Methicillin-Resistant *Staphylococcus pseudintermedius* Biofilm Formation & Antimicrobial Susceptibility

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In the Literature

Walker M, Singh A, Nazarali A, Gibson TWG, Rousseau JD, Weese JS. Evaluation of the impact of methicillin-resistant *Staphylococcus pseudintermedius* biofilm formation on antimicrobial susceptibility. *Vet Surg*. 2016;45(7):968-971.

FROM THE PAGE ...

Antimicrobial resistance has grown dramatically in both human and veterinary medicine and is a major cause of patient morbidity and increasing healthcare costs.[1,2] *Staphylococcus* spp—particularly *S pseudintermedius*, which can display methicillin resistance—are common isolates in dogs and cats. *Staphylococcus* spp are known biofilm formers, which can further complicate bacterial eradication. Biofilms are particularly problematic in surgical site infections related to orthopedic implants.

This study investigated the impact of methicillin resistance and biofilm formation on determination of minimum inhibitory concentration (MIC) in *S pseudintermedius* isolates. Amikacin, enrofloxacin, cefazolin, and gentamicin—4 antimicrobials commonly used for treating staphylococcal infections—were tested. Antimicrobial MICs were examined using standard laboratory methods for both planktonic and biofilm bacterial isolates.

The MIC for all antimicrobials was significantly higher for all biofilm-associated vs planktonic bacteria. The presence of biofilm resulted in a >667-fold to >4000-fold increase in antimicrobial MIC, which was beyond the upper limit of the antimicrobial dilution tests. For planktonic bacteria, the MIC for all antimicrobials was significantly higher in methicillin-resistant *S pseudintermedius* (MRSP) as compared with methicillin-susceptible isolates. For biofilm bacteria, the MIC was not different between MRSP and methicillin-susceptible isolates; however, the MIC was greater than the tested dilutions for all antimicrobials.

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The results of this in vitro study corroborated clinical findings in MRSP infections in small animals.[3] The MIC patterns are often increased, which results in fewer antimicrobial choices that remain susceptible to bacterial isolates. Although methods of MIC determination with biofilm-forming bacteria are not robustly established, these data suggest that standard systemic antimicrobial treatment of biofilm bacterial infections may have little, if any, effect on eradication.

… TO YOUR PATIENTS

Key pearls to put into practice:

1. It is imperative to perform culture and susceptibility testing when there is concern for antimicrobial resistance, including in cases with recurrent or persistent infections and/or high-risk sites (eg, ears, surgical sites, implant-associated sites).
2. In *Staphylococcus* spp infections, the potential for biofilm formation should be considered.
3. Biofilm formation may render results of antimicrobial MIC test results invalid.
4. Local strategies (***Table***) should be considered to augment or even replace systemic antimicrobial therapy whenever possible.

TABLE

Topical Agent	Mechanism	Uses
Chlorhexidine, 0.05%	Antiseptic	Open wounds, pyoderma
Tris-EDTA	Alkalizing, potentiates antimicrobial efficacy	Open wounds, otitis
Silver (nanoparticle, sulfadiazine)	Protein inactivation, inhibiting cell division	Open wounds, implant coatings
Honey, sugar	Hyperosmotic agents	Open wounds

References

1. World Health Organization. Antimicrobial resistance global report on surveillance. http://www.who.int/drugresistance/documents/surveillancereport/en. Published April 2014. Accessed January 6, 2017.
2. Weese JS. A review of multidrug resistant surgical site infections. *Vet Comp Orthop Traumatol*. 2008;21(1):1-7.
3. Frank LA, Loeffler A. Meticillin-resistant *Staphylococcus pseudintermedius*: clinical challenge and treatment options. *Vet Dermatol*. 2012;23(4):283-291, e56.