# Infection Prevention and Control Best Practices

*For Small Animal Veterinary Clinics*

Dear veterinary staff member,

We are conducting a brief online survey to understand your current infection control practices and your motivation for seeking out these guidelines. Participation in the survey is strictly voluntary. You may exit the survey at any time, and you may skip any questions you wish. All responses are anonymous

This survey should only take approximately 2-3 minutes to complete. We would greatly appreciate your feedback.

Click this link to start the survey:

https://uoguelph.eu.qualtrics.com/jfe/form/SV_6DbIPOk3dZnLbQ9

# Hospital-Associated Infections and Other Infectious Syndromes

Hospital-associated infections (HAIs) are caused by pathogens encountered within the hospital environment. These infections are often further defined as such by their onset after 48 hours or more of hospitalization (while the patient may still be in hospital) or within 30 days of hospital discharge. This definition can result in both over- and under-diagnosis of HAIs, but provides a standard framework to identify and monitor HAIs.

While it may seem straightforward, identification of HAIs can be a challenge because:

- Most veterinary patient hospital stays are relatively short and clinical signs of infection often only become apparent after discharge.
- Animals may develop signs of infection during hospitalization from diseases they were incubating at the time of arrival.

Hospital-associated infections may be caused by bacteria acquired while in the hospital, or from an animal's own microbiota, but in either case a HAI is associated in some way with the hospital environment or factors / procedures (e.g. surgery, catheterization) that occurred during hospitalization.

In general, common types of HAIs include intravascular (IV) catheter-associated infections, urinary tract infections (UTIs), and surgical site infections (SSIs), in addition to infectious respiratory disease and infectious diarrhea (see Management of other infectious syndromes section). While there are specific considerations for each of these HAIs, general infection prevention and control protocols are effective at reducing the risk of all of them:

- **Use hand hygiene and personal protective equipment** to reduce the transmission of pathogens between patients and personnel, and contamination of clothing and equipment (see Chapter: Hand Hygiene and Chapter: Personal Protective Equipment).
- Follow routine practices for **cleaning and disinfection** of equipment and environment including removal of organic debris, selecting a disinfectant based on spectrum of activity and material compatibility, and following the manufacturer's directions for proper use (especially concentration and contact time) (see Chapter: Cleaning, Disinfection, Sterilization).
- Employ **appropriate patient management** strategies for patients known or suspected to be infectious to others. This includes use of isolation areas, separate equipment, and appropriate patient movement (see Chapter: Patient Care and Handling).
- Pay particular attention to infection control precautions for procedures with higher risks of HAIs such as catheterization (both intravenous and urinary) and surgery.
- Separate staff animals and resident animals from patients (see Chapter: Non-Patient Animals).
- Employ **antimicrobial stewardship** strategies (see Chapter: Antimicrobial Stewardship).
- Establish a **surveillance program** to determine benchmarks of infection rates in order to detect any changes that may indicate an HAI outbreak. (see Chapter: Surveillance).
- **Educate and train** veterinary personnel on zoonotic disease risks and infection prevention and control (IPC) strategies. All veterinary personnel should be familiar with their clinic's IPC policies or guidelines (see Chapter: Education).

## Contamination of skin preparation materials

Contamination of containers used to hold gauze soaked in chlorhexidine or other biocides for wound care, intravenous catheter placement or surgical preparation have been implicated in HAIs in both human and veterinary medicine (Mathews 1996). Refilling containers of these solutions without proper cleaning and disinfection allows bacteria to become tolerant to the biocides, allowing for serial contamination (see surgical site management section in Chapter: Surgery).

If containers of pre-soaked gauze or other materials are used:

- Empty them daily, and clean, disinfect and dry the containers themselves regularly. Do not "top" up containers or solutions.
- Use stainless steel containers (rather than plastic), as they are more amenable to frequent cleaning and disinfection.

# Bloodstream infections

## Intravascular catheters

Intravascular catheters (both venous and arterial) provide direct access for opportunistic pathogens to the bloodstream. Inadequate skin preparation, contamination of skin prep solutions, duration of catheterization, catheter material, location of catheter, and infusion with dextrose increase the risk of an infection.

