

## ABSTRACT

*Vibrio cholerae* is a Gram-negative bacterial pathogen that is endemic to aquatic environments throughout the world. After ingestion of water contaminated with *V. cholerae*, the bacteria can colonize at the small intestinal epithelium and cause disease through production of cholera toxin. Virulence gene expression in *V. cholerae* is tightly controlled, in part through regulation dependent on the presence of specific environmental factors. In the small intestine, bicarbonate increases in concentration from the lumen to the epithelial surface, and acts as a positive regulator of virulence gene expression by increasing the activity of the virulence gene regulator ToxT. Antimicrobial peptides are also present at the small intestinal epithelium and were previously shown to increase virulence gene expression when bicarbonate is present, despite not displaying an effect when bicarbonate is not present. There are numerous potential mechanisms that could explain this observation, either through direct interactions between antimicrobial peptides and ToxT or through indirect activity. I found that the human antimicrobial peptide LL-37 does not directly interact with ToxT, that less LL-37 is localized to the *V. cholerae* cytoplasm when bicarbonate is present, and that the combination of bicarbonate and LL-37 may increase the activity of ToxT at virulence gene promoters. Additionally, the increase in virulence gene expression is not due to intracellular production of reactive oxygen species. Taken together, these findings indicate that antimicrobial peptides likely play an indirect role in increasing virulence gene expression while bicarbonate is present, though the exact mechanism remains unclear.



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THESIS  
PRESENTATION

by

**Maxim Marino**

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**Determining the Role of  
Antimicrobial Peptides in *Vibrio  
cholerae* Virulence Gene  
Expression**

**M.S. in Biomedical  
Sciences**

## PRESENTATIONS AND AWARDS

**Marino, M.**, Plecha, S., Matson, J.S. “Antimicrobial Peptides Increase Virulence Gene Expression in *Vibrio cholerae*” Poster Presentation at the 26th Midwest Microbial Pathogenesis Conference, Toledo, OH, September 2019.

## PUBLICATIONS

Plecha, S., **Marino, M.**, Saul-McBeth, J., DeAngelis, C., Matson, J.S. (2020). Antimicrobial Peptides Increase Virulence Gene Expression in *Vibrio cholerae*. (under review)

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## FUTURE PLANS

Max plans to return to Michigan while he applies for jobs and possibly graduate programs.