MINNESOTA FUTURES RESEARCH GRANT 2015

Proposal Title: Bacterial polyphosphate metabolism: an unrecognized contributor to dental diseases?

Principal Investigators: Jake V. Bailey, Robert S. Jones, Cavan S. Reilly and Beverly E. Flood

Abstract:
This project addresses the enormous public health problem of recurrent dental caries in children. Over 12 million U.S. children between the ages 6-11 suffer from dental caries, making it the most common childhood disease, and greatly impacting quality of life of children. Growing evidence shows that managing chronic decay is extremely challenging due to poorly understood shifts in the ecology and phenotype of microbial communities in the complex dental biofilm. A brief unfunded collaboration between our groups has identified an overlooked, but possibly crucial metabolism, which may modulate local gradients of phosphate and calcium within complex oral biofilms. Some bacteria that are not recognized as virulent in single species laboratory models, may act as a dynamic shunt for phosphate in dental biofilms via the accumulation of a molecule known as polyphosphate - potentially mediating phosphatedependent conditions such as caries (dental decay) and calculus formation (mineralized dental plaque). Polyphosphate metabolism in dental biofilms may also influence the effectiveness of topical therapies that aim to deliver phosphate to protect children from caries. Here we propose an interdisciplinary project that will investigate polyphosphate metabolism in dental biofilms and explore its impact on human oral health.