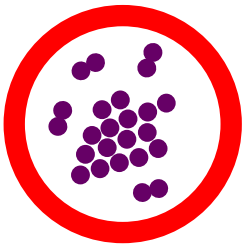
MRSA

For Vets



Worms & Germs
Promoting Safe Pet Ownership

General Information

Staphylococcus aureus is a Gram-positive, aerobic commensal bacterium of humans that is carried in the anterior nares of approximately 30% of the general population. It is primarily an opportunistic pathogen - it takes advantage of breaks in the hosts normal defensive barriers. It can infect almost any tissue, but skin and soft tissue infections are most common.

- Strains of *S. aureus* can be either methicillin-resistant (**MRSA**) or methicillin-susceptible (MSSA). Methicillin-resistance in staphylococci is usually acquired through the *mecA* gene. This gene confers **resistance to all beta-lactam antimicrobials** (i.e. penicillins, cephalosporins, carbapenems, monobactams).
- Some strains of MRSA, particularly those found in hospitals, also carry genes for resistance to other types of antimicrobials. Infection with these highly resistant strains can be extremely difficult to treat.
- Some strains of MRSA can also carry genes for the Panton-Valentine leukocidin (PVL), which tends to be associated with more virulent, invasive strains.
- People and animals can carry MRSA without showing any clinical signs. This is known as **colonization**, which may be transient or persistent. **Infection** with MRSA is accompanied by signs of inflammation (e.g. heat, pain, swelling, discharge).
- Colonization or infection with MRSA has been reported in numerous animal species.
- Pets such as dogs and cats do not commonly carry MRSA. It is suspected that **MRSA found in pets typically originates from humans**. However, once colonized or infected, dogs and cats can pass the bacterium on to other animals and people.

Prevalence & Risk Factors For MRSA

Humans

- MRSA may be carried in the nares by 0.2-3.5% of the general population.
- MRSA is an important **hospital-associated (HA)** pathogen, causing infection in people with risk factors such as recent hospitalization, surgery, antimicrobial use, chronic illness, and residence in long-term care facilities.

- Infection with MRSA has also become a **community-associated (CA)** disease, which can affect anyone in the general population, even without traditional HA risk factors.
- There is also evidence that people who work with horses, cattle or pigs may be at increased risk of acquiring MRSA.
- The prevalence of MRSA varies widely in different parts of the world. In 2002, 57.1% of hospital *S. aureus* isolates from intensive care units in the USA were methicillin-resistant, compared with 10.4% in Canada in 2003. In Europe, the prevalence of MRSA varies from less than 1% to over 40%.

Animals

- *Staphylococcus aureus* is not usually found in most dogs and cats, although the prevalence of this bacterium in culture specimens from dogs and cats has been reported to be anywhere from 10-90%.
- The most common staphylococcal species in dogs is *S. pseudintermedius* (formerly thought to be *S. intermedius*). Methicillin-resistant *S. pseudintermedius* has also been reported.
- In one study, the most common staphylococcal species in cats was *S. felis*. It has not been well investigated whether *S. aureus* and *S. pseudintermedius* can be persistently carried by normal cats.
- Cases of MRSA colonization and infection were first described in companion animals in the 1990s.
  - Cases of dogs and cats harbouring MRSA strains identical to those of cohabitating humans have been reported, particularly in cases of recurrent human infection/colonization. Although pets have been implicated as sources of infection, there is no evidence that the animals, and not a person, were the original source.
- The prevalence of MRSA among healthy pets is low (less than 4%) in most populations. Pets typically carry MRSA in the nose, intestinal tract or on the skin.

- Risk factors for MRSA in companion animals are largely unknown. Some are likely similar to those in humans, such as previous surgery and hospitalization, although most infections in pets are community-onset. Fluoroquinolone use was recently identified as a risk factor for MRSA versus MSSA infection in dogs and cats. Pets used in hospital visitation programs may also be at increased risk. *Living with a human or veterinary healthcare worker has not been associated with MRSA carriage in dogs.*

