



"O papel da microbiota na aquicultura do camarão *Penaeus vannamei*"

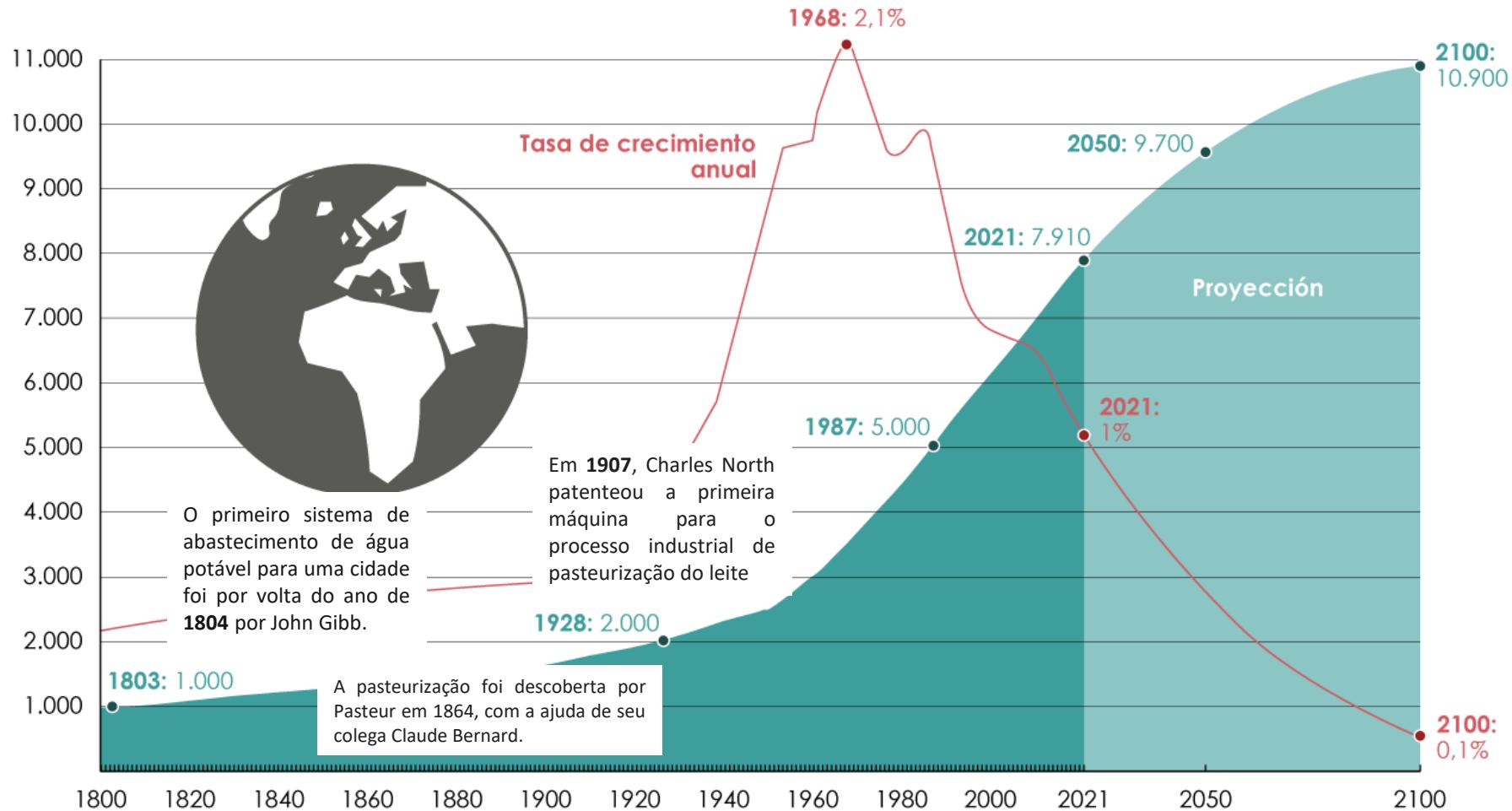


Experiência de vida com a microbiota intestinal



La evolución de la población mundial

Millones de habitantes

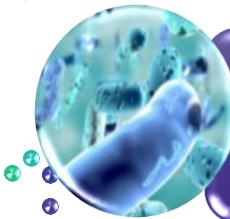
**Autor:**

Álvaro Merino (2022)

Fuente:

OurWorldInData a partir de datos de la ONU y HYDE (2022)

Larvicultura de *Penaeus vannamei*



Microbiota

*Epicin G2,
Epicin Hatchery*



Dietas secas

*Royal Caviar y Epibal
Royal Seafood, MeM
y Wean*



Dietas líquidas

*Epifeed LHF y
Epilite*



Artemia

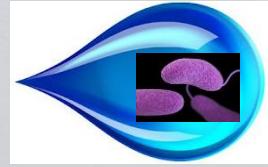
*Epifeed AR
Vitellus*



Microalgas

Pastas de algas





Resultados:

