will be lowered by exposing the waste material to environmental conditions.
- Dragging pastures to break up and disperse fecal piles is recommended to allow exposure of pathogens and parasites to environmental conditions.
 - Dragging should only be done in pastures that currently are not occupied and horses should be kept off the pasture for approximately two weeks.

- Feces from other species can also transmit disease to horses.

Travel:

- Water sources at an away facility may not be tested, and quality may be poor.
- Feed and hay may not be stored in closed containers and could be contaminated with feces from rodents and wildlife.
- Be very selective about feed and water provided to horses when traveling if sources from home cannot be provided.

Direct contact

- A susceptible animal becomes exposed when the disease agent directly touches open wounds, mucous membranes, or the skin through blood, saliva, nose to nose contact, rubbing, or biting.
- Isolate ill or newly introduced animals.
- Fence line contact should be limited, both to animals from neighboring farms and also to animals from different groups on the same operation.
- Double fencing is ideal to prevent contact across fence lines.
- Stocking density should be kept at the lowest acceptable level, and congregation of animals minimized.
- Fomites play a major role in transmission of direct contact diseases.

Reproductive

- Reproductive diseases can be greatly reduced or eliminated by using AI.
- Stallions should have a thorough breeding examination prior to the start of the breeding season.
- Visiting mares should be cultured prior to mating.
- For AI, each stallion should have its own artificial vagina.
- When performing insemination, basic hygiene principals apply.
- Similar precautions should be taken when collecting and transferring embryos.

Fomites

- Virtually any object can serve as a fomite
- Recognize and separate ill horses.
- Have dedicated equipment, brushes, and tack for the isolation facility or ill horse.
- Any item that could potentially contact fecal material poses a risk as a fomite.
 - Separate equipment should be used for handling manure and feed.
- Limit the use of shared items between horses.
 - Shared halters, brushes, clippers, and other tack items can transmit disease agents.
- Items should be cleaned and disinfected on a regular basis (daily, weekly, or monthly, depending on item and frequency of use). Shared items should always be cleaned and disinfected between uses.
- Employees should be cautious to use aseptic technique in drawing medication from multi-dose bottles.

Traffic

- Vehicles, trailers, or humans can cause the spread of a pathogenic agent through contaminated tires, wheel wells, undercarriage, clothing, or shoes/boots by spreading organic material to another location.
- Follow proper hygiene and biosecurity standards, such as frequent hand washing, removal of dirty clothing, and cleaning of boots/shoes.
- Items that leave or move around the facility, such as vehicles and equipment (including trailers, tractors, and implements) can transport fecal material from one group of animals to another.
- Items exposed to a location with a large number of animals (shows, races, sales, etc.) should be considered a risk.
- All trucks, trailers, and vans used to transport horses should be cleaned and disinfected regularly, preferably after each use.
- Cleaning of vans, trailers and trucks should also include the outside surfaces.
- Request visitors maintain a reasonably sanitary vehicle or park at the perimeter of the facility.

- Have a designated parking area at the perimeter of the facility and request that all visitors be restricted to using facility-owned vehicles.
- Posted signage should be available to direct visitors on the proper protocol to minimize disease spread.
- Drive paths should not have direct animal contact.
- Veterinarians set the example of traffic control, use of disposable boots and footbaths, and proper hand washing.

Vector

The prevalence of vector-borne diseases is dependent upon the prevalence of the disease agent and the distribution, abundance, life expectancy and feeding habits of the vector. The most effective means to prevent transmission is the elimination of the insect, or at least separation from the host.

Eliminating the insect

Methods of killing insects include:

- Direct treatment of horses with pour-ons or sprays
 - Effective but short-lived duration
 - Insect resistance is a problem
- Spraying premises with knockdown insecticides
 - Effective in smaller areas; inefficient in larger areas
 - Must be used the same day they are mixed up
 - Duration short-lived (1-2 hour action)
 - Effectiveness dependent upon weather conditions (target air temperature between 65-90°F for best results)
- Spraying with residual sprays
 - Remain active for several days
 - Apply to shaded areas only as ultraviolet light breaks down chemicals
 - Rain will wash away spray so must be reapplied
- Biological control such as parasitic wasps which feed on fly larvae, or birds that eat insects.

- Effective but requires repeated introduction of control organism
- Birds present their own biological disease risks such as spreading salmonellosis, which should be considered
- If used in conjunction with sprays, the parasitic insect may be killed

Separating host/vector

- Separation of host and vector is needed when a specific region is heavily populated with insects and premise treatment is not practical.
- Fence off these regions or confine animals to a building that can be insect-proofed or sprayed with an approved insecticide.
- In the case of mosquitoes, keep horses stabled in the early evening and morning.

Breeding area control

- Eliminating standing water, especially wet, muddy areas (mosquitoes)
- Eliminating decaying organic matter weekly (flies)
- Fill in low lying areas, moving feeding areas away from wet areas, and remove old buckets and tires.
- Promptly remove decaying organic matter.
- Drag dry lots and pastures to disperse fecal piles

Zoonotic Disease and Health Concerns of Employees

- There are many zoonotic diseases including encephalitis viruses, salmonellosis, leptospirosis, brucellosis, staphylococcus and streptococcus infections, *E. coli*, cryptosporidiosis, ringworm, and the most serious- rabies.
- As people age, their reflexes and immune systems decline.
- At-risk clients and their employees may include: children under the age of 5, pregnant women, and immune compromised individuals.
- Zoonotic diseases that rarely affect healthy adults can cause severe disease (and even death) in young children.

- Products may have toxic potential if accidentally injected or absorbed via mucous membranes (eg. the sedative detomidine; prostaglandins and oxytocin in pregnant women).
- Biological agents should be stored in a cabinet or refrigerator designated for that purpose.
 - Food for human consumption should never be stored with biologicals.
- Injection needle caps should never be removed by grasping with the mouth.
- Hands should be washed after handling of any biologicals.

Handwashing:

The following hand washing technique is recommended:

- Wet hands and forearms with warm water.
- Add at least 3-5 mls of soap (the size of an olive).
- Lather up and vigorously scrub each side of the hands beyond the wrist for 10-30 seconds.
- Cleaning under rings and cleaning dirty fingernails.
- Rinse under warm water until no soap residue remains.
- Dry hands with a disposable towel (using a multi-use towel can spread disease between individuals).

Hands should be washed immediately after handling sick animals, after coming in contact with feces or urine from horses, after using the restroom, and prior to eating.

Risk Communication

- Risk communication is a two-way, interactive process.
- One of the major barriers to effective risk communication is inadequate planning and preparation.
- Risk management plans must be understood, supported, and adopted by every employee for effective implementation.
- Educational programs should not be limited to one form.
- Proper communication of the risk management plan is of utmost importance for effective infectious disease control.

- When communication is effective and efficient, disease spread can often be minimized and controlled.

Conclusion

Risks of disease transmission cannot be completely eliminated, but by employing some basic hygienic and biological risk management principles, these risks can be effectively managed and significantly reduced.