Transmission & Environmental Survival of MRSA

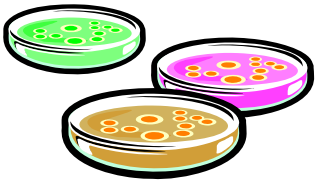
- The primary means of transmission of MRSA in human hospitals has been identified as the hands of healthcare workers, but environmental and even aerosol transmission have also been implicated on occasion.
- Transmission in the community occurs through direct contact with high-risk, colonized or infected individuals. Outbreaks have occurred on sports teams, military bases and prisons where many people may have close contact with each other, hygiene may be suboptimal and breaks in the skin may be common.
- Companion animals can carry MRSA in their noses and around the perineum. Direct contact with these areas or tissues infected with MRSA are most likely to result in transmission from pets.
- MRSA can survive in the environment for a limited period of time, but the bacteria are susceptible to most commonly used disinfectants, if the surface/equipment is cleaned properly before the disinfectant is applied.

Symptoms and Signs

Most healthy people and animals that are exposed to MRSA have no problems at all – they may become colonized for a short time, or even a long time, often without ever knowing it. But in some cases, infection can occur.

- **Humans**: Infection with MRSA in humans can cause the same spectrum of primarily opportunistic disease as MSSA, including skin and soft tissue infection (SSTI) (in particular surgical site infection), pneumonia, septic arthritis, osteomyelitis, catheter site infection, primary bloodstream infection and endocarditis. Community-associated MRSA infections are most frequently associated with SSTIs, including simple cutaneous abscesses, but CA-MRSA strains can also cause severe necrotizing pneumonia and necrotizing fasciitis. Soft tissue infections with PVL-positive CA-MRSA can occur without any previous wounds, and initially may appear very similar to a spider bite.
- **Animals**: In dogs and cats, MRSA typically causes wound and post-operative infections, although a recent study identified pyoderma as the most common type of MRSA infection. The bacteria have also been isolated from the urinary tract, auditory canal, eye and joints. No significant difference in signalment or clinical signs between cats and dogs with MRSA versus MSSA infections has been identified. Inflammatory granulation tissue with eosinophilc infiltrate has been associated with methicillin-resistant staphylococcal infections in cats.

Diagnosis of MRSA



Because MRSA can cause such a wide range of clinical infections, and because it cannot be differentiated clinically from MSSA and many other bacterial infections, culture is the primary means of diagnosis in veterinary medicine. In humans, molecular techniques such as real-time polymerase chain reaction are now being used in order to detect MRSA more rapidly than culture (hours versus days), but this type of testing has not been validated for use in animal species.

Infection: As in human medicine, appropriate culture specimens should be collected according to the suspected type of infection (e.g. wound swab, tracheal aspirate, urine sample).

- Try to prevent contamination of samples from resident staphylococci on the skin and mucous membranes.
- MRSA survives well on refrigerated culture swabs in standard transport media (e.g. Stewart's medium).
- It is important to confirm that the laboratory used tests all *Staphylococcus* isolates for susceptibility to oxacillin or methicillin. An *S. aureus* isolate that is resistant to either of these drugs is MRSA.
- If the laboratory identifies an isolate as a "coagulase-positive *Staphylococcus*", it is important to differentiate the species *S. aureus*, *S. pseudintermedius* and *S. schleiferi* subsp. *coagulans*.

Serologic assays for anti-staphylococcal antibodies, which are sometimes use as aids in detecting and managing deep-seeded infections (e.g. bacteremia, endocarditis) in people, are not used in animals.

Colonization: The most sensitive body site to culture for MRSA in humans is the anterior nares. The ideal body site to culture in animals remains unknown, therefore culture of the nares as well as the perineum or a fecal sample is recommended. Animals should be tested on a weekly basis until at least two consecutive negative culture results are obtained. If an animal has a clinical MRSA infection, culture of these sites is not indicated until the infection is resolved.

Molecular typing and classification of MRSA isolates is not routinely performed for isolates from sporadic cases. This type of testing is used in order to help identify epidemiological trends on both a local (i.e. outbreaks) and global scale. Isolates are classified into epidemic clones, which are named differently in different parts of the world (e.g. USA300 (USA), CMRSA-10 (Canada)). Common techniques include pulsed-field gel electrophoresis (PFGE), multi-locus sequence typing (MLST) and *spa*-typing. MRSA isolates from pets tend to be the same strains that are common in people in the same geographic region.

