Biosecurity should be a component of every equine practice, whether large or small. Veterinary personnel should know what biosecurity means and entails, why it is important, and how it should be implemented. The goal of biosecurity is the same whether in a small ambulatory practice or a large university or referral clinic. Every staff member should take responsibility for protecting patients, all staff members (including himself or herself), and other animals with which staff members have contact.

**Defining Biosecurity**

The various definitions of biosecurity focus on the key areas of protection and reducing and preventing transmission of infectious disease:

- “Biosecurity is a set of preventive measures designed to reduce the risk of transmission of infectious diseases…”1

- [Biosecurity involves] “protecting the health of livestock by preventing the transmission of disease through physical barriers and hygiene practices.”2

I think of biosecurity as having a three-part goal. The first part is protection of patients. Patients with infectious diseases are often immunocompromised, which makes it difficult to fight off other biologic insults. Infectious disease and compromised immunity are marked by clinical signs such as fever, depression, and inappetence and a laboratory finding of leukopenia. Compared with healthy adult horses, the following horses have decreased immunity without signs of clinical illness: foals before weaning, late-term pregnant or recently foaled mares, and geriatric horses.

The second part of biosecurity is protection of other patients or animals with which veterinary personnel have contact. Other patients could be at risk for acquiring infection via cross-contamination. The risk is always higher in animals that are immunocompromised because of illness, recent surgery, or current treatment with
medications such as an antimicrobial that could alter the normal flora of the gastrointestinal (GI) tract, possibly resulting in overgrowth of harmful bacteria.

The third part of biosecurity is protection of staff members from zoonotic diseases, some of which are easily transmissible.

The Importance of Biosecurity

Biosecurity is critical to preventing disease transmission. Every staff member can help on a small scale to prevent large-scale epidemics and pandemics. Because biosecurity is so important, accountability is a large part of properly practicing it. All staff members must be accountable to themselves and the patients they care for every day. Even if individuals know that they should be following a certain protocol, they may “cut corners” if they think no one is watching. Just one small breach in biosecurity could mean full contamination of an entire isolation unit. To help enforce biosecurity compliance and accountability, some hospitals have installed surveillance cameras in high-risk isolation units, but management still needs to regularly remind employees of the importance of biosecurity.

My approach to biosecurity is “guilty until proven innocent” if a patient shows clinical signs of a potentially contagious or infectious disease (BOX 1). A patient may require isolation if it has neurologic signs (especially with no history of rabies vaccination or with a recent history of [1] respiratory signs, fever, and, possibly, travel or [2] contact with a horse with this history); nasal discharge with enlarged lymph nodes (as in strangles); diarrhea; a fever of unknown origin; or pronounced leukopenia, with or without fever and/or diarrhea. In addition, animals from a facility with a known outbreak of a contagious disease should be quarantined, even if they do not appear clinically ill.

**Box 1. Clinical Signs of a Potentially Contagious or Infectious Disease**

*In equine medicine, the most common and important infectious diseases have a bacterial or viral origin, except for ringworm infection, which is fungal; however,*
endoparasites and ectoparasites can be problematic in certain circumstances. Signs of infectious bacterial and viral diseases can be vague, sometimes mimicking signs of other conditions. Common signs include weakness, ataxia, vague neurologic deficits, fever, diarrhea, nasal discharge, enlarged lymph nodes, and coughing, with laboratory findings including anemia and leukopenia or leukocytosis.

In clinics that handle a large number of GI cases, especially abdominal surgeries, good biosecurity practices are imperative. Data\textsuperscript{3,4} show that GI cases involving colic and diarrhea are particularly associated with transmissible organisms. During GI disease, the normal flora of the gut is disturbed, resulting in conditions that favor pathogenic organisms such as Clostridia and Salmonella spp. Horses experiencing a GI insult are more likely to (1) shed pathogenic organisms that they were harboring in their GI tract when they became ill and (2) become infected if they have contact with these organisms. Of these bacteria, Salmonella spp are by far the most important, having caused numerous outbreaks at veterinary clinics, particularly those that treat colic. Some clinics routinely screen fecal samples for Salmonella spp in some (e.g., high-risk patients) or all patients, and some clinics also sample the environment. It is important to appreciate that although Salmonella spp are most frequently recovered in GI cases, even an apparently healthy horse may shed these organisms in its feces. If a positive fecal result is obtained, the case can be managed more appropriately, especially regarding antimicrobial use. Screening fecal samples is also useful in tracking the disease (e.g., Did the patient present with the bacterial overgrowth, or was it a complication of surgery or hospitalization?). National survey data of the National Animal Health Monitoring System (NAHMS)\textsuperscript{5,6} indicate that, at any given time, approximately 1% to 2% of healthy horses are shedding Salmonella organisms. There is also ample evidence that other organisms capable of causing contagious disease can be shed by healthy animals; therefore, veterinary personnel must vigilantly and carefully follow biosecurity practices when working with all patients, not only those that are obviously ill.
Putting Biosecurity Into Practice

Any practice that treats inpatients must have an area where a patient may be quarantined if diagnosed with, or suspected to have, a contagious disease. In small practices, this area may be one stall covered with drapes that does not have adjoining stalls; in a large referral or university practice, this area may be a separate isolation unit in which all stalls are completely self-contained (ideally, there are no overhead connections across walls, each stall has separate ventilation, and there is no direct communication between stalls via a common central hallway or open stall fronts). In many isolation units, anterooms add a second level of protection.