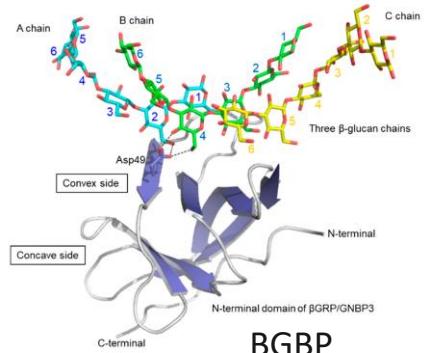
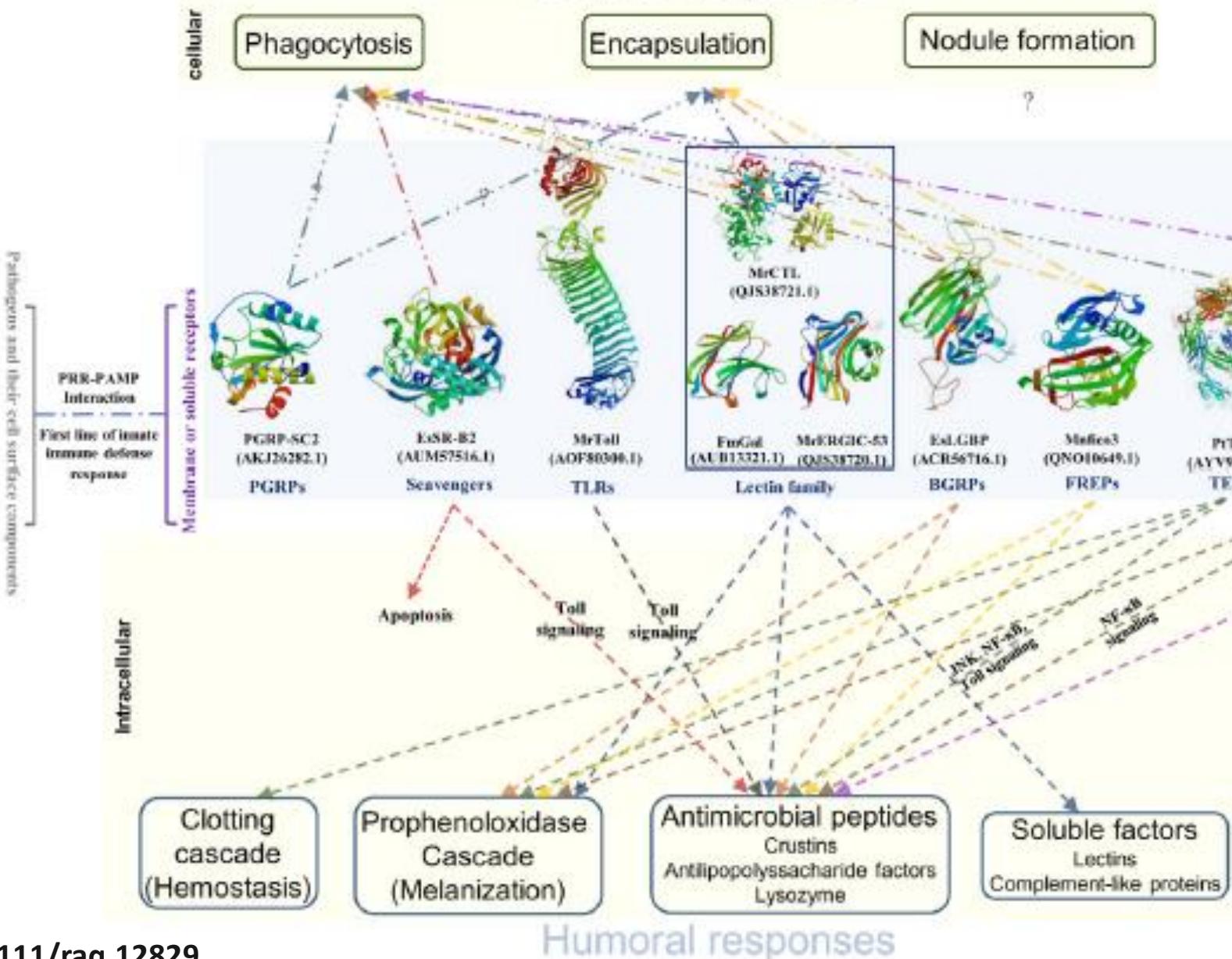
2,00E+06 ufc/ml de *Vibrio* total em 24 horas

2,00E+04 ufc/ ml de *Vibrio pharaemolyticus*

3 de 4 UFC com genes patogênicos.



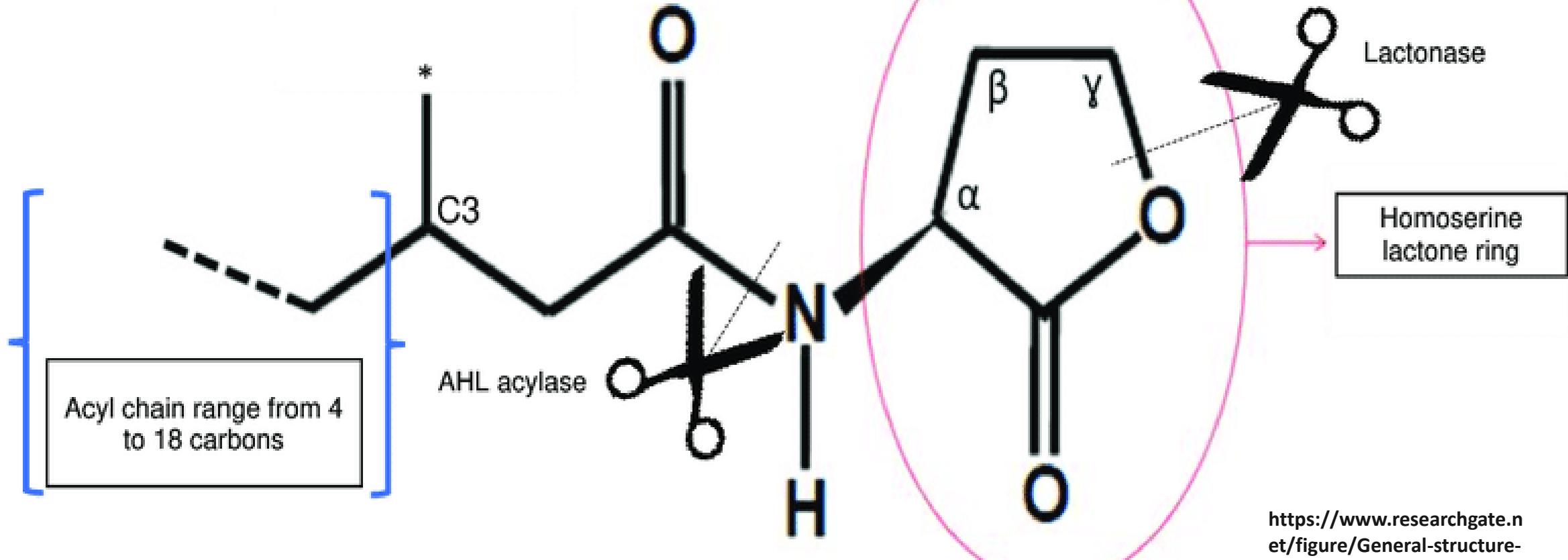
Cellular responses



<https://doi.org/10.3390/ijms22041578>



Quorum Quenching (QQ)



https://www.researchgate.net/figure/General-structure-of-the-N-acyl-homoserine-lactone-AHL-A-fatty-acyl-chain-is-linked-to_fig1_348732503

Metagenômica em aquicultura para avaliar a diversidade do microbioma



Article

RNA-Seq Analysis on the Microbiota Associated with the White Shrimp (*Litopenaeus vannamei*) in Different Stages of Development

Raúl Enrique Valle-Gough¹, Blanca Yesenia Samaniego-Gámez², Javier Eduardo Apodaca-Hernández³, Francisco Xavier Chiappa-Carrara⁴, Mauricio Rodríguez-Dorantes⁵ and María Leticia Arena-Ortiz^{1,*}