Treatment of MRSA

Infection: Skin and soft tissue MRSA infections are often amenable to local/topical therapy including drainage, debridement and lavage. **Local therapy should not be overlooked**, even if the animal is also treated with systemic antimicrobials. Specific antimicrobial therapy should be based on culture and sensitivity testing, the tissues involved, and the ability to administer the drug to the animal as prescribed.

- Fluoroquinolone resistance can develop rapidly in MRSA during treatment. Clinical response to this drug class does not correspond well to *in vitro* susceptibility, therefore fluoroquinolones are not recommended for treatment of MRSA infections.
- Over 50% of MRSA strains in dogs and cats that are resistant to erythromycin are also inducibly resistant to clindamycin. This can only be detected using a "D-test", which is not routinely performed by veterinary diagnostic laboratories. Erythromycin-resistant MRSA strains should therefore also be considered clindamycin-resistant, regardless of *in vitro* clindamycin susceptibility results.
- In general, empirical treatment for MRSA in companion animals is unnecessary.

Use of vancomycin in animals should be avoided due to the importance of this drug in human medicine and the risk of emergence of vancomycin-resistant *S. aureus* (VRSA) and enterococci (VRE).

Colonization: In humans, decolonization therapy, including topical nasal ointment and/or systemic antimicrobials, may be prescribed depending on the individual's risk of transmission and/or subsequent infection. In general, it appears that healthy dogs and cats can clear MRSA colonization within a span of weeks if re-exposure from another animal, person or the environment can be avoided. **There is no evidence that antimicrobial therapy is either necessary or effective for MRSA decolonization of companion animals.**

Infection Control For Pets Carrying MRSA

Hand Hygiene: Hand hygiene is the simplest and most practical means of preventing transmission of MRSA between humans and animals. In general, MRSA colonization is uncommon among healthy pets, but if they have been exposed to a hospital environment (such as animals used in hospital visitation programs) or a person who was recently hospitalized, they may be more likely to be carrying MRSA. Proper hand hygiene is important after handling any animal, but it is particularly important in these cases.

In-Clinic Precautions:

- Because **healthy dogs and cats can carry MRSA** without any clinical signs, a good general infection control program, and particularly good hand hygiene practices, is crucial.
- **MRSA-positive animals** should be admitted directly to an isolation room or designated examination room, and not be allowed to come into contact with other animals in the reception area or elsewhere in the hospital.
- MRSA-positive animals admitted to the hospital should be kept in isolation, and **barrier precautions** (i.e. disposable gloves and designated lab coat or disposable gown) should be used for all contact.

- **MRSA-infected sites/wounds** should be covered with a bandage to prevent pathogen transmission.
  - **Bandage materials** from MRSA-infected wounds are high-risk items and should be disposed of directly into the garbage when removed from the animal.
- **Areas and equipment** used for the handling and/or treatment of MRSA-positive animals should be thoroughly cleaned and disinfected immediately after use. MRSA is susceptible to most disinfectants commonly used in veterinary clinics, when they are used correctly (e.g. surface cleaned first, proper dilution and contact time).

Considerations For Therapy Animals

Animals that regularly visit healthcare facilities are more likely to be exposed to MRSA, and therefore are more likely to carry it. Guidelines have been developed to reduce the risk of pets acquiring infectious diseases in hospitals. Owners involved in these programs should ensure that they follow these guidelines. In particular:

- Pets should never be allowed to lick a patient's face, hands or any area of broken skin.
- Pets should not be fed treats by patients.
- If a pet must be placed on a bed or patient's lap, it should be placed on a clean towel or sheet, never directly on the patient's hospital gown or bed linens.

Testing or treating clinically normal animals, including therapy animals, for MRSA is not indicated, but MRSA should be considered in these animals if they develop infections, particularly of the skin and soft tissues.

Pet Owners Diagnosed with MRSA

- Owners diagnosed with MRSA should be told to wash their hands thoroughly before and after handling their pet, in order to prevent transmission of the bacteria to the pet, as well as transmission back from the pet should it become colonized.
- Owners should not kiss their pets nor allow their pets to lick their face or any broken skin.
- **Testing or treating normal pets for MRSA is not necessary**, *even if a person in the house is infected or colonized with MRSA.* However, if one or more individuals in a household is repeatedly positive for MRSA, and precautions to prevent person-to-person transmission have already been taken, then screening of pets for MRSA may be considered as part of a whole-household intervention, *which includes screening and decolonization of all people*.