Regardless of the size or design of the isolated area, it should include the following elements. Clearly visible signage should (1) indicate that the area is isolated and that only authorized, trained personnel should enter and (2) detail the protocol for entering the area. Visitors or nonessential staff should enter the area only if necessary and if accompanied by trained personnel. Personnel should not be allowed to eat or drink or conduct other hand-to-mouth activities in the area. In many cases, completely separate attire and footwear are mandatory for isolated areas. At a minimum, personnel should don some personal protective equipment (PPE), which can include gowns, coveralls, gloves, boots, bouffant hair caps, face shields, and facemasks. PPE should be changed between patients and should be donned just before working with an isolated patient and removed immediately when finished. All used PPE should be placed in a biohazard trash bag or can and disposed of properly. In addition, proper handling and hygiene of all equipment are imperative, so there should be a stringent cleaning protocol for stalls and other spaces in the isolation area. It is usually best to use the same protocol consistently.

Several very good disinfectants are available. However, if an organism is exposed to the same disinfectant all the time, it may become resistant to the disinfectant. Therefore, a different disinfectant may need to be used in response to an identified or perceived
problem; for example, if the spread of infectious disease seems to be increasing, changing the disinfectant may be an easy way to correct the problem. Staff members should stay current with what disinfectants are available and consider changing a disinfectant as new options become available. Bleach is one of the most common household and workplace disinfectants. Some other disinfectants act as oxidizers, providing a quick kill and performing better than bleach in the presence of some organic debris; examples include peroxynitrate disinfectant and accelerated hydrogen peroxide. The numerous other disinfectant classes include quaternary ammoniums, phenolics, and biguanides. For additional information about disinfectants and their spectrum of activity, visit the Web site of the Center for Food Security and Public Health of Iowa State University.\textsuperscript{7,8}

The following key points should be remembered when using disinfectants. First, a surface cannot be disinfected properly if it is not clean: you must clean before you disinfect; otherwise, you are wasting time and money. Second, the “solution to pollution is dilution,” so always follow the recommended dilution on the product packaging. More is not always better: some disinfectants kill more efficiently at lower dilutions. Conversely, make sure that you do not overdilute a product, which can also decrease its effectiveness. When cleaning and disinfecting, it is very important to apply products in the proper order and to avoid mixing certain products to prevent production of noxious fumes. To achieve optimal disinfection, adequate contact time with a disinfectant must be allowed. Ventilation and proper handling of materials as indicated on material safety data sheets are also imperative. In general, disinfected areas should be rinsed properly before use.

Some infectious diseases are not contagious, while others are very contagious, particularly among high-risk animals. It is important to know your “enemy.” Understanding a suspected disease is critical to ensuring effective control. You want to do everything necessary to reduce the risk of disease spread, which might mean patient isolation as well as institution of full barrier precautions; however, if these are unnecessary, time and resources should not be wasted on them (because of the use of
Disposable PPE, barrier nursing can become expensive). Therefore, knowing the route of transmission is important for determining the risk factor. In some cases, the route of transmission may not require patient isolation, as with most venereal diseases (e.g., equine metritis) and some blood-contaminating and insect-borne diseases (e.g., equine piroplasmosis). Patients with GI diseases with zoonotic potential—including those caused by Clostridium spp, Escherichia coli, and Salmonella spp—require isolation. Common diseases that require isolation of infected horses and full barrier protection include salmonellosis, strangles, influenza, rotavirus infection, herpesvirus infections (particularly those caused by equine herpesvirus 1 or 4), infectious anemia, and rabies. Other contagious diseases may not require patient isolation, even if they have zoonotic potential; diseases such as brucellosis, ringworm infection, leptospirosis, infection with methicillin-resistant Staphylococcus aureus, staphylococcosis, and vesicular stomatitis require only mild barrier precautions, such as gloves or disposable boots. It is important to place warning signs on stalls, identifying the risk: for example, “Has ringworm; wear gloves when handling.”

When working with animals, especially those that are ill or hospitalized, good hygiene is a must! Between patients, it is imperative to wash hands or use an alcohol-based hand sanitizer, remembering that sanitizer works only if no gross debris or dirt is present. Always wash your hands thoroughly with an antibacterial soap before eating or drinking. A good hand-washing practice is to turn off the faucet with a paper towel to reduce the risk of recontamination. Many who work in equine health care have pets or other animals to care for; therefore, it is important to change clothing and shoes and, if possible, shower after working with ill animals to reduce the risk of disease spread.

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