

Methicillin-resistant Staphylococcus aureus (MRSA) and methicillin-resistant Staphylococcus pseudintermedius (MRSP) in skin infections from company animals in Portugal (2013-2021)

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INTRODUCTION

Antimicrobial resistance among bacterial pathogens is one of the major concerns worldwide, in both human and veterinary medicine. They have been increasing in the last years and have major implications in health, as the failure in treatment leads to enhanced morbidity, mortality and costs associated with disease treatment [1,2].

Bacterial skin infections are among the most common pathologies present in small animal practice and are one of the most common reasons for antibiotic prescription [3]. *Staphylococcus pseudintermedius* and, to a less significant extent, *Staphylococcus aureus*, are important causes of skin infections [4].

Methicillin-resistance in Staphylococci is associated with the presence of the *mecA* gene encoding the penicillin binding protein 2a (PBP2a). This gene has the ability of reduce the affinity of the bacteria for all beta-lactam antimicrobials, and therefore making them resistant to this bacterial agents [4,5].

Methicillin-resistant Staphylococcus aureus (MRSA) and *methicillin-resistant Staphylococcus pseudintermedius* (MRSP) is now a significant concern in veterinary medicine [4]. MRSA and MRSP pose a major clinical challenge in the treatment of bacterial pyoderma of companion animals [3,4].



OBJECTIVE

The main objective of this work was to determine the prevalence of methicillin-resistance in staphylococci isolated from pyoderma admitted to INNO Veterinary Laboratory (Braga, Portugal) in the years 2013 to 2021, and evaluate the prevalence of MRSP and MRSA in the same time period.



MATERIAL AND METHODS

- Microbiological cultures from skin infections from dogs and cats were submitted to the INNO Veterinary Laboratory between January 2013 to June 2021, from various clinics in Portugal.
- Samples were incubated in Columbia agar + 5% sheep blood, Columbia CNA agar + 5% sheep blood and McConkey Agar (BioMérieux, France) plates during 24 h at 37 °C. Gram coloration of the colonies was made to identify pure colonies of Gram positive Cocci..
- Phenotype identification of the agents was performed using the automated system Vitek 2 Compact system (BioMérieux, France) with the Vitek 2 ID card (ref 21341, bioMérieux, France). For the present study, only samples with *S. aureus* and *S. pseudintermedius* growth were selected. Automated antimicrobial susceptibility testing was performed with the Vitek 2 Compact system method (BioMérieux, France), using the Vitek 2 AST-GP71 card (bioMérieux, Inc., Durham, NC) in accordance with the manufacturer's specifications [6].
- Methicillin resistance was phenotypically detected using the automatized VITEK 2 Compact System (BioMérieux, France) with the Vitek 2 AST-GP80 card (ref 421826, BioMérieux, France) by oxacillin minimum inhibitory concentration (MIC) testing automatically interpreted by using *S. pseudintermedius* and *S. aureus* specific breakpoints. These guidelines can be found in the CLSI VET01-S2 document.



RESULTS

- From a total of 730 samples that tested positive for bacterial growth, 101 (13,8%) were *S. pseudintermedius* and 27 (3,7%) were *S. aureus*.
- The isolates tested for oxacillin n=6 MRSP and n=4 MRSA. In figure 1 it is possible to observe the evolution on the number of MRSA and MRSP from 2013 to 2021. Nine samples were collected from dogs and one from a cat. The majority of the animals were females (n=6). The breed most affected was non defined breed SRD (n=6).

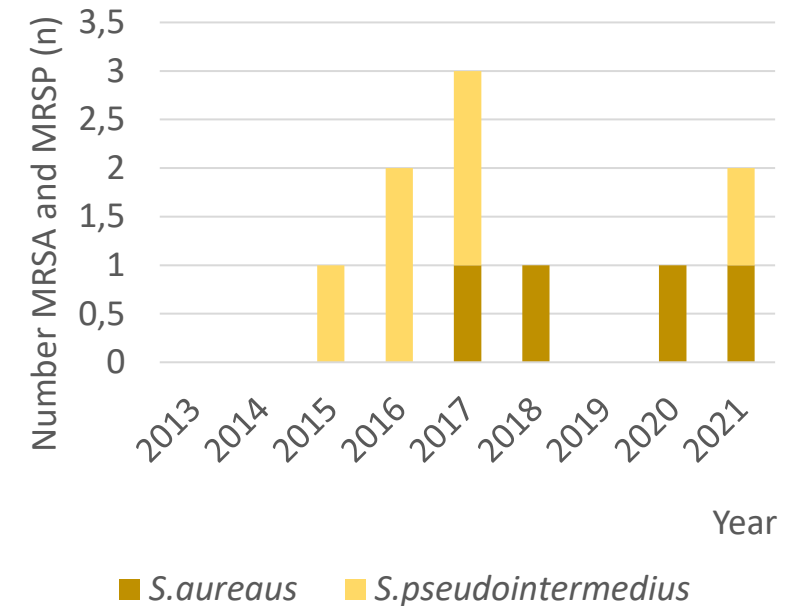


Figure 1. Evolution on the number of MRSA and MRSP from 2013 to 2021.



DISCUSSION

The prevalence of methicillin-resistant staphylococcal pyoderma in the present study was low. This study was performed with samples that were collected in clinics, and it is reasonable to suspect that the prevalence of MRSA and MRSP could be higher amongst the population of cats and dogs in Portugal. It is possible that some bacteria were not identified due to errors in sample collection, misidentification or overlooking a bacterial pathogen in the case of a polymicrobial infection, culture conditions not ideal, bacteria's viable but not in culturable stage and the low prevalence of resistant subpopulations undetectable by standard diagnostic tests.

MRSP were the prevalent isolates in this study. This is in agreement with previous studies that report high incidence rates of *S. pseudintermedius* in dogs and cats, while *S. aureus* is a not so very common agent isolated from animals [4]. The most affected animals is the dog, but it was expected since, of the 6.7 million pets existent in Portugal, 38% are dogs and 20% cats [8].



CONCLUSION

The results obtained in this study help to understand the situation at a national level, where studies in this area are almost non-existent. It proves the importance of an accurate understanding of the prevalence of methicillin resistant staphylococcal infections in veterinary practice and the worth of routine culture and susceptibility testing, particularly in practices where methicillin resistance rates are high or are increasing in the population. The presence of MRSA or MRSP in small animals indicates that they are part of the animal-human-environment transmission 'triangle', which should lead us to think of this issue as a public health problem.



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