Pets are often "innocent bystanders" that acquire the MRSA from their owners. ***If*** household infection control measures fail to control transmission of MRSA between people, and there is evidence that a pet may be a source of MRSA, **temporarily removing the pet** from the household can be considered (but is rarely necessary). This should allow the pet to naturally eliminate MRSA colonization while the human members of the household undergo decolonization. ***Permanent removal of pets is not indicated***.

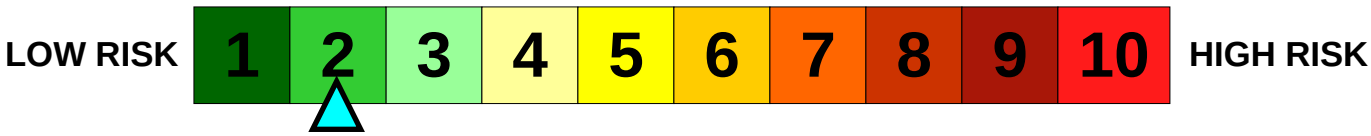
MRSA in Clinic Personnel

- In Canada, employees cannot be forced to submit to testing for MRSA, nor can they be forced to take time off from work if they are diagnosed with MRSA infection or colonization.
- If an employee is aware that he/she is positive for MRSA, the person should be especially diligent with regard to following all hand hygiene protocols in the clinic, and avoiding hand-to-nose contact (because the nares are the most common site of colonization in humans). If possible, the individual should avoid working with immunosuppressed animals (e.g. patients on antineoplastic chemotherapy). There is no indication to remove a colonized individual from patient care duties.
- **MRSA exposure is an occupational risk in veterinary medicine.** Clinic personnel should assume that both they and their patients could be carrying MRSA, and routine infection control practices should be in place to reduce the risk of MRSA transmission from unknown carriers, both human and animal.
- Employees that are concerned about MRSA (e.g. those that have been working with an MRSA-positive animal) should be encouraged to see their physician regarding diagnosis and appropriate treatment (if any).

Zoonotic Disease Risk

The zoonotic risk to the general population posed by MRSA in healthy house pets such as dogs and cats is:

HEALTHY ADULTS



Individuals with compromised immune systems (e.g. HIV/AIDS, transplant and cancer patients) are more susceptible to many kinds of infections, including those which may be transmitted by pets. While these individuals are not advised to get rid of their pets, precautions should be taken to reduce the frequency of contacts that could result in pathogen transmission (e.g. avoiding contact with open wounds, feces), as well as the ability of infectious agents to survive in the household (e.g. prompt and thorough disinfection of potentially contaminated surfaces).

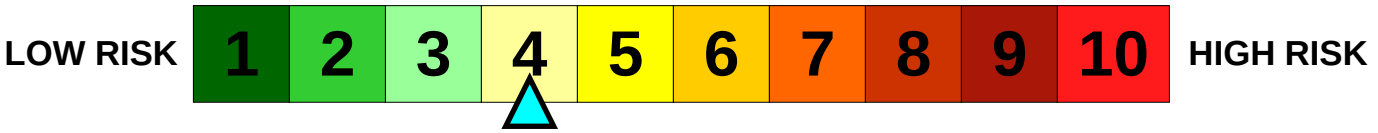
- Immunocompromised individuals should avoid contact with any pet that is colonized or infected with MRSA. This may involve temporarily removing the animal from the home until the condition resolves and the animal is negative for MRSA, but **it is not necessary for these individuals to give up their pets** altogether.

Infants and young children (less than 5 years old) are more likely than adults to extensively handle animals if given the opportunity, more likely to touch their faces or mouths, and less likely to wash their hands after handling an animal. Children may "snuggle" with pets; this very close contact can increase the risk of disease transmission.

- Young children should be supervised when playing with animals, and an adult should ensure that they wash their hands afterwards, and especially prior to handling food. Older children should be taught to do the same.

For these groups, the zoonotic risk posed by MRSA in healthy house pets such as dogs and cats is likely:

YOUNG CHILDREN / IMMUNOCOMPROMISED PERSONS



Additional Information

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