Staphylococcus pseudintermedius

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Introduction

- Companion animals, as humans, have an incredibly large and diverse microbiota. The purpose of this work is to summarize some important characteristics of S. pseudintermedius, an important member of this microbiota.
- S. pseudintermedius is a both skin and mucous membrane commensal in dogs and cats, causing opportunistic infections in both animals.
- It is a Gram-positive non-sporulated coccoid that appears as clusters upon microscopic examination.
- This microorganism was initially called Staphylococcus intermedium when it was discovered by Hajek in 1936, but after the development of molecular typing techniques it has been differentiated in 3 closely related species referred together as the Staphylococcus intermedium Group (SIG):
  - S. intermedius
  - S. pseudintermedius
  - S. delphini
- S. pseudintermedius is the most prevalent Coagulase Positive Staphylococi inhabitant of cats and dogs, and the carriage rates ranges between:
  - 46 – 92%
  - 5 – 45%
- Under certain conditions S. pseudintermedius may cause some diseases.

Pyoderma

- It’s a type of dermatitis mainly caused by S. pseudintermedius, and a common problem in clinical practice.
- It’s classified as primary or secondary (depending on whether an underlying or associated disease is identified) and depending on the depth of the infection:
  - Surface pyoderma or pseudopyderma
  - Superficial pyoderma
  - Deep pyoderma
- The depth of the disease will have an impact on its severity and, therefore, in the treatment and prognosis.

Emergence of MRSP

- Since 2006, MRSP has increased and emerged as a significant animal health problem in veterinary medicine.
- Metcillin resistance is mediated by the mecA gene, located within a mobile genetic element called SCCmec which can contain resistance genes to other antibiotics.
- Use of antimicrobials in pet animals has increased substantially in most industrialized countries.
- MRSP clones are not shared between Europe and North America, suggesting that the mecA gene has been acquired several times by different S. pseudintermedius.
- Europe → ST71
- North America → ST68
- The treatment of infections with MRSP is a new challenge in veterinary medicine because of the very limited therapeutic options.

S. pseudintermedius as a Zoonotic Agent

- The first case of human infection with S. pseudintermedius from a dog bite was described over 20 years ago.
- Since then, human infections with this microorganism have been reported occasionally, often directly related to close contact with a pet dog.
- S. pseudintermedius can also cause infection in healthy individuals even without exposure to animals.
- Direct inoculation of this pathogen into the skin and soft tissues causes skin abscesses.
- Transmission of MRSP via hospital staff, pet owners and the environment can occur.
- Transmission and resistance control is necessary to reduce the emergence of multi-resistant clones and to prevent zoonotic infections.
- Identification of more virulence factors will provide new tactics to prevent and treat infections caused by S. pseudintermedius.

Infection and Resistance Control

- Superficial skin infections caused by S. pseudintermedius can be effectively treated with topical antimicrobial agents, preventing the exposure of microorganisms to antibiotics and reducing the probability of acquiring resistance.
- Control measures to reduce the risk of transmission of S. pseudintermedius:
  - Combined sampling results in detection of 95% of carriers.
  - In veterinary hospitals:
    - Environment Cleaning and Disinfection
    - Personal Protective Equipment
    - Hand Hygiene
    - Animal Cohorting and Hospital Design
  - In households:
    - Avoid contact with infected sites
    - Hand hygiene

S. pseudintermedius vaccine potential

- Surface-exposed proteins are likely to interact with the host immune system.
- Identification of these proteins results in the identification of vaccine candidates.
- The cell-wall-anchored proteins SpdO and SpdO can mediate bacterial binding to canine corneocytes and represent potential therapeutic targets for the prevention and treatment of canine staphylococcal pyoderma.
- Lactococcus lactis expressing S. pseudintermedius SpdO adheres to canine corneocytes

Conclusions

- Staphylococcus pseudintermedius is an important pathogen of companion animals like dogs and cats.
- Knowledge of sites of colonization is important to detect carriers and prevent underestimation on its prevalence.
- There has been a sudden emergence of MRSP in dogs and cats and it constitutes a prominent risk to animal health.
- Human infections have been reported several times, even without exposure to animals, so clinicians should be aware of the potential risk that it can be to human medicine.

References


Images:
- Clairets of coccoid adhering to a corneocyte on skin surface (Gortel K. Vet Clin North Am Small Anim Pract, 2013)
- Nose
- Mouth
- Eye
- Hair
- Ear
- The depth of the disease will have an impact on its severity and, therefore, in the treatment and prognosis.
- S. intermedius
- S. pseudintermedius
- S. delphini
- The emergence of MRSP: 2.006
- S. pseudintermedius as a Zoonotic Agent
- S. pseudintermedius vaccine potential
- Conclusions