**The Regulatory Relationship Between *msaABCR* and *sarA* in *Staphylococcus aureus***

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Background: *Staphylococcus aureus* has a complex regulatory network responsible for regulating virulence. We have identified the *msaABCR* operon that plays a role in biofilm development and regulating virulence (e.g. *sarA*). In this study, we show that proteases and autolysis are regulated by *msaABCR* in a *sarA-*independentfashion, but regulation of biofilm is *sarA-*dependent.

Methods:We constructed an *msaABCR/sarA* double-mutant in USA300-LAC strain. The *sarA-*ORF was fused with an inducible promoter for *sarA* trans-complementation. We measured the effect of *sarA* induction in the double-mutant on protease production, autolysis, and biofilm formation.

Results: Induction of *sarA* in the *msaABCR/sarA* double-mutant did not restore autolysis or protease production relative to wild-type or *msaABCR*-mutant levels. This suggests that *msaABCR* is essential for regulating autolysis and protease production. However, induction of *sarA* was able to restore the biofilm development in the double-mutant and the *msaABCR* mutant.

Conclusion: This study shows that the *msaABCR* operonplays a role in regulating autolysis and protease production in a *sarA*-independent fashion. Even though *msaABCR* positively regulates the expression of *sarA*, induction of *sarA* in the double-mutant is not sufficient to restore autolysis or protease production. Induction of *sarA* restored biofilm production indicating that regulation of biofilm by *msaABCR* is *sarA-*dependent.