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# *Staphylococcus pseudintermedius* Animal Colonization and Infection: An Emerging and Underestimated Zoonotic Pathogen

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## Abstract

The skin and mucous membranes of dogs are known to contain *S. pseudintermedius*, which is also a part of the canine body's typical microbiota. It has also been acknowledged as an opportunistic and zoonotic pathogen that can colonise people and cause serious illnesses, particularly in hosts who are immunocompromised. The most significant development is the emergence of the seriously detrimental to public health methicillin-resistant *S. pseudintermedius* (MRSP), which is inherently multidrug resistant. Reports of its zoonotic transmission and human infections, which have primarily been attributed to the rising prevalence of dog ownership and close contact between dogs and humans, worsen the epidemiological situation. Limited information exists regarding the zoonotic spread of MRSP from pet dogs to humans, including dog owners, small-animal veterinarians, and other individuals who are in close proximity to dogs. Especially as a result of *S. pseudintermedius* being mistaken for S. aureus. Despite this, since its first documented report in Belgium in 2006, reports on the rising emergence and spread of MRSP in humans have been steadily rising over the years.

**Keywords:** Microbiota • Zoonotic • Transmission • Canine

## Introduction

MRSP strains are resistant to the beta-lactam antibiotics typically used as first-line therapy, treatment outcomes have been further compromised in both veterinary and human medicine. Unluckily, the extent of *S. pseudintermedius*'s zoonotic transmission, prevalence, epidemiology, and public health significance have all been understated due to the limited awareness and surveillance of this phenomenon. This review concentrated on in-depth reports on zoonotic transmission, human colonisation, and infections by *S. pseudintermedius*, their pathogenic characteristics, and antimicrobial resistance in order to close this information gap. Risk factors, epidemiology, and treatment. We used the keywords "*Staphylococcus pseudintermedius* AND humans" to search the Web of Science, PubMed, and SCOPUS databases while compiling this review. In order to assess the genetic relatedness and diversity of the *S. pseudintermedius* genomes that are publicly available, a phylogenetic tree was also built [1].

*Staphylococcus pseudintermedius* was first described as a novel species of the Staphylococcus intermedius group (SIG) in 2005, despite the fact that nasal carriage of Staphylococcus intermedius (almost certainly *S. pseudintermedius* prior to its reassignment) was reported among humans who had contact with dogs. Members of the SIG also include one coagulase-negative strain, S. ursi, three other coagulase-positive strains, S. delphini, S. intermedius, and S. cornubiensis. *S. pseudintermedius*, and particularly multidrug-resistant (MDR) strains, are known to cause surgical wound infections and skin infections in dogs, such as canine pyoderma. Though it has also been isolated in cats and horses, *S. pseudintermedius* is not as common as it has been in dogs, where it has been found in up to 77-90% of healthy dogs. In addition to being a typical commensal of In particular in immunocompromised hosts, pseudintermedius is renowned for its challenging opportunistic potential. Additionally, *S. pseudintermedius* has been linked to numerous instances of human colonisation and infections, primarily as a result of close human-companion animal contact. With the emergence of methicillin-resistant *S. pseudintermedius* (MRSP), which is intrinsically resistant to beta-lactam derivatives and other non-beta-lactam antimicrobials, *S. pseudintermedius* began to draw attention in recent years [2]. Few reports on human MRSP are found in the literature, despite the fact that there are numerous publications on antibiotic-resistant *S. pseudintermedius*. The human nares are the most frequent source of colonisation, as opposed to the pharynx and rectum in companion animals, and *S. pseudintermedius* colonisation is very similar to S. aureus colonisation in humans. Moses and others reported. That compared to their nares and mouth, dogs' perineums were more colonised. The pathogenesis of *S. pseudintermedius* in companion animals has been the subject of numerous articles, but the pathogen's significance in human infections is still largely unknown and underappreciated. *S. pseudintermedius* has typically been linked to invasive infections in humans (especially in immunocompromised dog owners) as well as skin and soft tissue infections (SSTIs) in case reports [3].

## Literature Review

*S. pseudintermedius*' pathogenic arsenals resemble those of S. aureus; it has become a very significant zoonotic pathogen. The zoonotic spread of *S. pseudintermedius*, which includes the traits that make it resistant to multiple drugs (like MRSP), from companion animals to human carers or other people in close proximity and constant. There is still a dearth of knowledge about the epidemiology and pathogenesis of human contacts with their pets, which is still largely unacknowledged. When the host's natural defences are weakened, *S. pseudintermedius* has also been reported as a frequent etiologic agent of opportunistic infections and urinary tract infections. In 2006, a case of cardiac device pocket infection that was initially mistaken for S. aureus was reported as the first instance of *S. pseudintermedius* infection in a human. With the aid of more advanced identification techniques, particularly matrix-assisted laser/desorption ionization-time-of-flight mass spectrometry (MALDI-TOF MS),

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species-specific PCR (nuc gene targeting), and multilocus sequence typing, a number of case reports that initially reported S. intercedes and S. aureus infections in humans have also been reclassified as *S. pseudintermedius* (MLST) and genome-wide sequencing (WGS). The possibility of understanding *S. pseudintermedius*' pathogenic potentials, epidemiology, and adaptations as well as determining its prevalence in humans has further encouraged the reporting of *S. pseudintermedius* infections in humans [4].

## Discussion

The European Food Safety Authority has identified *S. pseudintermedius* as one of the three most clinically significant pathogens in the EU based on a number of newly available pieces of evidence [5]. Although the creation and use of advanced microbiological technologies has greatly aided the development of the literature on the epidemiology of human *S. pseudintermedius*, much research still needs to be done. The evidence of *S. pseudintermedius* colonisation and transmission to humans, as well as its pathogenic potentials and management, adaptations, risk factors, and epidemiology, were highlighted in this review. Due to the inability of phenotypic and automated methods to correctly identify and differentiate the pathogen from other human pathogens, such as S. aureus, the antimicrobial resistance patterns of *S. pseudintermedius* isolated from humans have not been well studied over the past ten years [6,7].

## Conclusion

It is particularly challenging and difficult to make definitive statements about the patterns of resistance of human *S. pseudintermedius*. Nevertheless, despite these difficulties, previous reports have noted the emergence of antibiotic-resistant *S. pseudintermedius* with significant relevance to human medicine. *S. pseudintermedius* has consistently been found to be resistant to penicillins that are susceptible to penicillinase, including ampicillin, amoxicillin, and penicillin G. Notably, the Clinical Laboratory Standards Institute considers MRSP to be beta-lactam resistant. Recommendations made by the European Committee on Antimicrobial Susceptibility Testing (EUCAST) are based on a number of reviewed reports. When compared to cefoxitin, which is typically used for the precise prediction of methicillin resistance in S. aureus and other coagulase-negative staphylococci, oxacillin has been reported to be a better predictor of MRSP. A study using 115 SIG isolated from veterinary and human clinical samples evaluated cefoxitin and oxacillin discs, along with their MIC results, in order to properly identify MRSP isolates. They claimed that oxacillin was a more accurate mecA resistance gene detector than cefoxitin, making it a better predictor of MRSP isolates. According to this and other series of reports, oxacillin MIC of 0.5 mg/L (broth) is the specific breakpoint for MRSP detection with high reliability for mecA detection.

## Acknowledgement

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## Conflict of Interest

There is no conflict of interest by author.

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