

Biological Risk Management for Mobile Veterinarians

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Introduction

Biological risk management (BRM) is designed to identify activities that potentiate the risk of infectious disease entry or spread, and provide intervention techniques to diminish those risks. Veterinarians have a responsibility to protect their clients, as well as their communities, from endemic, emerging, and foreign animal diseases. A BRM plan helps the veterinarian fulfill this responsibility. However, to be successful in coordinating the efforts of all involved, a veterinarian should consider a community-oriented concept of care. Successful prevention/intervention strategies require teamwork among the veterinarian, his/her clients, and the community at-large. The veterinarian should encourage the cooperation of producers, pet owners, and businesses within the community to work together and initiate effective strategies to minimize biological risk. Based on the five principal methods of disease transmission—*aerosol, oral, direct contact, fomites, and vector-borne*—an established and executed plan can greatly reduce the incidence and spread of disease.

Risk Perception

We live in a mobile society, both globally and domestically, which provides a greater opportunity for the spread of diseases. The actions veterinarians take to control the transmission of unwanted biological agents will depend on the veterinarian's perception of risk. Risk perception is an individual's concept of what can cause an unwanted event to occur. Veterinary professionals should base their risk perceptions concerning BRM on scientific plausibility and not preconceived notions such as "this has not been a problem in the past" or "it is too expensive to make those changes in my practice." Veterinary professionals are role models in the community and clients will mimic their behavior. If veterinarians establish BRM policies for themselves, such as proper hand cleaning, wearing gloves when appropriate, washing footwear when entering barns, and always wearing clean, uncontaminated clothing, their clients will follow these examples and adopt the same practices.

Risk Assessment

Current scientific data that exists for biological risk management is fairly sparse and ambiguous, making it difficult to know which interventions will provide the best protections in a BRM plan. Interventions should be based on scientific principles and economic feasibility. For example, a set of sterile surgical instruments for each animal is the best action to prevent the transmission of diseases. This intervention from a time and cost standpoint may not be practical when castrating and dehorning a truckload of calves. This does not mean that the veterinarian has to disregard all aspects of a BRM plan. He or she may implement other interventions, such as placing the instruments in a bucket of disinfectant between every animal. However, what is most important is to recognize the level of disease risk he/she is accepting and what the client is willing to accept.

As new information becomes available, theories and practices will change. Veterinary professionals with an understanding of science and a working knowledge of disease control will be able to work within this evolving framework. Predicting what will cause disease is a complex series of conditional events. Disease predictions are not as simple as yes or no, but the various risks that predispose to disease occurring often are. Environmental conditions such as cleanliness or the animal's nutrition and stress levels can help or hinder a pathogen's existence. Assessing the risk of these conditions is a continuous process that changes over time. The veterinary professional has the skills to gather and evaluate information and to distinguish between subjective information that may be based on myths, and objective information based on science to help determine the actual risk of disease transmission.

In reviewing this material, it is imperative to understand that the focus is on routes of transmission, not specific disease entities. Assessing risk based on route of transmission provides a more complete and holistic approach and avoids emphasizing specific disease(s). The only references made to specific diseases, syndromes or infectious agents in this material are for illustrative purposes only, and there are no specific recommendations provided as to vaccination, treatment or testing procedures. This focus will make the information applicable to a variety of audiences and remain relevant even as scientific advances improve our understanding of diseases.

Risk Management

For the purpose of discussion, BRM for mobile veterinarians will be divided into two groups. The first group consists of *mobile clinic veterinarians* who have facilities capable of treating animals inside the vehicle and can move from location to location. Second are the *mobile veterinarians* that drive vehicles containing veterinary supplies to treat animals at a farm or in the home. One goal of this section is to convey examples and guidelines showing how to base BRM interventions on the five routes of disease transmission. A second goal is to convey that these interventions do not require veterinarians to make drastic changes in the way they practice medicine. Biological risk management is a feasible, practical approach that can fit well into the daily practice routine of veterinarians.

The documents illustrate the best available "standard operating procedures" for a wide range of management practices. Each veterinarian should perform a thorough assessment to identify opportunities for improvement. Then the management suggestions should be considered as to which ones are most practical, applicable, and economically feasible. Most recommendations can be implemented independent of others. This will result in tailoring the BRM program for each veterinarian based upon his/her preferences, resources, risk perception and risk tolerance. Some suggestions may not be feasible; but recognizing what is optimum helps establish long term goals.

