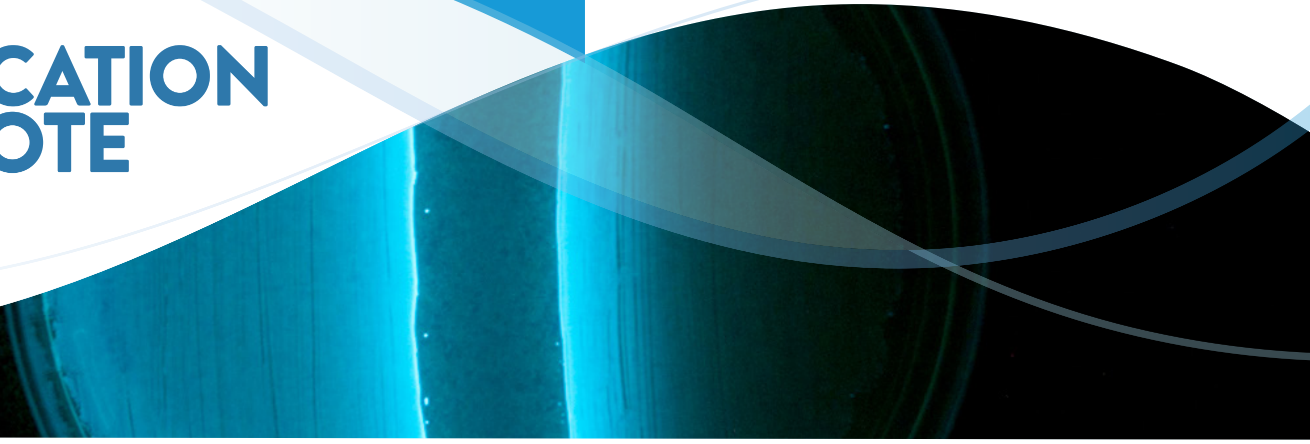
APPLICATION NOTE



VIBRIO CAMPBELLII QUORUM SENSING

ABSTRACT

This study will demonstrate the use of the ATCC *Vibrio* campbellii Panel (ATCC® MP-6™) as a non-pathogenic model for AI-2-based quorum sensing pathways.

INTRODUCTION

In many prokaryotes, cooperative behaviors are regulated through a density-dependent, signal-mediated communication system termed quorum sensing (QS).[1] When a bacterial population reaches a critical threshold, autoinducer signaling molecules (AI) specifically bind to a cognate regulatory protein or activate a two-component signal transduction system, leading to the regulation of group behaviors. In the marine organism *Vibrio* campbellii, AI signals (AI-1 and AI-2) and cognate regulators are used to regulate bioluminescence[1] (Figure 1). Since its discovery, AI-2 has proven ubiquitous within inter- and intraspecies communication, including that of pathogenic microorganisms.[2] Here, we show a panel of nine *V.* campbellii strains displaying wild-type or varying mutational phenotypes for use as a non-pathogenic model in the analysis of AI-2-based QS systems.

MATERIALS AND METHODS

Nine *V.* campbellii strains were phenotypically analyzed for QS proficiency by monitoring the bioluminescence production of genotypically diverse strains that were plated together in pairs on Autoinducer Bioassay Medium.[1,3-6]

RESULTS AND DISCUSSION

Upon analysis of paired strains, it was determined that bioluminescence could be restored in strains lacking regulator and/or AI production if the adjacent strain was proficient in that characteristic (Figure 2A-C, Table 1). Bioluminescence could not be restored in strains lacking part of the luxCDABE operon, which encodes for bioluminescence (Figure 1, Figure 2D, Table 1).