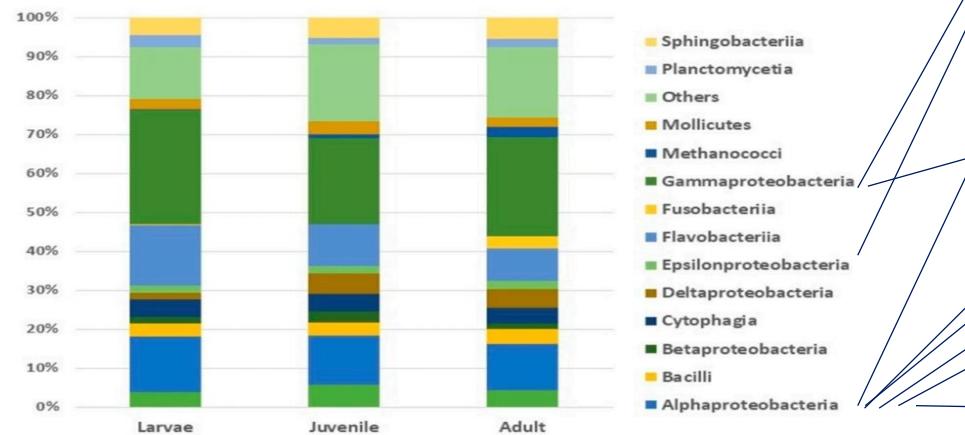


Figure 2. Taxonomical composition at class level of the *L. vannamei* microbiome in different stages of development.

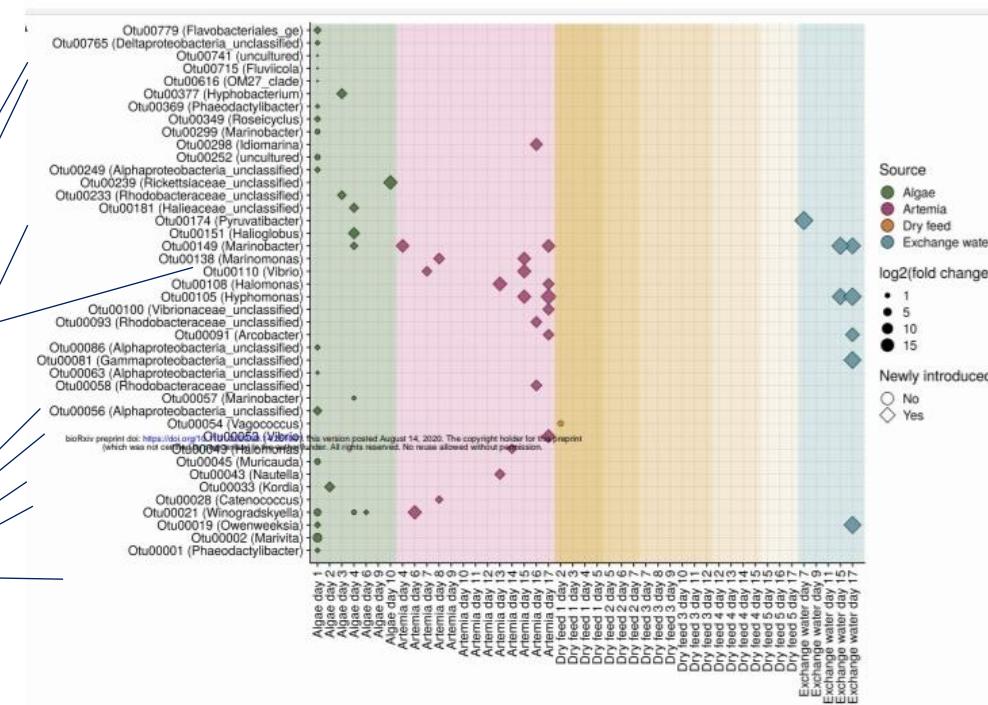
<file:///C:/Users/riramirez/Downloads/appsci-12-02483-v2.pdf>



Environmental Microbiology (2021) 23(1), 281–298

doc.10.1111/1462-2920.15310

Rearing water microbiomes in white leg shrimp (*Litopenaeus vannamei*) larviculture assemble stochastically and are influenced by the microbiomes of live feed products