Mobile Clinic Veterinarians

The goal of a mobile clinic veterinarian's BRM plan is to recognize activities and conditions within the mobile veterinary clinic that present a risk of disease transmission. Once the veterinarian recognizes these conditions, interventions can then be established

to minimize the spread of diseases. All diseases are transmitted by at least one of five routes: fomites, oral, direct contact, aerosol, or vector-borne. BRM interventions for the mobile clinic veterinarian are directed at these five routes of transmissions. The following discussions are examples of mobile veterinary clinic activities and interventions that should be established in a BRM plan.

Fomite Transmission

Fomite transmission requires an inanimate object to carry a pathogen from one susceptible animal to another. Fomite transmission often involves a secondary route of transmission such as oral or direct contact for the pathogen to enter the host. Iatrogenic transmission is a special type of fomite transmission in which a medical professional causes the spread of the pathogenic agent through the use of contaminated instruments, needles, vaccines, or biologics. Traffic transmission is a subtype of fomite transmission in which a vehicle, trailer, or human causes the spread of a pathogenic agent through contaminated tires, wheel wells, undercarriage, clothing, or shoes/boots by spreading organic material to another location.

From a BRM perspective, fomite transmission is the dominating method by which diseases are transmitted within a mobile veterinary clinic. Intervention policies to prevent transmission of diseases by fomites are based on hygienic practices, containment of contaminated areas, and time to let the pathogen die. Combating fomites requires constant cleaning of the facility and equipment. Veterinary instruments can act as fomites which requires deciding if the instrument used can be cleaned and disinfected rendering it safe to use again, or is it safer and a more economically feasible decision to throw it away ("when in doubt, throw it out" concept). A second example is how to deal with a cage contaminated with emesis and stool of an infected patient. Infected waste from the cage has to be removed and disposed of in a manner so as not to contaminate others areas (double bagging, promptly removing trash, wearing gloves/washing hands). Veterinarians have to think about their personal hygiene as well because if their hands and clothes are not kept clean, they can become walking fomites and spread diseases.

Fomite transmission can transmit a wide range of biological agents. Examples of interventions in a BRM plan to minimize disease transmission by fomites are:

- Using disposable materials once and then properly disposing of them (sharps should go in a designated container).
- Storing clean materials and instruments in an area separate from dirty, contaminated materials and instruments to prevent cross-contamination.
- Having a pre-defined procedure for disposing of biologically contaminated materials. This procedure should guide veterinarians and their staff as to how to clean areas without cross-contaminating other areas. Situations can range from what should be done if a rabies suspect is brought into your facility to dealing with a leash contaminated by a pet with ringworm.
- Establishing policies to prevent humans from becoming fomites and transmitting biological agents on their clothes and hands. Protocols should be established that address the type of appropriate clothing to wear so it can be easily changed if soiled. Adequate hand washing stations should be available

(or disinfecting wipes or hand sanitizers) and protocols established so that hands are washed or sanitized between patients.

- A mobile veterinary clinic can in itself become a large mobile fomite if not washed and cleaned on the outside as well as the inside. Establish protocols for washing the vehicle on a routine schedule, being vigilant to remove dirt from under the vehicle and other hard to reach areas.

Oral Transmission

Oral transmission involves the consumption of pathogenic agents in contaminated feed, water, or licking/chewing on contaminated environmental objects. The most common method is by fecal contamination of food and water. In a mobile veterinary clinic, the risk of orally transmitted diseases is constant if proper cleaning and disinfection does not occur. Internal parasites and diseases such as giardia, parvovirus, and *Salmonella* are examples of biological agents that can contaminate objects and be transmitted to other animals or people. Interventions that can be implemented to block oral transmission of diseases are based on hygienic practices and proper disposal of animal waste. Common cleaning procedures, if done properly, will minimize oral transmission of disease.

Example protocols include:

- Cleaning and disinfecting cages and food/water bowls between every animal.
- Using disposable towels in place of cloth towels to prevent cross-contamination when cleaning surfaces.
- Picking up fecal material deposited by animals as they enter and leave the mobile veterinary clinic.
- Washing hands between every patient.
 - Keeping hands clean by washing with soap and water or using hand sanitizers is a simple, effective procedure that limits disease transmission.