**Precautions to help reduce the risk of a bloodstream infection when placing a catheter:**

- Choose a site free from skin lesions or other infections, that is easy to monitor, adequately protected from contamination and amenable to catheterization.
- Choose a catheter of appropriate size and material for the given patient and procedure.
- Clip (don't shave) the site prior to catheter placement, avoiding sites that have been clipped for other procedures.
- At a minimum, prepare the catheter site with an antiseptic, allowing the antiseptic to dry before placement.
  - If there is gross contamination of the skin, clean the site with soap and water first.
- Use aseptic technique for placement, wearing clean or sterile gloves for a peripheral intravenous catheter, and sterile gloves for placing central lines or arterial catheters.
- Monitor the catheter for signs of heat, pain, swelling or discharge daily, or more frequently if complications are expected. If necessary, bandage the catheter in a way that makes monitoring possible. Change the bandage if visibly soiled. Bandage movement can be a potential issue for catheter maintenance and in some cases may increase the risk for infections and/or thrombophlebitis
- Minimize direct contact with the catheter site; perform hand hygiene and wear clean, disposable gloves when contact is required.
- Remove the catheter as soon as it is no longer required or is medically indicated. There is no evidence that routine catheter changes are beneficial.

Catheter flushing should be performed using good hygiene practices to prevent inoculation of bacteria. Only sterile fluids should be used for catheter flushing. Individual fluid vials are ideal, because of the potential for contamination of multidose vials or bags after repeated entry. In situations where this is not economically or logistically feasible, care must be taken to reduce the risk of contamination of multidose flush bottles or bags, and these items should be disposed if not used up within a specific time frame (e.g. 24 hours). It is recommended to flush catheters every 4 hours with saline unless fluids are used continuously; use of heparinized saline does not appear to be of any additional benefit (Davis 2013).

## Intravenous solutions, including parenteral nutrition

To reduce the risk of infection from intravenous solutions due to contamination, appropriate handling, storage, and administration are key. Solutions with added substances (e.g. electrolytes, medication, dextrose) should be used within 24 hours. Lipid-containing fluids have a higher risk of contamination and bags should be discarded at the end of the day, regardless of whether or not they are empty. See Chapter: Blood Donation for more information on management of blood and blood products from donors.

# Catheter-associated urinary tract infections (UTIs)

Catheter-associated UTIs are common HAIs in small animal clinics (Stull & Weese 2015). The risk of a UTI increase every day a patient is catheterized with a urinary catheter (Smee 2013). The means by which the urinary tract becomes infected and the origin of the bacteria are highly variable. Bacteria may be endogenous or introduced during catheter placement. Retrograde urine flow allows exogenous and endogenous bacteria to move up the catheter into the bladder. Biofilms may also result in UTIs, and are associated with lack of response to antimicrobial therapy.

Using aseptic technique and managing the catheter appropriately reduce the risk of UTI development:

- Ensure that the type of catheterization (intermittent vs. indwelling), catheter selection, placement, maintenance, changing and timing of removal are tailored to the patient and situation. The patient should be reassessed regularly to verify whether ongoing catheterization is required.
- Use only sterile urinary catheters (either new or resterilized).
- Gently but thoroughly clean the area around the urethra prior to catheter placement. Clip long hair if necessary. Aseptic skin preparation should be used if placing a percutaneous urinary catheter. Avoid causing excessive irritation to the area which could increase the risk of bacterial colonization and infection.
- Use sterile gloves and lubricant for placement. Perform hand hygiene before gloving and after glove removal.
- Follow appropriate antimicrobial therapy guidelines such as those available from ISCAID (Weese 2019) (also see Chapter: Antimicrobial Stewardship).
- Keep the urine collection bag below the level of the patient at all times to prevent backflow of urine.
- Never leave the catheter or tubing line open to the outside environment. Always keep it connected to a urine collection bag.
- Do not routinely culture urine from patients with indwelling urinary catheters (Weese 2019). Never collect urine for culture from the collection bag.

## Surgical site infections (SSIs)

See Chapter: Surgery.

## Other sources of HAIs

### Ventilator-associated pneumonia (VAP)

Although VAP is relatively common in human intensive care units, little is known about VAP in animals due to the relatively low use of long-term mechanical ventilation outside of procedures done under general anesthesia. General infection control practices will reduce the risk of VAP, in addition to proper equipment and filter maintenance. Veterinary specific guidelines for VAP prevention are not available, but some recommendations from human healthcare guidelines may apply (CPSI 2012) (also see Chapter: Cleaning, Disinfection, Sterilization).

### Endoscope-associated infections

Proper cleaning and disinfection of endoscopes are the cornerstones of endoscope-associated infection prevention (see Chapter: Cleaning, Disinfection, Sterilization). Endoscope culture is indicated when endoscopes are implicated as a source of potential infection during a disease outbreak investigation, along with careful review of endoscope cleaning and disinfection protocols and practices. In practices where multiple endoscopes are available, the specific endoscope used for each procedure should be documented to allow for accurate contact tracing.