<https://doi.org/10.1111/1462-2920.15310>



Metagenômica e Metataxonômica

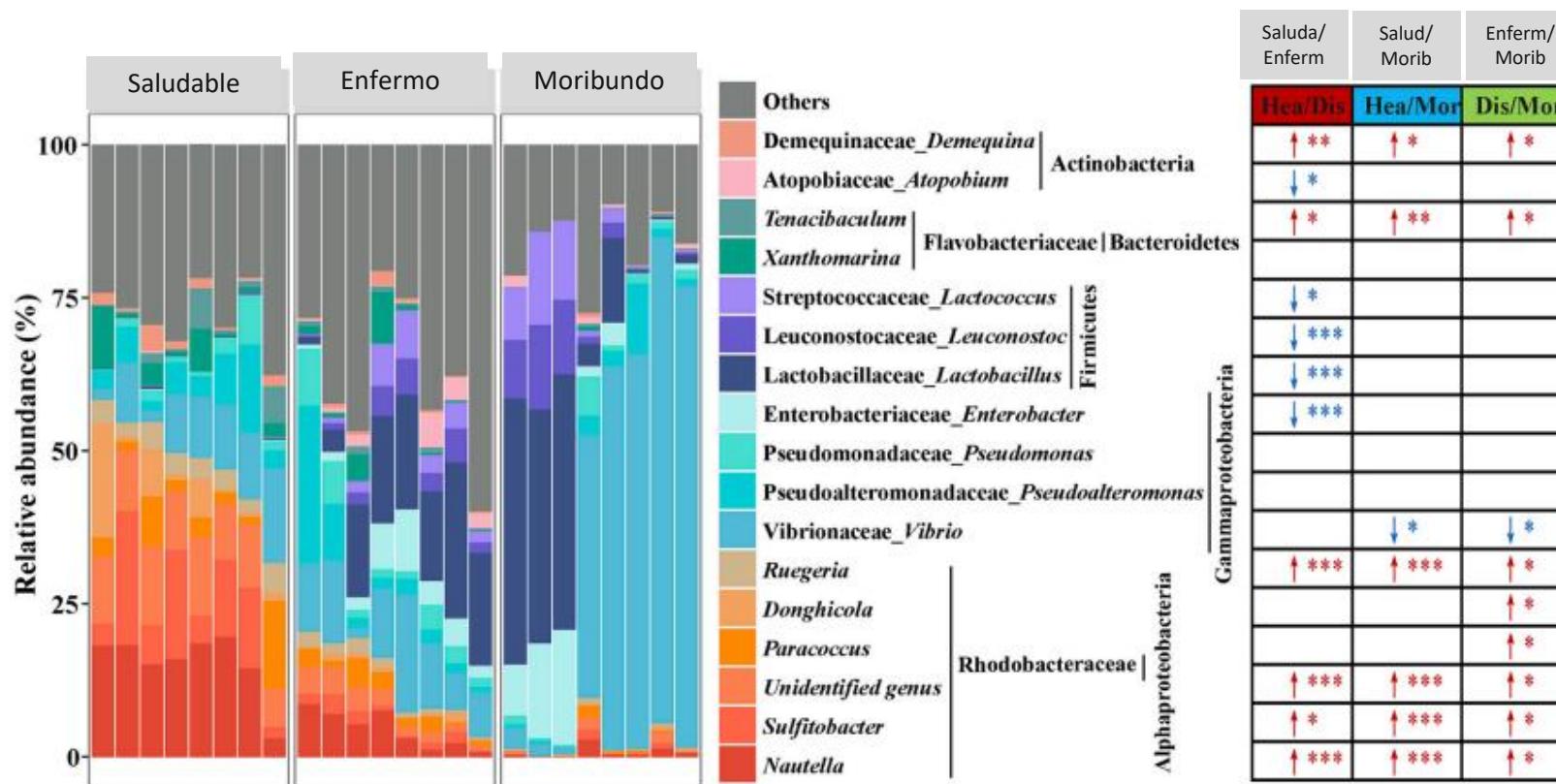


Fig. 3. Relative abundances of dominant taxa at genus level in the gut of healthy, diseased and moribund shrimp. Each sample had eight replicates ($n = 8$). The significant depleted and enriched genus in each pairwise comparison are indicated with “ \downarrow ” and “ \uparrow ”, respectively. Different asterisks indicate a significant difference at $*p < 0.05$, $**p < 0.01$, and $***p < 0.001$ based on Student's t-test. Hea: Healthy shrimp; Dis: Diseased shrimp; Mor: Moribund shrimp.

https://www.researchgate.net/profile/Haipeng-Guo-3/publication/374419591_Specific_gut_bacterial_taxa_inhabited_in_healthy_shrimp_Penaeus_vannamei_confer_protection_against_Vibrio_parahaemolyticus_challenge/links/652132d9fc5c2a0c3bbe3b3f/Specific-gut-bacterial-taxa-inhabited-in-healthy-shrimp-Penaeus-vannamei-confer-protection-against-Vibrio-parahaemolyticus-challenge.pdf



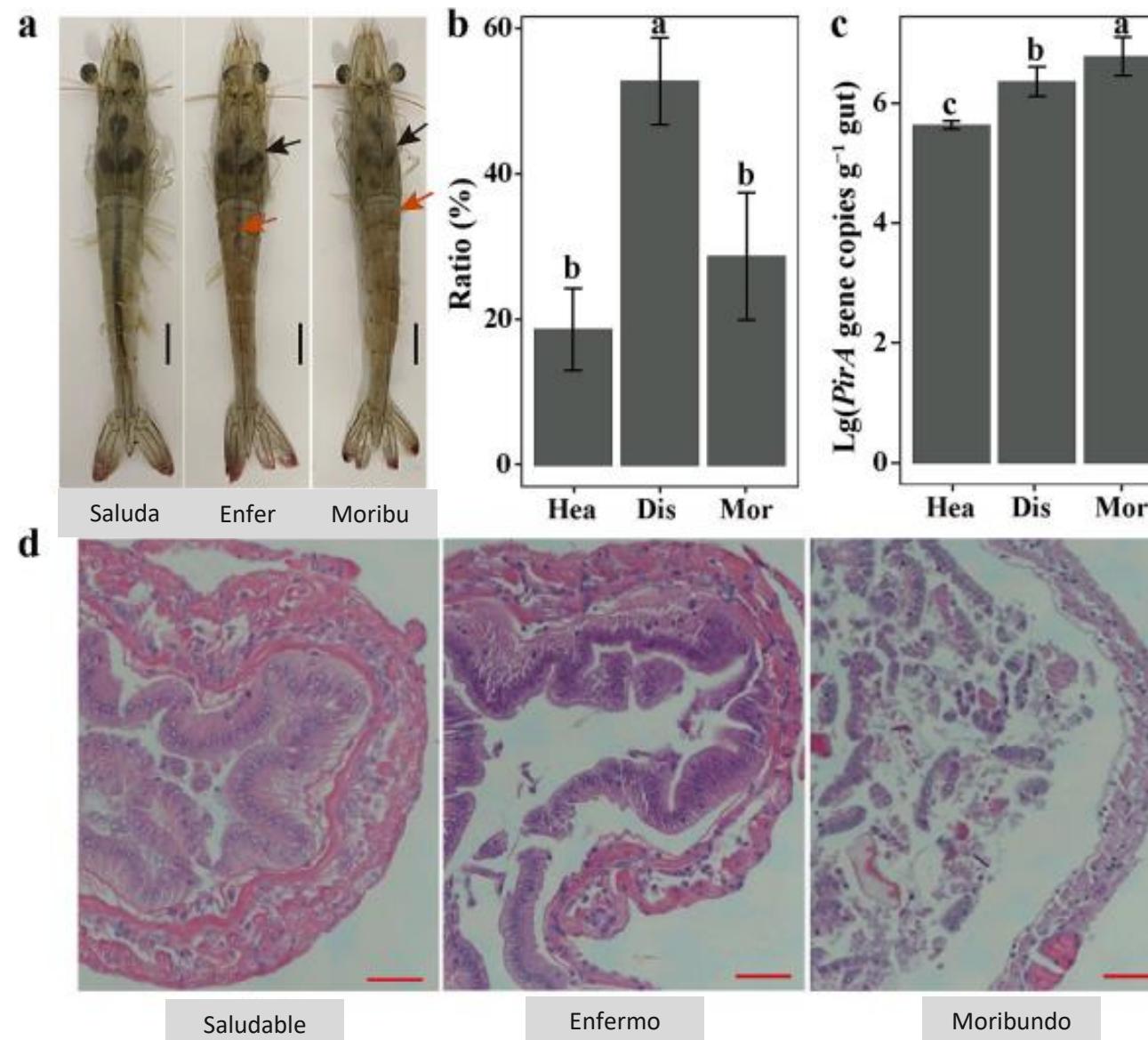


Fig. 1. The numbers, *PirA* gene copies and pathological features of healthy, diseased and moribund shrimp in each pond. (a) Ratios. (b) *PirA* gene copies. (c) Phenotypic characteristics. (d) Histological sections of gut. Bar = 1 cm in (c) and 50 μm in (d). Values represent mean \pm standard deviation ($n = 8$). Bars with different letters indicate significant differences at $P < 0.05$ according to Student's t-test. Hea: Healthy shrimp; Dis: Diseased shrimp; Mor: Moribund shrimp.

