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VIBRIO HARVEYI QUORUM SENSING

AP Notes
No. 10

Abstract

This study will demonstrate the use of the ATCC *Vibrio harveyi* 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 harveyi*, 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. harveyi* 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. harveyi* 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, 2D, Table 1).

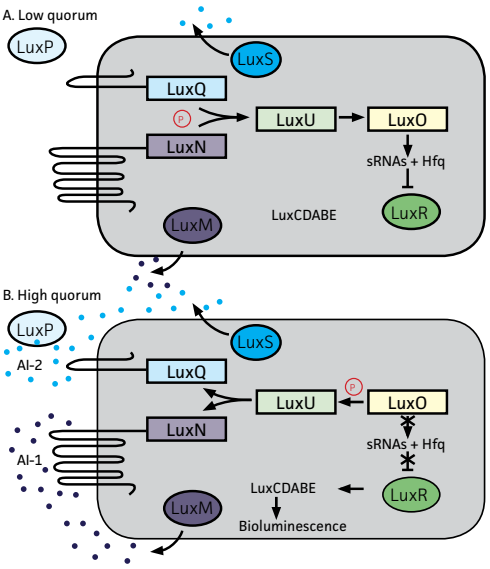

Figure 1. QS in *V. harveyi*

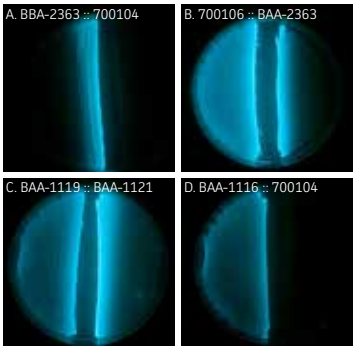

Figure 2. Bioluminescence

Table 1. ATCC® *Vibrio harveyi* Panel (MP-6™)

Sensors		Autoinducers								
		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. harvey*i 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

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