### Contamination of enteral feeding solutions

Contamination of liquid diets used for enteral (tube) feeding typically occurs during mixing, or during administration, particularly when they need to be given very slowly over a prolonged period, or continuously. To reduce the risk of contamination:

- Use products that do not require any mixing or additives.
- Always follow the manufacturer's recommendations for storage.
- Thoroughly rinse and clean bags and lines in hot water between uses for the same patient. Discard or thoroughly scrub and then disinfect (e.g. with an accelerated hydrogen peroxide product or a 1:50 concentration of bleach) prior to use on a different patient.
- Maximum hang time for enteral solutions should be 4-6 hours. Label bags with the time they were opened, and discard them after the maximum time.

# Management of specific infectious syndromes

Implementation of basic infection control measures is important for handling all patients, but especially those with active infections that are likely to be shedding much higher numbers of transmissible pathogens. Animals with confirmed or suspected multidrug-resistant (MDR) infections or at risk of shedding an infectious gastrointestinal or respiratory pathogen should be treated with the same enhanced infection control precautions. These precautions should include front office triage, contact precautions and personal protective equipment (PPE), housing in isolation and other patient handling protocols, and cleaning and disinfection of in-contact equipment and environmental surfaces (see the beginning of this chapter for links to the corresponding chapters on these topics).

## Multidrug-resistant (MDR) infections

Multidrug-resistant organisms (MDROs) are becoming commonplace in both human and veterinary medicine. As such, it is important to have practices in place to manage patients with suspected or known MDR infections.

Infections with MDR bacteria, such as *Staphylococcus aureus* (MRSA) and *S. pseudintermedius* (MRSP), can be managed with relatively simple, cost effective procedures that are applicable for a very broad range of other pathogens as well. Hand hygiene, environmental cleaning and disinfection, and sound antimicrobial stewardship are the pillars of prevention and control in these cases. Other infection control practices and aseptic techniques will help prevent pathogen spread and improve management of patients with known or suspected infections. When handling a patient with an MDRO:

- Keep broken skin covered to help prevent opportunistic infection with the MDRO.
- Pay particular attention to hand hygiene, as hands of personnel are one of the most common means of spread in the hospital setting.
- If the MDRO is associated with a urinary tract infection, label urine samples as infectious and handle accordingly.
- Carefully manage wounds (see wound care and bandages section in Chapter: Patient Care and Handling).

There is no clear evidence on how long an animal with an MDR infection should continue to be handled with contact precautions following diagnosis. At a minimum, the animal should be considered infectious to others until the clinical infection is resolved (e.g. until the animal is no longer being seen for rechecks of the same issue). Some pathogens such as MRSP may be carried for prolonged periods of time at other body sights even after clinical resolution of the original infection.

## Ringworm and other non-bacterial skin infections

Non-bacterial skin infections requiring additional considerations include primarily dermatophytosis (ringworm) and sarcoptic mange, both of which are easily spread between patients. *Sarcoptes* mites are fairly species-specific and at worst would only transiently infest a person or the clinic environment. However, certain dermatophytes can easily be transmitted to people as well as other patients, and these fungi tend to survive very well in the environment within dust, dander and hair shed by the infected animal. Additional precautions to consider when dealing with such cases include:

- Keep the patient in its own run/kennel as much as possible. For dogs that must be taken out for elimination activities, avoid any direct contact with any other patients.
  - After an infected dog is discharged, soak the leash in bleach solution (1:50) for 10-30 mins or an accelerated hydrogen peroxide (AHP) solution (as per label instructions), or autoclave if possible.
- Depending on the size/type of animal, appropriate PPE may need to include long pants or a longer gown to protect the legs, which must be removed and laundered or disposed each time after handling the patient.
- Avoid dry dusting, as this can spread contaminated hair and dander within a room. If possible, wet surfaces first and wipe with a damp towel/cloth.
- Use a disposable mop head to clean hard floors.
- If vacuuming is necessary, ensure the vacuum is equipped with a HEPA filter, and dispose of the filter immediately once vacuuming is done. Without such a filter, vacuuming may result in further spread of contaminated hair and dander within the room.

- All surfaces and reusable items that come into contact with the infected animal must be cleaned with hot, soapy water, followed by an effective disinfectant:
  - household bleach (1:10 to 1:100 solution in water)
  - lime sulfur (1:33 solution)
  - enilconazole (0.2% solution)
  - AHP product
- Avoid keeping infected patients in rooms with a cold air return.
- Fabric items (e.g. drapes, carpet, cushions) that cannot be effectively laundered may need to be discarded to eliminate dermatophytes if infections continue to occur after all other precautions have been taken.

An infosheet for veterinarians on ringworm in companion animals is available from the Worms & Germs Blog (see References).

