Linking the metabolic pathways of Escherichia coli with virulence by altering glucose availability, inhibiting the acetyl-CoA carboxylase gene *accA* with asRNA, and through the quantification of *luxS*.

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Abstract
The present study determines to confirm a link between the metabolic pathways of bacteria and virulence. Commensal bacteria convert ingested D-glucose into short-chain fatty acids and long- chain fatty acids. The long-chain fatty acids are produced for plasma membrane and biofilm construction. The genetic activity of accA produces the acetyl-CoA carboxylase enzyme needed for long-chain fatty acid elongation. In this study, Luria broth liquid cultures of Escherichia coli were enhanced with Dglucose. The 15 mM glucose sample yielded 4,210 ng/µL of accA as compared to 196 ng/µL for the control. The gene accA was inhibited with antisense RNA with a qPCR gene copy number of 63. The inhibition of accA suppressed the expression of the luxS gene. The luxS gene is vital for transferring intercellular quorum-sensing signals through its increasing the synthesis of autoinducer-2. Bacterial cells that expressed antisense inhibition of accA were more susceptible to antibiotics. The purpose of the study is to advocate for an antibiotic design that targets bacterial metabolic genes and enzymes. An antibiotic design that inhibits bacterial metabolism may help to overcome the issue of bacterial antibiotic resistance.

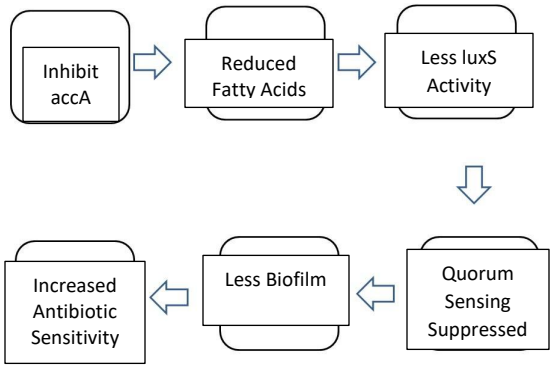


Figure 1: The flowchart shows the effects of inhibiting a bacterial metabolic gene, *accA*. Inhibiting accA reduces long chain fatty acid formation, suppresses *luxS*, which then lowers dissemination of quorum sensing signals. The *luxS* gene is responsible for releasing QS signals in the form of autoinducer-2 that controls biofilm formation and other virulent factors. Suppressing *luxS* lessens the consistency of biofilm. As a result, the antibiotic sensitivity was increased in mutant *E. coli* cells that expressed accA inhibition.

Recent Publications

1. Hillman, T. Linking the metabolic pathways of Escherichia coli with virulence by altering glucose availability, inhibiting the acetyl-CoA carboxylase gene accA with asRNA, and through the quantification of luxs. Microbiol Curr Res. 2019;3(1):8-15.
2. Hillman T (2019). Bacteriobot Drug-Liposome Carriers: An Optimization of Cancer-Drug Delivery to the Colon by Manipu-lating the Gut Microbiome. Nanoparticle 1(1): 1
3. Hillman, T. (2019). Current methods for inhibiting antibiotic resistant bacteria by targeting bacterial cell metabolism and disrupting antibiotic elimination through the AcrAB-Tolc efflux pump. *PeerJ Preprints*, *7*, e27840v1.
4. Hillman T. 2019. CRISPR-Cas9 may restore the balance of hormones affected by the frequency of DNA methylation sites and a decrease of commensal bacteria. PeerJ Preprints 7:e27509v2 https://doi.org/10.7287/peerj.preprints.27509v2
5. Hillman, T. (2019). HIV-1: Tackling the Obstacles, Which Limit the Effectiveness of the CRISPR-Cas9 Gene Editing of the T Cell Co-Receptor, CCR5.

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