Direct Contact Transmission

Direct contact requires the presence of an agent or organism in the environment or within an infected animal. A susceptible animal becomes exposed when the agent directly touches open wounds, mucous membranes, or the skin through blood, saliva, nose-to-nose contact, rubbing, or biting. It is important to note that depending on the disease agent, it is possible for direct contact transmission to occur between animals of different species, as well as to humans.

Direct contact can occur through nose-to-nose contact with a distemper dog or with casual contact between dogs with ringworm. Regardless of the situation, BRM interventions should be directed at minimizing physical contact with infected animals. Keeping animals in separate cages and having adequate spacing between animals that are waiting can be a challenge in a mobile veterinary facility. This can be managed by requiring all animals be in a kennel, on a leash, or remain in their owners vehicle until they can be seen. Appointment scheduling is also important to avoid build up of clients in the waiting area. Attention to small details and keeping animals separated can prevent direct contact transmission of diseases.

Aerosol Transmission

Aerosol transmission occurs when pathogenic agents contained in aerosol droplets are passed from one animal to another or animal to human. Most pathogenic agents do not survive for extended periods of time within the aerosol droplets, and as a result, close proximity of infected and susceptible animals is required for disease transmission.

Interventions developed against aerosol-transmitted diseases should be based on ventilation and distance to minimize exposure. Ventilation that provides fresh, uncontaminated air decreases the number of pathogenic agents present to expose other animals. Putting distance and barriers between sick and susceptible animals decreases their exposure. Animals may enter a mobile veterinary facility before the staff is aware of their potential illnesses. BRM plans can provide a protocol for this situation and should include the following:

- Exhausting the air within the facility to the outside to decrease aerosol exposure of viral and bacterial particles that are dispersed within the mobile facility.
- Minimize contact with other animals. In aerosol transmission, distance is important. Animals with disease can enter a veterinary facility before the diagnosis is known.
- After a preliminary diagnosis has been made (canine distemper for example), take precautionary measures to minimize all future exposures. Simple steps like exiting the sick animal out a door where others are not congregating, or shutting the exam room door and ventilating the air in the room to minimize aerosol transmission to susceptible animals.
- Disinfect areas the distemper dog has contaminated with aerosol droplets. This requires cleaning not only the exam table, but the surrounding counter tops, cupboards, and exposed floors and walls. It also requires cleaning the areas within the mobile veterinary facility that the animal passed through on their way to the exam room.
- Keep animals with contagious diseases out of areas where healthy animals frequent. If a contagious animal is inadvertently placed in a cage or allowed into the waiting room, have a predetermined protocol to disinfect and ventilate the contaminated area.

Vector Transmission

Vector transmission occurs when an insect acquires a pathogen from one animal and transmits it to another. Diseases can be transmitted by vectors either mechanically or biologically. Mechanical transmission means that the disease agent does not replicate or develop in/on the vector; it is simply transported by the vector from one animal to another (flies). Biological transmission occurs when the vector uptakes the agent, usually through a blood meal from an infected animal, replicates and/or develops it, and then regurgitates the pathogen onto or injects it into a susceptible animal. Fleas, ticks, and mosquitoes are common biological vectors of disease. Interventions used in developing a BRM plan to control vector-transmitted diseases are based on the use of pesticides, containment of ticks that get into the facility from infested patients, keeping windows closed or screened to minimize entry, and alteration of environmental

conditions that favor vector survival. Animals infested with ticks and fleas need to be confined in an area where the ectoparasites can be contained until the animals can be treated. Parking lots and areas with short trimmed grass have less potential for harboring fleas and ticks and are the preferred location to park mobile veterinary units.

Mobile Veterinarians

When developing a BRM plan for a mobile veterinarian, the first step is to recognize that personal actions can be responsible for transmitting unwanted biological agents in their practice community. Remember Typhoid Mary? She was a cook in the early 1900's that went from kitchen to kitchen spreading *Salmonella*, causing illness and death to many unsuspecting people. If a mobile veterinarian cannot manage biological risk, he/she could be the Typhoid Mary that spreads a foreign animal disease, leading to animal illness, death, and subsequent economic loss to unsuspecting clients.