## Leptospirosis

In the case of animals infected with *Leptospira* spp. special attention should be paid to items that have come into contact with the animal's urine. Immunocompromised staff in particular should avoid any contact with leptospirosis patients if at all possible. Of particular note:

- Cover broken skin and wear a face mask/goggles if there is a splash risk.
- Do NOT pressure wash kennels.
- Keep surfaces dry as much as possible.
- Normal laundering inactivates leptospires; however, personnel must wear proper PPE (i.e. gloves and designated lab coat) when handling bedding.
- After cleaning, disinfect areas where dogs have urinated with and AHP or other effective product according to label directions, or a 1:10 bleach solution.
- Label urine samples as infectious and handle them accordingly.
- House patients on ground level.
- Allow urination to occur on cleanable surfaces that are designated and restricted.
  - Be aware of the potential for urine to contaminate the animal's coat during elimination, especially if the animal urinates on a hard surface.
- Collected urine must be inactivated before disposal using a 1:1 ratio of an appropriately diluted disinfectant solution such as an AHP, quaternary ammonium compound (QAC), 1:10 bleach, or iodine.
- Critically ill leptospirosis patients can be effectively managed outside of isolation if necessary, but then procedural isolation, signage and clear communication with all clinic staff regarding appropriate protocols become even more crucial.
- 48 hours after the commencement of appropriate antimicrobial therapy, live/infectious leptospires are thought to no longer shed in the urine (Sykes 2010), and isolation precautions may no longer be necessary. Before contact precautions are relaxed, ideally the animal should be bathed and dried thoroughly to ensure any urine contamination of the coat has been eliminated.

An infographic on in-clinic management of leptospirosis patients is available from the Ontario Animal Health Network (see References).

## Gastrointestinal infections

Diarrhea is usually a readily-apparent clinical sign in animals, however its cause is often unknown. Some causes may be zoonotic, such as *Salmonella* and *Campylobacter*. Certain populations may be at greater risk of shedding certain pathogens, such as puppies and kittens *(Campylobacter),* dogs fed animal-based food items (e.g. raw meat, pig ear treats) or with exposure to livestock *(Salmonella, E. coli, Listeria),* and reptiles *(Salmonella).*

Although the zoonotic transmission of diarrhea-causing pathogens is poorly understood, *Salmonella* and *C. difficile* have been identified in veterinary staff (Marks 2011). Soap and water hand hygiene may be preferrable in some of these cases as bacterial spores (e.g. *Clostridium* spp.) are resistant to alcohol, as are some non-enveloped viruses (e.g. parvovirus) that can

also cause diarrhea, but are not zoonotic. Handwashing with soap and water is certainly necessary if the hands are grossly contaminated with diarrhea, as the organic material inhibits the antimicrobial action of alcohol-based hand sanitizers.

Patients at increased risk of shedding enteropathogens (e.g. those who are diarrheic or recently diarrheic) should be taken to a designated location for defecation, away from other patients. The area should be disinfected, if possible. Dogs should remain on leash and only defecation and urination should occur in this area, with feces cleaned up immediately. Litter boxes for cats should be regularly cleaned and disinfected to decrease the environmental pathogen load in the patient's housing area.

Should a patient pass diarrhea unexpectedly in any other area of the hospital:

- Remove feces immediately and clean the area using disposable towels.
- Liberally apply disinfectant to the area:
  - Bleach (1:10 solution) or AHPs (dilutes as per label instruction) are effective. Both C. *difficile* and C. *perfringens* spores are susceptible to these solutions.
- Leave the disinfectant in contact for the required contact time on the label (typically 10-15 minutes). Ensure all surfaces remain wet for the entire duration.
- Rinse the area if necessary to eliminate residual disinfectant, and dry all surfaces completely (either air dry or by means of towels/fans if area must dry faster).
- Treat all waste/soiled linens (e.g. disposable and reusable towels) as infectious and handle accordingly.

## Respiratory infections

Control of respiratory disease outbreaks in veterinary clinics is dependent on prompt recognition of the potential for an infectious pathogen, the ability to effectively separate (procedurally and/or physically) affected and unaffected animals, and strict adherence to general principles of infection control.

Routine use of mask and eye protection is not required, but should be considered in situations where someone's face will be in close proximity to a potentially infected animal, especially if the animal is coughing. Routine disinfectants, used properly, will inactivate the vast majority of respiratory pathogens. Enveloped viruses such as influenza A virus are particularly fragile and susceptible to disinfectants. Ensuring all contaminated surfaces and equipment are addressed and thoroughly cleaned before applying disinfectant is important. Veterinary personnel should pay particularly close attention to hand hygiene. Alcohol-based hand sanitizers are effective against the vast majority of respiratory pathogens, or hands can be washed with soap and water.

An infosheet for veterinarians on H3N2 influenza in dogs is available from the Worms & Germs Blog (see References).

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