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Staphylococcus pseudintermedius SPDSa inhibits the innate immune response and promotes bacterial survival in canine blood

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Staphylococcus pseudintermedius is an important opportunistic bacterial pathogen that is the most common cause of canine pyoderma. It is frequently associated with urinary tract, wound and surgical site infections and occasionally causes zoonotic infections in human beings. The development of a staphylococcal vaccine is challenging and prior infection with *S. pseudintermedius* is not associated with protective immunity. Identification of a novel virulence factor inhibiting phagocytosis and evasion of innate immunity could play an important role in the prevention or treatment of *S. pseudintermedius* infection. Here, through bioinformatics- based analysis of *S. pseudintermedius* genome sequences, we identified a putative adenosine synthase gene (SpdsA) encoding a 5-nucleotidase. *S.pseudintermedius* SpdsA protein shares approximately 73.46% similarity with that of *S. aureus* and 46.44% similarity with that of *S. suis* type 2. Like the orthologous protein in S*taphylococcus aureus* it catalyzes the dephosphorylation of adenosine mono- and triphosphates and consequently produces the immune signaling molecule adenosine. Attenuation of this enzyme with selected amino acid substations resulted in diminished hydrolytic activity on adenosine mono-and triphosphates and reduced adenosine production. Adenosine perturbation enabled escape of *S. pseudintermedius* from phagocytic clearance in dog blood. In contrast, the addition of SPDSa inhibitor or A2A receptor antagonist to phagocytic cells resulted in diminished ability of *S. pseudintermedius* to escape from phagocytic killing. Taken together, these results indicate that *SpdsA* may play an important role in promoting *S. pseudintermedius* survival and in inhibiting neutrophil activity by adenosine synthesis.

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