The second step in minimizing biological risk is to recognize its existence and develop a foundation to implement realistic interventions. Interventions should be based on the concepts surrounding the routes of disease transmission (aerosol, direct contact, fomites, oral, and vector). Veterinarians can influence the animal industry by being persistent in their education of clients to practice BRM. Additionally, educational activities should be directed at local agricultural supportive services (service people, feed providers, rendering trucks, etc.) convincing them of the importance of BRM and the role it plays in the economics of the community. A community-oriented approach to biological risk management prepares a community to better deal with threats from a foreign animal disease or a bioterrorist attack.

For simplicity, when discussing mobile veterinarians, the aspects concerning disease transmission will be condensed into three categories instead of five, combining oral and direct contact with fomites, followed by aerosol and vector transmission (see mobile clinic veterinarian section for full definitions of the routes).

Fomites, Oral, and Direct Contact Transmission

Fomite transmission requires an inanimate object to carry a pathogen from one susceptible animal to another. Humans often play a key role in facilitating this type of exposure. A mobile veterinarian generates fomites that can transmit disease by direct contact and/or oral transmission if not properly handled. A policy of "clean it or throw it away" would make managing fomites easier, but this is not always practical. Management practices to prevent fomites from forming may be a more realistic option in many cases. Fomites generated on farm or house calls typically fall into two categories: single use, disposable items; and multiple use items. Multiple use items can be further divided based on their ease of cleaning. Let's look at a few examples:

Single use, disposable items

- Needles
- Syringes
- Catheters
- Gauze

- Latex/nitrile gloves
- Paper products (towels, surgical drapes)

Multiple use items

- Easily washed
 - Surgical instruments
 - Thermometers
 - Bandage scissors
 - Calf jacks
 - Obstetrical chains and handles
 - Dehorner
- Difficult to clean
 - Ropes
 - Halters
 - Brushes
 - Muzzles
 - Leashes
- Washable
 - Clothing (coveralls and smocks)
 - Rubber over-boots
 - Medicine bottles
 - Soap or lubricant dispensing bottles
 - Coolers
 - Dosing syringes
- Special precautions required to clean (functionality may be harmed)
 - Stethoscopes
 - Ophthalmoscopes
 - Otoscopes
 - Endoscopes
 - ECG machine and leads
 - Tourniquet

A BRM plan utilizes interventions based on hygienic principles that are directed at keeping equipment, instruments, and working environments clean. These simple hygienic practices minimize unwanted transmissions of biological agents. Next are examples of veterinary procedures that pose a risk of disease transmission by fomites as well as sample interventions that could minimize the risk.

- Processing large numbers of cattle
 - Submerge dehorner, emasculator, scalpels or any instrument that comes in contact with blood in a bucket of disinfectant. The disinfectant will lyse red blood cells, decreasing the risk of transmitting anaplasmosis, bovine leukemia virus, and other blood borne diseases. The disinfectant will help minimize contamination as long as the disinfectant solution is kept clean.
 - Use a new, sterile, disposable needle to enter a vaccination vial.
 - Use a new, sterile, disposable needle on every animal.
 - Use the smallest dose vaccination vial. Large, 50 dose bottles may be more economical to purchase, but if the bottle is contaminated on the first syringe filled, then 50 head of cattle can be exposed. If a 10-dose vial is contaminated

on the first fill, the repercussions are still present but minimized and expose less animals. Decide the level of risk you and your client are willing to accept and design vaccinations accordingly.

- Submerging bolus guns, paste deworming equipment or any instrument that is inserted in an animal's mouth in appropriate disinfectant between animals.
- Cleaning of commonly used items
 - Some items that are commonly used on patients present the opportunity for being fomites and routine cleaning of these instruments would be an effective intervention.
 - Stethoscopes, thermometers, bandage scissors, and reflex hammers: clean with a disinfecting wipe.
 - Tourniquets should be made from disposable or cleanable material.
- Palpating and artificially inseminating cattle
 - Use a clean obstetrical glove on every animal palpated to minimize disease spread.
 - When inserting the AI pipette, the cover sleeve should be new for each animal, the vulvar area wiped clean with a disposable towel, and the hand manipulating the pipette should be gloved.
 - Containment of trash. Not all-veterinary work is done from a central area when on a farm call. It is important to keep trash and dirty syringes contained and dispose of trash on the premises where it was generated.
- Organize the mobile vehicle
 - Designate a dirty zone in the vehicle to place equipment such as calf jacks, speculums, ropes, and muzzles that become dirty after use. Designate a clean area in the vehicle to store unused equipment and materials.
 - Use disposable materials when possible and properly dispose of these materials at the farm or home where it was generated. This prevents veterinarians from transporting contaminated trash that could present a biological hazard to the next premise.
 - Keep sterile surgical packs in sealed plastic bags or airtight plastic containers to protect from dust or moisture exposure.
 - Use ice packs or electric refrigeration to store materials that need to be kept cool. Do not store materials on ice as the ice will melt and containers floating in the water are easily cross-contaminated.
- Personal hygiene
 - Wear protective clothing (coveralls, scrubs, smock, or lab coat) over personal clothing to protect from contamination.
 - Change protective outer clothing when contaminated and between each farm/house call.
 - Do not wear protective clothing home; wash it at work or commercially to minimize cross-contamination of personal clothing.

