

Advancing the Arizona State University Knowledge Enterprise

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Platelet Factor 4 as an Antimicrobial Agent

Antibiotic resistance is arguably one of the biggest threats facing the world today. While widespread misuse of antibiotics in human and animal use has been implicated in the rise in antibiotic-resistant bacteria, bacteria will still evolve to resist antibiotics even with responsible use. The CDC estimates that there are more than 2.8 million antibiotic-resistant infections each year, in the US alone, resulting in over 35,000 deaths. A growing number of bacteria are becoming even more difficult, if not impossible, to treat with current antibiotics. Case in point, there are now Gram-negative bacteria that are resistant to essentially all available antimicrobial agents. Thus, it is imperative that new antimicrobial agents are prioritized and developed to combat this serious global threat.

Researchers at Arizona State University have discovered that Platelet Factor (PF4) plays a protective role against bacterial infection. They have shown that, because PF4 is cationic, it binds to the negatively charged bacterial surface and serves as an opsonin for the receptor Mac-1 expressed phagocytic leukocytes. In an animal model of Staphylococcus aureus (S. aureus) infection, PF4 strongly decreased the number of viable bacteria, dramatically reducing bacterial burden and improved survival. Further, PF4 is capable of binding both gram-positive and gram-negative bacteria, making it potentially effective against polymicrobial infections.

Compared with established antibiotics, which directly target bacteria and can lead to resistance, PF4 augments the natural defensive function of macrophages.

Potential Applications

- Utilizing PF4 to treat bacterial infections
 - Both gram-negative and gram-positive bacteria
 - Sepsis or bacterial peritonitis

Benefits and Advantages

- PF4 dramatically augments bacterial phagocytosis by macrophages
 - Because it doesn't directly target bacteria, antibiotic resistance might not develop
- Reduces adverse reactions caused by gram-positive as well as gram-negative bacteria
- Reduces bacterial burden by 7-fold
- Can be used as a stand-alone agent or in combination with existing therapies
 - For sepsis treatment, PF4 may be given in combination with corticosteroid therapy

For more information about this opportunity, please see

Lishko VK et al - JCB - 2018

WO2022099204A1

For more information about the inventor(s) and their research, please see

Dr. Ugarova's departmental webpage

Dr. Podolnikova's departmental webpage