

## SUMMER 2020 – SC EPSCOR / INBRE RET PROJECT DESCRIPTION FORM

<b>Mentor's Name</b>	Brian Lee
<b>Institution</b>	Coastal Carolina University
<b>Department</b>	Chemistry
<b>Mailing Address</b>	PO Box 261954, Conway, SC 29528-6054
<b>Telephone</b>	843-349-4070
<b>Email</b>	<a href="mailto:brianlee@coastal.edu">brianlee@coastal.edu</a>
<b>Research Subject Area</b>	Structural Biology

### A. Briefly describe overall research program at your laboratory.

The human microbiome has complex host interactions and profound effects on human health ranging from the development of various diseases to effects on metabolism and even neurological activity. Lactic acid bacteria are found in a variety of commercial products such as yoghurt and cheese, which are commonly used for the beneficial effects of these probiotics in addition to their epicurial purposes. While these bacteria are non-pathogenic, they are closely related to pathogenic bacteria such as *Streptococcus pyogenes*, which cause a variety of human diseases ranging from a superficial sore throat to life threatening diseases, such as necrotizing fasciitis (flesh eating disease). Our research focuses on the regulatory elements that allow these bacteria to switch from superficial to invasive modes of infection. These same regulatory elements are also found in the non-pathogenic lactic acid bacteria, including *S. thermophilus*, *L. bulgaricus* and *L. acidophilus*. Our research aims to characterize the structure and function of these regulatory elements in non-pathogenic bacteria.

### B. Briefly describe specific project(s) for your teacher:

Small regulatory RNA transcripts will be identified through bioinformatics and their sequences will be cloned into vectors for *in vitro* transcription using T7 polymerase. The sRNA transcripts can be synthesized and then purified using silica-membrane spin columns (Qiagen). The purified RNA transcripts will be characterized by RNase T<sub>1</sub> digestion and thermal melt assays to test for secondary structure. Computational modeling will be used to predict three-dimensional structures of the sRNA elements. Experimental data for structure determination can be obtained from either X-ray crystallography or NMR spectroscopy. RNA transcripts will be prepared for both techniques, which will require the use of facilities at MUSC (a comprehensive research university within the SC-INBRE program).

### C. Will any other people (post docs, grad students, undergraduate students, colleagues, etc.) be involved directly with your teacher?

The teacher will work with undergraduate and high school students during the summer research program.

### D. Will you require any advanced reading/preparation for the teacher? If yes, please briefly describe.

Literature references will be required reading to provide background knowledge in sRNA based gene regulation and laboratory techniques such as cloning, *in vitro* transcription, RNA purification and crystallization.