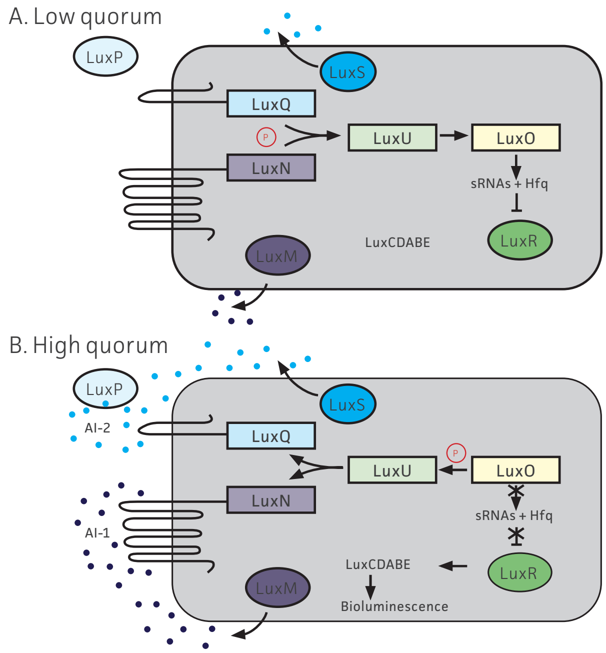


Figure 1: Quorum sensing

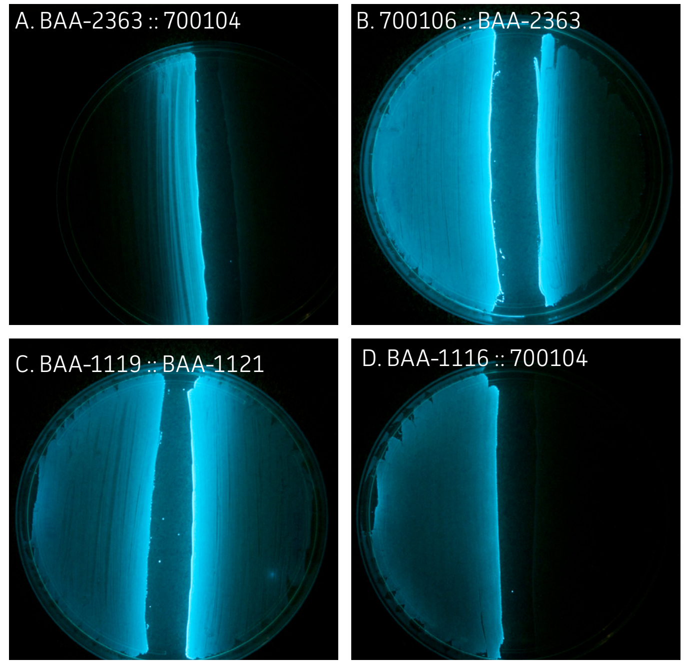


Figure 2: Bioluminescence

Table 1: ATCC *Vibrio campbellii* Panel (MP-6)

		Autoinducers								
Sensors		1+ , 2+	1+ , 2+	1+ , 2+	1+ , 2+	1+ , 2+	1- , 2+	1+ , 2-	1+ , 2-	1- , 2-
	ATCC No.	700104	700106	BAA-1116	BAA-1117	BAA-1118	BAA-1119	BAA-1120	BAA-1121	BAA-2363
luxA-	700104™	-	-	-	-	-	-	-	-	-
1+ , 2-	700106™	+	+	+	+	+	+	+	+	+
1+ , 2+	BAA-1116™	+	+	+	+	+	+	+	+	+
1- , 2+	BAA-1117™	+	+	+	+	+	+	+	+	+
1+ , 2-	BAA-1118™	+	+	+	+	+	+	+	+	+
1- , 2+	BAA-1119™	+	+	+	+	+	+	+	+	+
1+ , 2+	BAA-1120™	+	+	+	+	+	+	+	+	+
1- , 2+	BAA-1121™	+	+	+	+	+	+	-	-	-
1+ , 2+	BAA-2363™	+	+	+	+	+	-	-	-	-

Sensor 1 = LuxN; Sensor 2 = LuxQ; Autoinducer 1 = AI-1; Autoinducer 1 AI-2; (+) = Light observed; (-) = No Light observed

CONCLUSION

The characterization of these V. campbellii strains illustrates that ATCC MP-6 is well suited as a non-pathogenic model for the analysis of AI-2-based, two-component regulatory QS pathways.

REFERENCES

1 Bassler B, Wright M, Silverman M. Multiple signaling systems controlling expression of luminescence in *Vibrio harveryi*: sequence and function of genes encoding a second sensory pathway. Mol Microbiol 13: 273-286, 1994.

2 Galloway WR, et al. Quorum sensing in Gram-negative bacteria: small-molecule modulation of AHL and AI-2 quorum sensing pathways. Chem Rev 111: 28-67, 2011.

3 Surette MG, Miller MB, Bassler BL. Quorum sensing in *Escherichia coli*, *Salmonella typhi*murium, and *Vibrio harveyi*: a new family of genes responsible for autoinducer production. Proc Natl Acad Sci U S A 96: 1639-1644, 1999.

4 Waters CM, Bassler BL. The *Vibrio harveyi* quorum-sensing system uses shared regulatory components to discriminate between multiple autoinducers. Genes Dev 20: 2754-2767, 2006.

5 Bassler BL, Greenberg EP, Stevens AM. Cross-species induction of luminescence in the quorum-sensing bacterium *Vibrio harveyi*. J Bacteriol 179: 4043-4045, 1997.

6 Bassler BL, Wright M, Silverman MR. Sequence and function of LuxO, a negative regulator of luminescence in *Vibrio harveyi*. Mol Microbiol 12: 403-412, 1994.

7 Lin B, et al. Comparative genomic analyses identify the *Vibrio harveyi* genome sequenced strains BAA-1116 and HY01 as *Vibrio* campbellii. Environ Microbiol Rep 2(1): 81-89, 2010.

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