

# Antibiotic Resistant Staphylococcus Skin Infections in Dogs

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In this article, when “staph” bacteria or infections are mentioned, I am referring to *Staphylococcus pseudintermedius* infections in dogs unless otherwise indicated.

## What are staph bacteria?

*Staphylococcus* (“Staph”) *pseudintermedius* in dogs are bacteria that have adapted to live on the skin of dogs typically without causing problems. It is normal for dogs to have staph bacteria on the skin.

When we contact our dog, some *Staph pseudintermedius* bacteria from the dog are transferred to our skin. This species of bacteria does not grow well on human skin and doesn’t live long on us if we are healthy. Likewise, we transfer our skin bacteria to our dog, but they don’t live long on the skin of a healthy dog, so there are no problems.

## What causes skin infections with staph bacteria?

Carrying staph bacteria is normal, having a staph **infection** is not normal. Even though skin is colonized by staph bacteria, the immune system and skin barrier keep bacteria from penetrating the skin and causing an infection. Diseases like allergies cause the skin to be inflamed and itchy, which breaks down the skin barrier and allows the bacteria to penetrate the skin and cause an infection. In addition, the immune system of a dog with allergies is trying to fight allergens (like pollen), and does not fight staph effectively. Antibiotics clear the infection, but if the allergies are not controlled, it is only a matter of time before the staph bacteria cause an infection again. When allergies are controlled, the skin barrier returns to normal, and although staph bacteria still live on the skin, they do not cause an infection.

## What causes antibiotic resistant bacteria?

Staph bacteria proliferate and cause infections when they have a good place to live (like the inflamed skin of an allergic dog). When the dog is given antibiotics, most staph bacteria are killed. However, if even one bacteria has genes to allow it to survive in the presence of an antibiotic, that one bacteria will proliferate and share its genes with other bacteria. If antibiotics are continued, that bacteria will have no competition from other staph and will become the main strain on the dog. If antibiotics are stopped, other staph bacteria will colonize the skin, but the genes of antibiotic resistance will remain long term. If a different antibiotic is given, another resistant bacteria is selected for. Bacteria share genes that give better survival, eventually bacteria with multiple antibiotic resistance genes are created. These bacteria are transferred from dog to dog, but like normal bacteria, do not cause problems unless the skin barrier is disrupted and the immune system does not eliminate the infection.

## Helping prevent spread of resistant *Staph pseudintermedius* bacteria

- The following are general guidelines for owners of dogs with staphylococcal skin infections.
- It is impossible to completely prevent exposure to antibiotic resistant staph because it is carried by healthy dogs.

- A *Staphylococcus pseudintermedius* infection in a dog is of minor concern to healthy humans or other healthy animals in the house. The disease risk has been documented, but is very low. However, if there is a young child or immune suppressed person in the house, or other dogs or people with open sores, they should not have contact with an infected dog.
- Any skin issue in a human should be seen by a human doctor and the doctor should be informed a pet in the house also has a skin condition. Do not let dogs lick sores or broken skin of humans.
- With multiple healthy pets in one house, it is often not helpful to isolate a dog with a staph infection since all others have likely already been exposed. An exception may be a pet who is predisposed to skin infections due to age or an uncontrolled underlying disease.
- In the case of a dog with a resistant staph skin infection, is recommended owners should wear gloves if possible when handling infected materials and wash their hands afterwards or use hand sanitizer. Owners should wash their hands after treating infected areas of the dog's skin.
- Cleaning surfaces in the house while an animal is being treated may help prevent spread. Bleach (1 tablespoon per quart) is effective to disinfect bleach-safe surfaces after cleaning. A new dilution needs to be made daily, do not mix with other cleaners (especially ammonia).
- A dog's bedding should be laundered several times weekly when an infection is present, use bleach if possible, and dry in a hot dryer.
- Dogs with antibiotic-resistant staph infections should not be sent to the groomer until infections have cleared. If grooming is essential, the groomer should be informed ahead of time of the resistant nature of the dog's infections so additional precautions can be taken.
- After an infection is cleared, a dog may harbor antibiotic-resistant bacteria in the nose, mouth and anal area long term<sup>1-3</sup>. Ideally, owners should avoid contact with these areas and wash hands if contact occurs so antibiotic resistant bacteria are not spread. Ideally as well, this pet should be kept away from immune-compromised people. However, humans are more likely to acquire antibiotic resistant staph bacteria from other humans rather than from dogs.

## For Veterinarians:

### Diagnosis and treatment of resistant staph bacterial skin infections:

- A resistant staph infection in a dog does not look different than a non-resistant infection, except that it is still present while the dog is on antibiotics.
- A sample should be taken from the affected area of the skin to confirm staph bacteria is present. Samples should also be taken to rule out other causes of skin disease, such as skin scrapings for mites and tape preps for yeast.
- It is always a good idea to culture skin infections. BUT if a dog is cultured prior to starting antibiotics, the culture may or may not identify the resistant bacteria, and re-culturing may be needed when the pet is on antibiotics to single out the resistant strains.
- If bacteria are present while a dog is on antibiotics, they need to be cultured, and an antibiotic chosen based on the culture results.
- The proper antibiotic (based on culture) should be given at the proper dosage for the proper length of time, along with topicals and bath therapy while the underlying cause of the infection is investigated and treated.
  - Because most underlying diseases cannot be controlled within a couple weeks, antibiotic treatments usually need to be longer. Duration of antibiotics for a resistant infection is 3-4 weeks for a superficial infection (1 week beyond resolution) or at least 6 weeks for a deep infection (2 weeks beyond complete resolution).