<https://doi.org/10.1016/j.aquaculture.2023.740192>

Seleção de K como estratégia de manejo da comunidade microbiana: um método para melhorar a viabilidade larval em aquicultura

Olav Vadstein^{1*}, Kari J. K. Attramadal¹, Ingrid Bakke¹ e Yngvar Olsen²

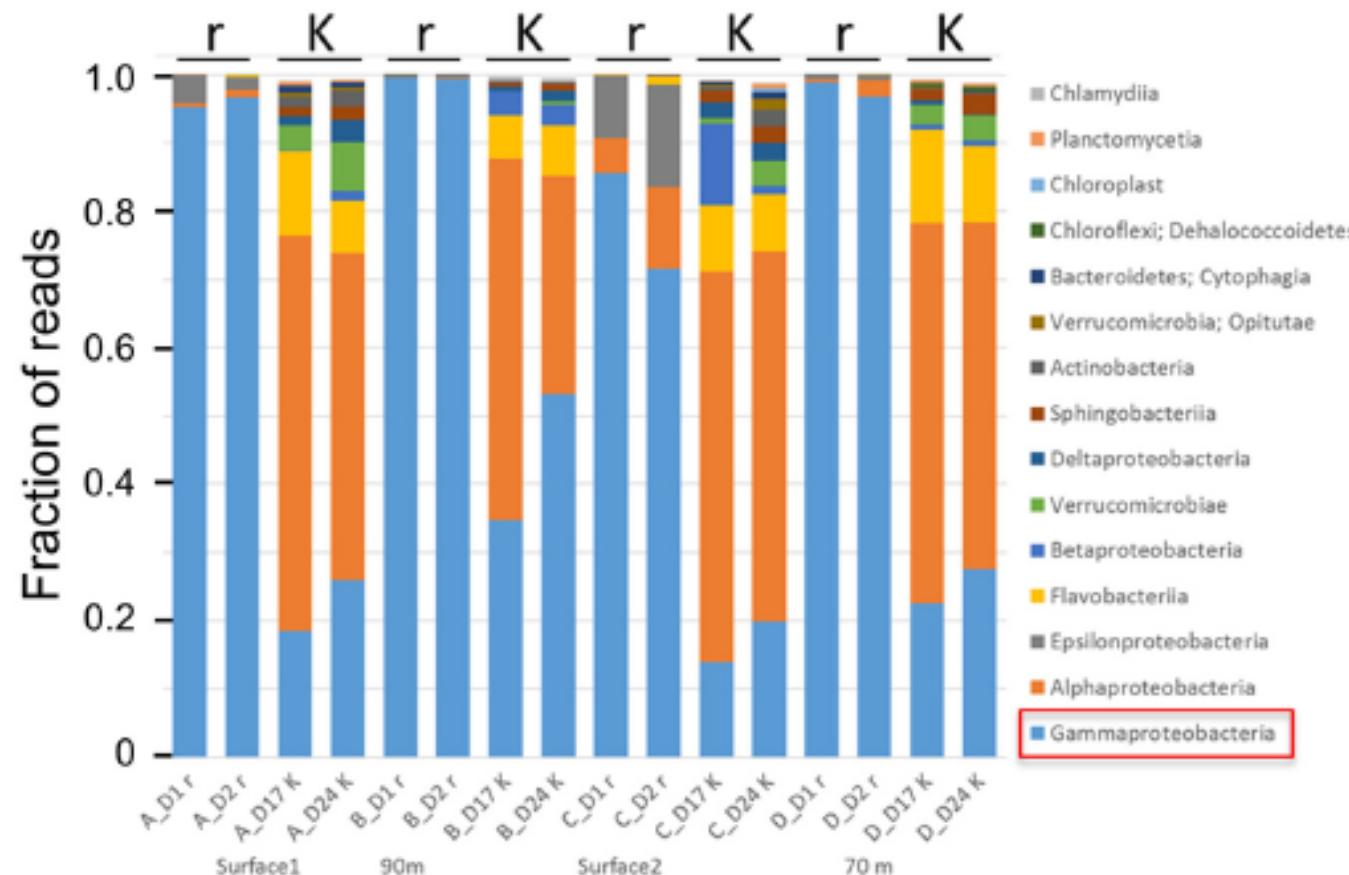


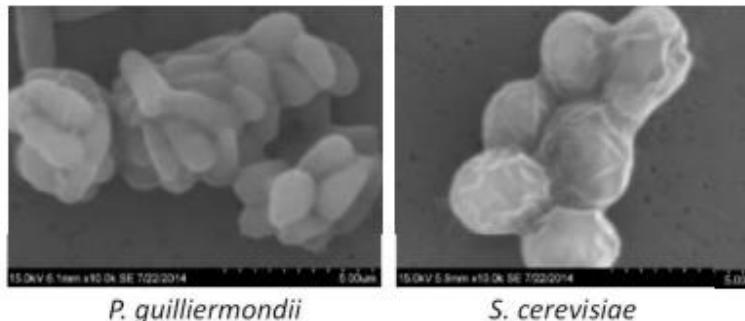
Figura 5. Efectos de la selección r y K sobre la composición de la comunidad microbiana en cuatro experimentos diferentes con distintos inóculos de agua de mar. El grupo fue muestreado dos veces durante los períodos de selección r y K. La selección r se obtuvo ofreciendo nutrientes orgánicos y minerales para el crecimiento, mientras que la selección K se obtuvo por agotamiento de recursos y competencia durante más de 2 semanas. Las comunidades seleccionadas r fueron muestreadas en los días 1 y 2 después adición de recursos, mientras que las comunidades seleccionadas por K se tomaron muestras los días 17 y 24. La composición de la comunidad microbiana se analizó mediante secuenciación de Illumina de amplicones de 16S-rDNA.