- Pull back, tie up, or cover hair to minimize exposure and potential fomite transmission.
- Do not wear jewelry.
- Keep fingernails trimmed and cleaned.

Aerosol Transmission

For the most part, aerosol transmission by mobile veterinarians is a rare occurrence, but there are circumstances that need to be recognized. Foot and mouth disease has been known to inhabit the nasal passages of humans for up to 28 hours and be spread to susceptible species. In an outbreak situation, this is something that mobile veterinarians must be aware of in order to decrease their risk of aerosol transmission to susceptible animal species.

Intense animal production farms that house swine or poultry in confinement can present circumstances where the influenza viruses responsible for the flu in humans can pose a threat to these animals and vice versa. Swine can be infected with both human strains of influenza as well as avian strains. If conditions exist where swine are infected with both strains, a new virulent strain of influenza could be produced. This scenario, called reassortment, is what has led to at least one of the last three pandemic flu outbreaks and resulted in the death of a veterinarian in the Netherlands in 2003. Veterinarians and other workers who are sick with the flu should avoid working in avian and swine production units. As with all health care workers, veterinarians should get a yearly influenza vaccine.

Vector Transmission

Vector transmission occurs when an insect acquires a pathogen from one animal and transmits it to another. Fleas, ticks, and mosquitoes are common biological vectors of disease. Mobile veterinarians can inadvertently transport flies, mosquitoes, or ticks inside their vehicle. Ticks can also be carried on clothing. Use of DEET to repel ticks on clothing and keeping the vehicle's windows closed will minimize the trapping of insects inside the vehicle.

Zoonotic Disease

Zoonotic disease transmission occurs when diseases are transmitted from animals to humans. Human exposure will actually occur through one of the other five routes of transmission, but because of its importance it is addressed as a separate route of transmission.

Studies show that veterinarians are the most knowledgeable and the expected purveyors of information on zoonotic disease. Studies also show that immune compromised individuals are not offered adequate information about zoonoses prevention, from their physicians or veterinarians. Physicians and veterinarians alike must share in the responsibility of educating the public about zoonotic disease. This is part of a *community-oriented* care concept discussed earlier.

While the possibility of exposure and transmission of zoonotic diseases from animals to people cannot be totally eliminated, it can be minimized. By providing immune compromised clients and staff with correct and up to date zoonotic information, we can encourage them to keep themselves healthy and minimize exposure. This can be accomplished through:

- Making clients and staff aware that information is available to them if they or family members are immune compromised
- Making clients aware that immune status can be affected by many conditions
- Speaking with immune compromised clients and staff regarding animal handling guidelines and recommendations
- Providing an educational material on zoonoses so they are aware of diseases such as listeriosis, brucellosis, salmonellosis, Q fever, tularemia, botulism, staphylococcus and streptococcus infections, *E. coli*, salmonellosis, cryptosporidiosis, leptospirosis, ringworm, and the most serious- rabies.