- Antibiotic “pulse therapy” to prevent recurrence of resistant infections is not recommended.
- Combine oral antibiotics with topicals and shampoos:
  - Frequent bathing is very helpful and very necessary in greasy and odiferous pets. Chlorhexidine containing shampoos can be used several times a week if helpful.
  - Pets with dry skin will be worsened with frequent bathing, and may benefit from chlorhexidine sprays or mousse instead of bathing. Most owners mistake flakey skin as a sign of dry skin. Most pets with allergies are oily and flakey, not dry and flakey.
  - Topical antibiotics are able to be used in concentrations above what bacteria can develop resistance to, and are recommended in addition to systemic therapy along with frequent bathing with an antibacterial shampoo to help prevent further resistance. Alcohol containing products may sting raw skin, in these cases ointments are better.
  - Great topical antibiotics for the skin include gentamycin containing ointments or sprays or mupirocin ointment. The benefit of the gentamycin products is that most have a steroid to help with skin inflammation. Steroids can cause skin atrophy with long term use and so should not be a sole therapy for recurrent infections.
- Healthy dogs do not get skin infections. The underlying cause of an infection should always be looked for. This may involve bloodwork to look for organ or endocrine dysfunction (especially in an older dog). Any pet not on parasite prevention has the chance of fleas, ticks, or mites causing an infection. If the underlying cause is allergies, the allergies need to be treated constantly when present. This may be for a few weeks, through the allergy season, or constantly year-round, depending on what the dog is allergic to.
- There is no way to sterilize (decolonize) a dog (or a human) for all staph bacteria. A dog with resistant bacteria should always be assumed to be a carrier of this bacteria. If there is a recurrence of a staph infection on the dog, it should also be assumed to have (or rapidly develop) antibiotic resistance again.
- Methicillin resistant *Staph aureus* (MRSA, a resistant bacteria that usually grows on the skin of humans) tends to be short-term in pets<sup>4-7</sup>, and it is unlikely pets will spread it to other humans.

### Preventing resistant staph infections in the first place:

- **Strongly strive to diagnose and treat the underlying disease. Dogs always have an underlying predisposing condition in order to be susceptible to a skin infection and need to have that underlying condition managed. If the underlying condition is not found or not managed, the infections will likely come back over and over again and eventually develop resistance.**
- If any resistance to oral antibiotics has developed, or the underlying diseases cannot be found or controlled, the pet should be referred to a veterinary dermatologist sooner than later.
- Treatments for allergies prevent recurrence of infection by controlling the inflammation of the skin so the skin barrier and innate immune system are restored and the bacteria do not have a good place to infect. These treatments also help with itching, if present.
- Do not use oral antibiotics for a staph ear infection. These should be treated topically.
- Small, localized staph infections (small hot spots) should be treated topically.
- Using the correct dose of oral antibiotics (usually at the top end of the dose range) as well as topical antibiotic sprays or ointments, along with frequent bathing can help prevent resistant bacteria from occurring while you are working on controlling the underlying disease. The

bacteria would have to develop the resistance to 3 different classes of antibiotics at the same time in order to survive. This is not as effective at preventing resistance if the chosen therapies have all been used individually in the past, or if shampoos and topicals contain the same antibiotic.

### Helping prevent spread of antibiotic resistant staph bacteria at the clinic:

- Patients with a history of drug resistance should have this fact readily noted in the chart.
- Employees should be educated about resistant bacteria, how to prevent spread, and disinfection protocols.
- Gloves and lab coat are recommended when examining suspect or known cases.
- People should wash hands or use hand sanitizer between appointments. Staph lives best on the skin, and is the easiest way staph bacteria are spread. Doctors are the worst with performing hand disinfection historically...
- Immunocompromised staff or those with open sores should not handle pets with resistant infections.
- Dogs should not contact each other in the clinic. Consider all aspects of the appointment (history, exam, payment) all in the exam room to prevent contact or spread of bacteria.
- Rooms should be cleaned after a contagious pet has left. Hair and skin debris needs to be removed for proper disinfection. Dust mops should have a disposable or washable cover.
- Cleaning should be followed by disinfection. Staph bacteria, even drug resistant forms, are readily inactivated by most routine disinfectants (bleach, quaternary ammonium, accelerated hydrogen peroxide, alcohol) at the proper concentrations and contact times. Don't forget to clean all surfaces: scales, floors, tables, walls, door handles, desks, keyboards, computer mice, and chairs that the pet may have had contact with. A periodic cleaning with another disinfecting product (like bleach) is recommended.
- In a hospitalized situation, the antibiotic resistant status of the animal should be properly labeled and the dog not allowed to contact other dogs. Surgical patients are at most risk of acquiring an infection because they have deep skin barrier disruption, surgical implants, and prolonged healing times. Those caring for surgical patients should not have contact with antibiotic resistant cases.
- Brushes, muzzles, clippers, and leashes should be cleaned and disinfected after use.

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