

Title: Isolation, Characterization, and Identification of bacteria on *Cambarus bartonii* gill filaments

Program of Study: Biology

Presentation Type: Print Poster

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Category: Experimental- Basic

Abstract:

Crayfish are a keystone species in aquatic ecosystems. The ectosymbiotic relationship between crayfish and branchiobdellidans has been linked to an increase in crayfish growth and the potential control of bacterial growth on crayfish gill filaments. Branchiobdellids feed on the gill bacteria that cause epibiotic gill fouling when the crayfish setae are not effective. It has been discovered that severe gill fouling during the intermolt period can reduce transport of oxygen and nitrogenous waste across the gill membranes and can lead to mortality. The taxonomy and characteristics of these bacteria have not yet been identified. In this research project, the microbials that cause gill fouling on *Cambarus bartonii* will be isolated and tested to determine the characteristics and taxonomy of each bacterium discovered. The first step in the experiment was swabbing the gills of crayfish and inoculating a TSA plate with the sample to grow a culture. Bacterial colonies were streaked for isolation to obtain pure cultures. Several strains including Gram stain, acid fast, and endospore stain were performed from the pure cultures to determine several characteristics of the bacteria. Then, several tests were conducted such as oxidase test, nitrate reduction test, urease test, and citrate utilization test to determine more characteristics of the bacterium and narrow the taxonomic possibilities. These steps were repeated for each of the bacteria that were grown from the gill filament samples. Characteristics discovered of the bacteria that cause gill fouling will help us to understand the condition and the role of brachiobdellids in cleaning symbiosis.

Christian worldview:

The motivation of this research is the awe and appreciation that is brought from observing God's creation. Romans 1:20 says that God's divine nature can be understood through the creation of the world. This is evident in the relationships that have been studied in the microbial world. It may seem inconceivable that the Creator of the universe designed and ordered these creatures to interact with purpose, even on a microscopic level. Having the opportunity to study even the smallest of God's creation allows vast and extensive knowledge on the power of God. In studying commensals and parasites, the question of how many microbes came to be harmful arises. Genesis 1:31 explains that God's original creation was very good and He purposefully designed it that way. It is possible that these organisms were created the way that they are today, but after the Fall, the genes that control their harmful characteristics could have been "switched

on." As a Christian, I conduct research that will allow me and the community of believers to understand more about God and His creation by further understanding why these organisms have the characteristics that they possess. It is also important to me to conduct research that will advocate for the stewardship of the environment. God allowed man to have dominion over his creation, but commands that man tends to it and takes care of it. For this reason, I have taken initiative to conduct my experiments in a manner that is pleasing to God. The findings in this research will provide better knowledge on what needs to be done to tend to the environment of the crayfish.