Pichia guilliermondii



	<i>P. guilliermondii</i>	<i>S. cerevisiae</i>
1 cm ³	4.2×10^{10} cells	2.2×10^9 cells
	2.2 m ²	0.8 m ²
1g	~ 4.3 m ²	~ 1.6 m ²



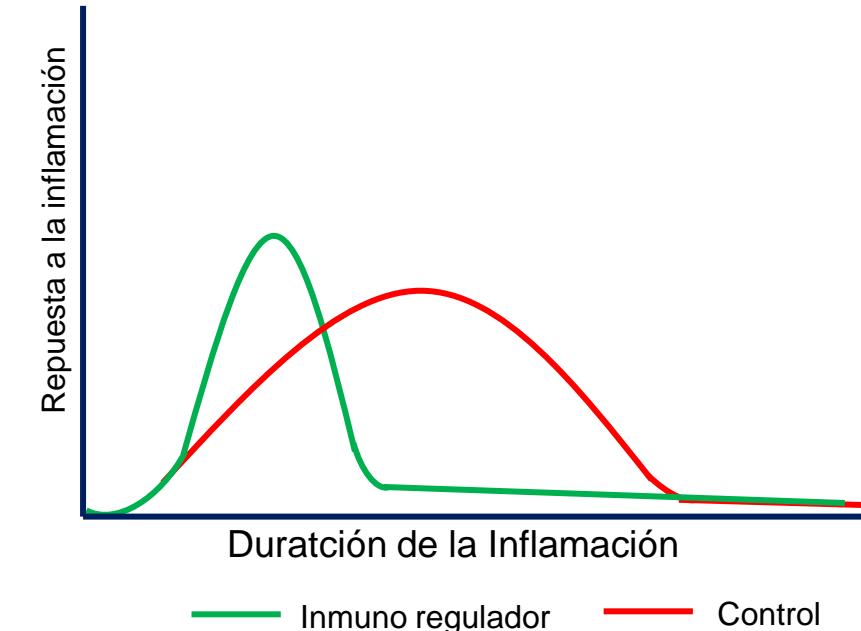
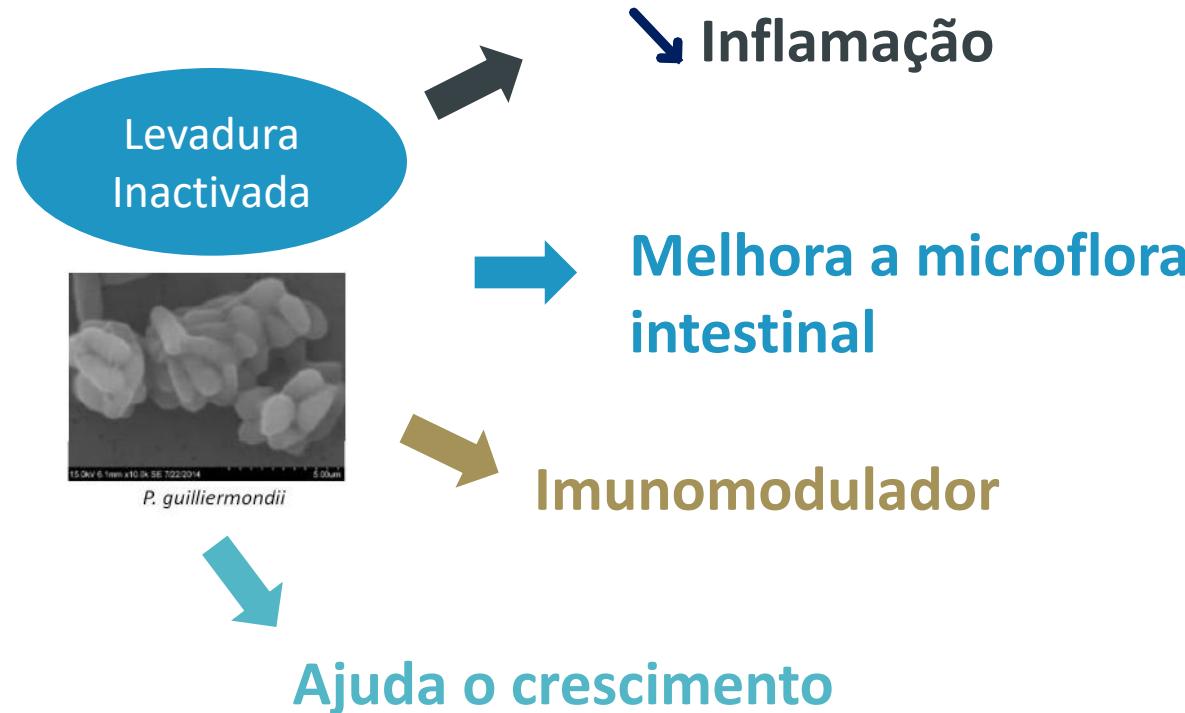
Peisker M et al. Morphological Characterization of *Pichia guilliermondii* and *Saccharomyces cerevisiae* Yeast and their Effects on A of Intestinal Pathogens on Piglet and Chicken Epithelium In-vitro. *Journal of Animal Research and Nutrition* 2017;2.



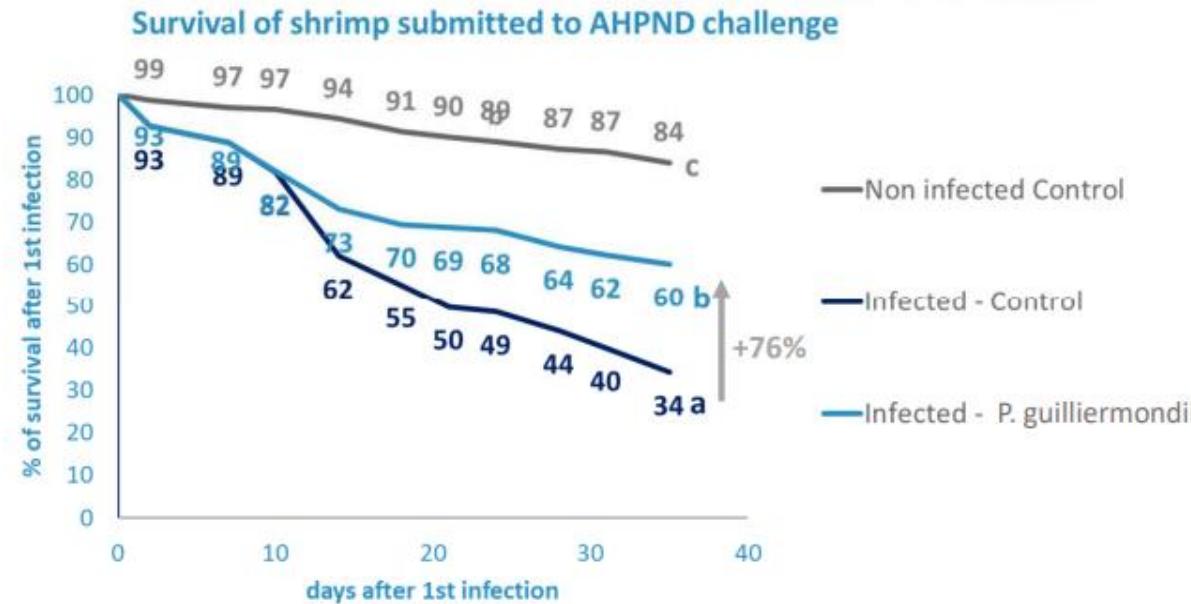
P. guilliermondii tem cerca de 3 vezes a área por unidade de volume e peso de *S. cerevisiae*



