

The Unrelenting Superbug- Persistent *Staphylococcus aureus* Blood Stream Infections

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“What you see is that the most outstanding feature of life's history is a constant domination by bacteria.”
Stephan Jay Gould

Background

Our immune systems are constantly under attack from a multitude of bacterial species, one of which is the well known superbug *Staphylococcus aureus*, and its derivative- Methicillin resistant *Staphylococcus aureus* (MRSA).

S.aureus is capable of causing a wide range of infections but poses a substantial risk when present in the host's blood stream.

Despite application of appropriate antibiotics and resistance of the host immune system, this bacteria can remain within a patient's blood stream leading to continuation of the infection.

This phenomenon is called 'persistence' and the mechanism(s) are currently unknown.

Aims & Strategy

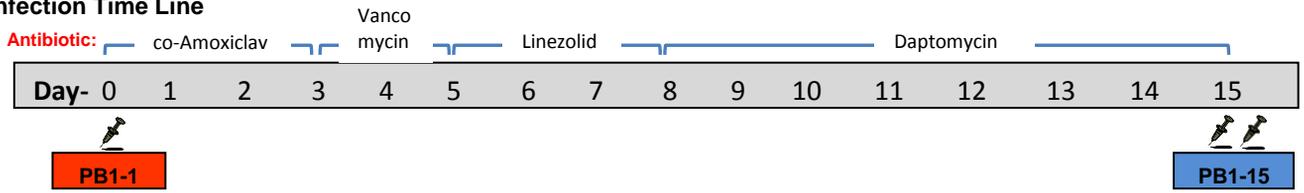
Aims of my research

- Find common characteristics of persistent *S.aureus* isolates from clinical settings
- Propose potential mechanisms of persistence

How...

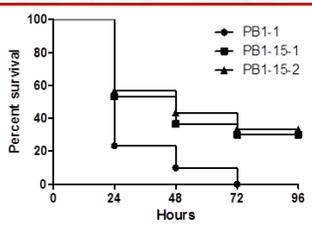
- Liaise with Leicester Royal Infirmary and identify cases of persistent *S.aureus* blood stream infections (duration >7 days)
- Investigate a wide range of known virulence traits associated with disease causing bacteria
- Investigate the possibility of genetic mutation as a reason for persistence via DNA sequencing

Infection Time Line



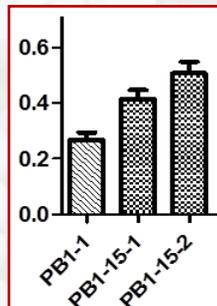
Results

Persistent isolates are generally less harmful but form better biofilms e.g. bacterial 'slime'



Using a caterpillar based model of infection, persistent isolates (PB1-15) showed decreased numbers of fatalities compared to isolates taken from earlier on in the infection (PB1-1).

Biofilms are collections of bacterial cells stuck together on a surface, and are often referred to as 'slime'. Persistent isolates (PB1-15) showed better biofilm forming capabilities as compared to isolates taken from earlier on in the infection (PB1-1).



Conclusions

Multiple virulence traits have been investigated using *S.aureus* isolates originating from several independent persistent blood stream infections (Poster figures show example data from one infection).

Decreased mortality in a caterpillar based model of infection and increased biofilm capabilities are two traits which are shared between persistent isolates. Meaning that these attributes may be significant to the emergence of persistence.

Overall, data suggests a common developmental pathway was implemented during the infections leading to the evolution of the persistent isolates and therefore persistent infections.

Continuing Hypothesis

Genetic mutation(s) within a bacterial population allows for the development of persistence via a limited number of pathways leading to the presentation of common persistent characteristics.