There are ways to prevent zoonotic infections. Wearing personal protective equipment (gloves, masks, rectal sleeves, waterproof gear, coveralls, boots and others) in situations that may predispose a veterinarian to exposure such as calvings/foalings, abortions, rectal or vaginal palpation, artificial insemination, handling infected animals, passing esophageal tubes or balling gloves, doing an oral exam, necropsies, and handling vaccines or antimicrobials can limit exposure to an unwanted pathogen. Protect yourself and the people you work with by utilizing BRM principals to minimize your exposure to diseases. One of the most effective means to prevent the spread of disease is by proper hand washing. Everyone knows it, but this simple procedure needs to be continually emphasized to staff, clients, and especially children:

- Wet hands;
- Apply soap and rub hands together for at least 15 seconds (the amount of time required to sing happy birthday);
- Rinse with water; and then
- Dry hands with a single-use, 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 animals, after using the restroom, and prior to eating to minimize the risk of zoonotic disease. Practicing and teaching these techniques can help protect the veterinarian, staff, and clients from unnecessary exposure.

Pre-transmission Phase: Preparing your BRM Plan

The pre-transmission phase is where plans are developed and preparations are made to minimize disease transmission. As a veterinarian, situations will arise where your perception of risk will influence your actions. It is the pre-transmission stage that the veterinarian identifies hazards based on risk perceptions and prepares for them. The more pre-planning that is done, the more likely your BRM plan will be successful. An example of a pre-transmission intervention is establishing a dirty zone for storing soiled equipment to minimize cross contamination of clean equipment. A second example is to store surgical packs in waterproof, airtight containers so they stay clean and dry until needed. If concepts of disease control are utilized to develop interventions, the impact of epidemic outbreaks or the introduction of a foreign animal disease will be decreased. The following are more examples of planning in the pre-transmission stage:

- Evaluate what type of personal protective gear is adequate.
 - Does the type of work being performed require scrubs, a smock, a lab coat, or coveralls?

- Are boot baths present for entering and exiting animal facilities or would disposable boots be more applicable?
- Examining issues involving hand washing:
 - Are adequate hand washing stations available (soap and warm water)?
 - If hand washing is not practical due to lack of water, can hand sanitizers be used?
 - Is it convenient to wear latex/nitrile exam gloves while working with patients?
- When evaluating designs of the mobile veterinary clinic, ask yourself does the facility:
 - Provide good ventilation?
 - Have cleanable surfaces (tile or linoleum floors, formica counters)?
 - The use of a covering on the baseboards will make cleaning easier and more efficient, preventing the buildup of organic biofilms on floor surfaces and wall edges.
 - Have adequate lighting for cleaning and safety?
 - Allow for isolation of contagious animals?
- Develop a standard for what veterinary procedures can be performed.
 - What are my facilities capable of handling (surgery, boarding, treatment, isolation, necropsy)?
 - What staff will I have available to assist with procedures?
 - What staff will I have available to assist with cleaning and disinfecting procedures?
 - Cages between every animal.
 - Surgical/medical treatment instruments between cases.

To summarize, the pre-transmission stage is where prevention policies that minimize transmission of unwanted biological agents have the greatest impact.

Transmission Phase: BRM in Action

This is the phase where a biological risk management plan is put to work. Equipment gets dirty and clothing will get contaminated. From a BRM perspective, the degree that these events will cause problems is dependant on interventions developed and followed in the pre-transmission period. The better the planning before problems occur, the better prepared a veterinarian will be to prevent transmission of diseases. An example of a transmission stage intervention is storing a dirty surgical pack in a different area than clean equipment to prevent cross-contamination. Another example is having a clean pair of coveralls available and changing them between cases. A simple, but very important, intervention in the transmission stage is having a way to clean your hands after examining/treating animals. If hand-washing stations are not available, be prepared to clean your hands by carrying soap, disinfectant wipes, or hand sanitizer. These things don't just happen, they require planning and preparation. Basic prevention steps that minimize transmission from an infectious/contagious animal include:

- Wearing protective outer clothing and changing it after the examination/treatment.
- Wearing latex gloves during examinations/treatments.
- Washing/sanitizing hands after handling infectious animals.
- Isolating the animal from other animals at the facility.
- Thoroughly clean and disinfect the exam room; allowing it to sit idle for the rest of the day would be ideal; or use it for other species that are not susceptible to the infectious agent.
- Thoroughly clean and disinfect all items used for treatment.
 - Ensure staff is adequately trained as to what disinfectant is appropriate for the surfaces, organism, and instruments being disinfected.
- Disposing of all single-use items in a proper waste receptacle and leaving it on the farm/at the house where it was generated.
 - This step may need to include multi-use but difficult to clean objects if the risk of disease transmission is high (halters, ropes, muzzles, leashes).
- Placing all equipment that cannot be cleaned in the field in the designated dirty zone of the vehicle (including protective outerwear). Keeping dirty equipment in an area separate from clean equipment prevents cross contamination.
- Washing or sanitizing hands before entering the driver's seat is essential after handling the equipment/clothing that contacted an infectious animal.