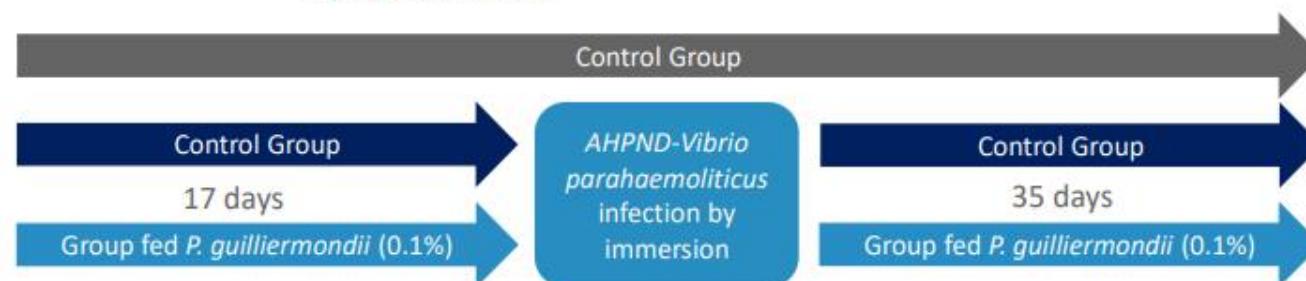
Modo de ação e benefícios imunorregulatórios de *P. guilliermodii*



Pichia guilliermondii



- Study location: R&D facility, Peru
- Animals: Pathogen free *L. vannamei* from PL13
- Housing: 20L tanks, 100 shrimp/tank, 4 replicates/group



Bacteriological and histopathological analysis of *Penaeus vannamei* experimentally infected with *Vibrio parahaemolyticus*-AHPND strains

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82112 Mazatlán, Mexico

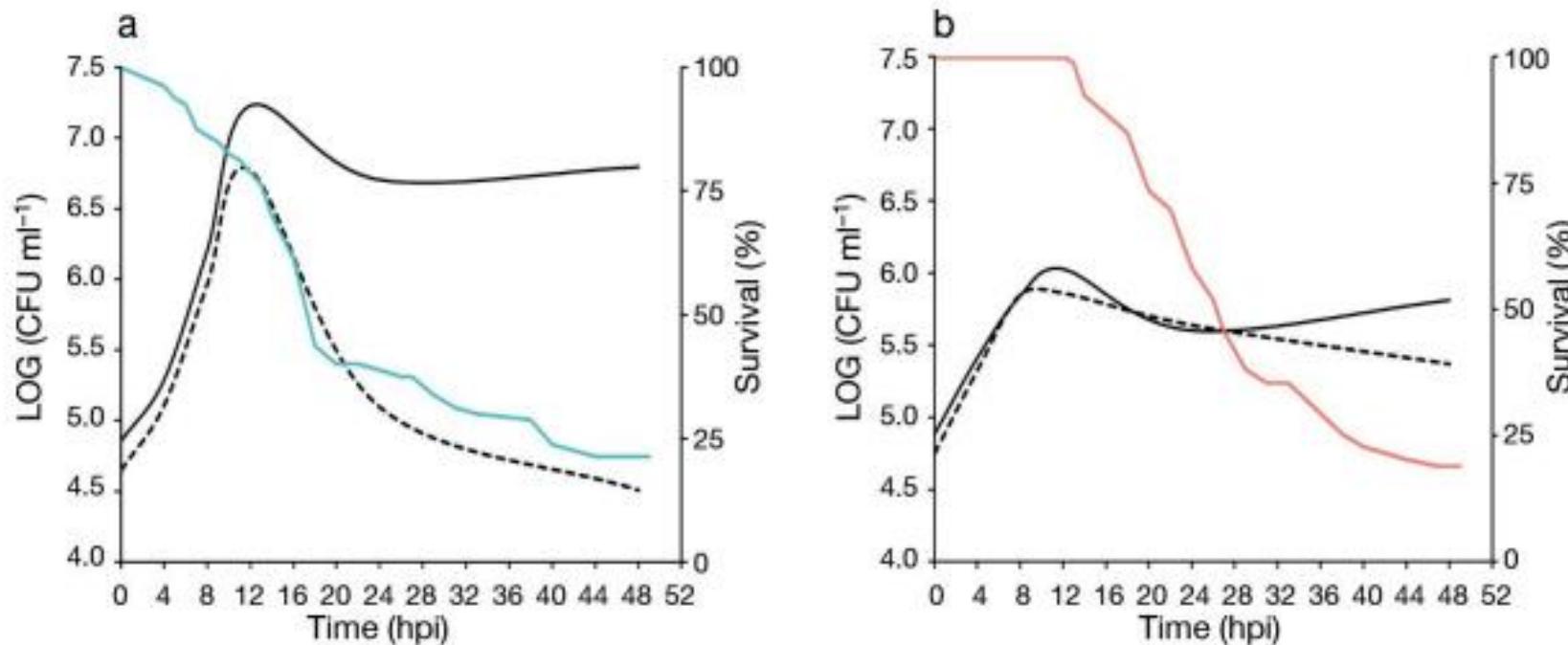
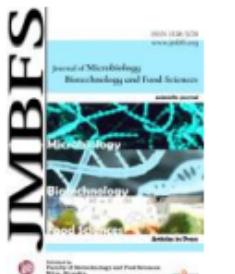


Fig. 2. Bacterial growth (black lines) and shrimp survival (colored lines) over time following experimental infection with *Vp* AHPND+ strains (a) M0904 at $1.25 \times 10^5 \text{ CFU ml}^{-1}$ and (b) M0607 at $1.73 \times 10^5 \text{ CFU ml}^{-1}$. Black continuous lines: bacterial growth on the bottom of the experimental units; dotted lines: bacterial growth in the water column