To summarize, the transmission stage recognizes disease spread is imminent and steps should be taken to minimize the exposure of equipment, clothing, and other animals to the infectious agent. Being adequately prepared by developing prevention protocols in the pre-transmission stage will increase success in minimizing disease spread in the transmission phase.

Post Transmission Phase

In this phase, the act of transmitting biological agents has already occurred. This is the opportunity to examine policies that were developed and evaluate their effectiveness. Ask the question, did the planned interventions achieve the goals expected? For example, the planning of methods to prevent spreading of fomites from unclean hands was to be accomplished by washing hands frequently, but there was no water available. To modify this plan, hand sanitizers and latex gloves should be made available. The post-transmission stage can also be considered the replanning stage. The development of a BRM plan is continuous; situations change, outbreaks occur. Plans for interventions need to be continuously re-examined and improved upon.

Summary

Successful biological risk management is a continuous process that requires a *community-oriented* approach. The benefits a community yields from a BRM plan are numerous and include:

- Better health care for veterinary patients.
- Decreased opportunities for endemic diseases to become epidemic outbreaks which could have devastating effects on the economy.

- Better preparation in the case of a foreign animal disease introduction or outbreak.
- Decreased transmission of zoonotic diseases.

A veterinarian's strategy for the development of interventions is based on the five modes of disease transmissions. Veterinarians who carry out BRM interventions can do so without making drastic changes in the way they practice medicine.

Risk Communication

Once a BRM plan is developed, it must be communicated to veterinary staff and clients to be effective. Depending on the nature of the mobile veterinarian, there may not be any staff to communicate about the hazards identified or the management recommendations that need to be implemented. This newly acquired information still needs to be delivered to those affected by the risk assessment and risk management plan. The client is a very important stakeholder and someone that a mobile veterinarian needs to communicate with. This helps ensure the level of disease risk is understood by all parties and that changes implemented will be accepted and followed.

One of the major barriers to effective risk communication is inadequate planning and preparation. Before educating your clients or staff, it is important to consider what message will be most effective and when and where the information should be communicated. Because many employees or clients may not understand disease transmission routes and the chain of events involved in disease spread, this communication can be difficult and affected parties may not fully appreciate the significance of the measures they are asked to follow.

Characteristics of effective risk communication:

- It must be adapted to meet the needs of the audience. If bilingual information is required, make sure it is provided.
- It should present the important information in more than one way (appeal to both visual and auditory learners).
- Keep sessions focused to a maximum of three main points.
- Sessions are more valuable if they are timely and the participants can apply the new information immediately.
- Sessions should cover what, when, where, how, by whom, and why.

Educational programs that inform employees and other affected individuals of the risk assessment and management plan can take many forms, and may include:

- Face to face/group meetings (one of the best communication forms if the presenter and participants have open dialogue)
- Newsletter, fliers or bulletin
- Videos, CD's, PowerPoint presentations or web-based instruction

To help facilitate communication, there are handouts provided on the website (www.cfsph.iastate.edu/BRM) about each of the routes of transmission with various applicable diseases. The final report graphs that are generated are meant as a visual aid to illustrate

potential areas of action. The various risk factors identified have not been quantified or prioritized. It should not be interpreted as an arbitrary number which is required for a veterinarian to “pass,” or even that comparable scores for two different veterinarians mean they face equal risk. The reports should be used to identify if a particular area seems to represent a disproportionate risk and help track progress over time through continued assessments. The management recommendations are made to minimize circumstances that could potentially result in the spread of infectious diseases.

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. However, few management plans are successful if records are not kept or some form of audit performed so that progress can be measured. Part of the risk communication process should include helping to ensure that a monitoring system is put in place to measure progress.

Conclusion

Biological risk management is an essential component of keeping a mobile veterinary facility or vehicle as clean and secure as possible. Risk 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. It may take time to persuade your clients and community to adopt some of these principles, but the results of your efforts will reflect the efficacy of this program, and others will follow suit in time.