EFFECT OF PROBIOTIC AND SUPPLEMENTED FEED ON GROWTH, SURVIVAL AND DISEASE RESISTANCE OF WHITE SHRIMP *LITOPENAEUS VANNAMEI* POSTLARVAE

Vennila Jayaprakash and Arulvasu Chinnasamy*

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*Corresponding author: arulvasu@gmail.com

<https://doi.org/10.55251/jmbfs.4096>

E1
+ 15%

Table 2 Growth and survival of *Litopenaeus vannamei* postlarvae fed with probiotic supplemented feed for 15 days

Experiments	Initial length (mm)	Final length (mm)	Initial weight (mg)	Final weight (mg)	SGR (%)	Survival rate (%)
Control	20.98 ± 1.02	31.32 ± 0.23 ^b	19.00 ± 1.22	25.11±0.01 ^c	1.13 ± 0.21 ^b	80.00 ± 3.00 ^c
E1	23.68 ± 1.52	33.01 ± 0.26 ^b	24.80 ± 1.30	31.52±0.04 ^b	1.82 ± 0.65 ^b	95.00 ± 3.85 ^b
E2	25.22±1.14	37.30±0.28 ^a	27.00±1.20	48.10±0.03 ^a	3.31 ± 0.33 ^a	100.00± 0.00 ^a
E3	21.14 ± 0.86	32.00 ± 0.20 ^b	22.10 ± 1.04	32.41±0.05 ^b	1.70 ± 0.37 ^b	90.00 ± 0.00 ^b

Values represent the means ± standard deviation of the samples with different superscript letters are significantly different from each other ($p < 0.05$). Means without letters do not differ substantially. Control: unenriched *Artemia* nauplii, E1: *Artemia* nauplii enriched with 5×10^7 cfu cells, E2: *Artemia* nauplii enriched with 5×10^9 cfu cells and E3: *Artemia* nauplii enriched with 5×10^{11} cfu cells and SGR: specific growth rate.

E1: 5,0+E07 ufc /mL equivalente a 10 g de probiótico para 5,0+E09 ufc/g.

E2: 5,0+E09 ufc /mL

E3: 5,0+E11 ufc /mL.



Co-cultivo de microalgas com consórcios probióticos para aquicultura

<https://PMC8880515/>

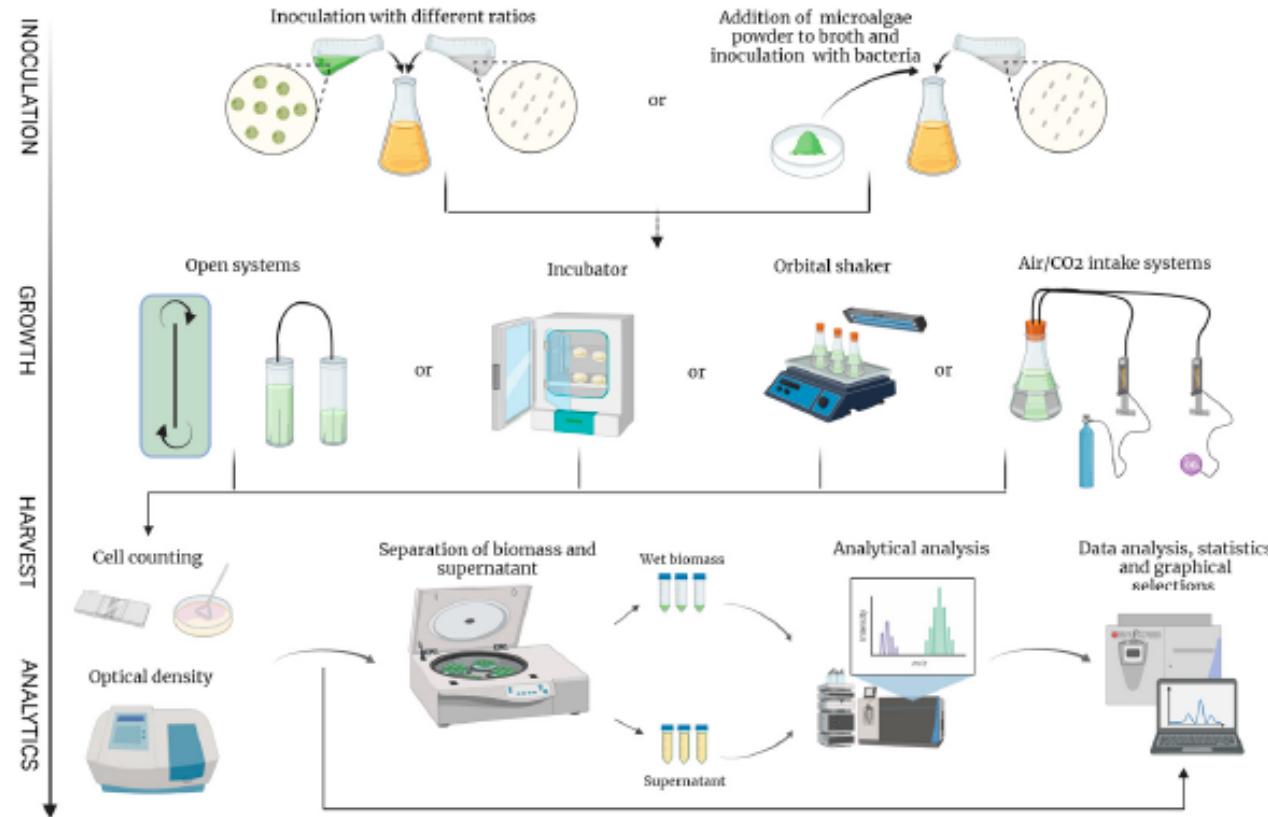


Figure 2. A contractive overview of the methods used for studies of microalgae and probiotic consortia. Co-cultivation begins with inoculation of microalgae and bacteria. Either viable microalga or its powder/extract can serve as an inoculum. The system in which the microbes are inoculated can be closed or open system (flow-through ponds; tubular photobioreactors); Petri dishes/biofilms in incubators; orbital shakers; or flasks with air/CO₂ supply. During cultivation, growth parameters are usually measured by cell counting (CFU; hematocytometer) and optical density. Downstream processing is performed by separating biomass and supernatant, which are subjected to analytical analysis.

Conclusões:

Tanto as algas quanto os consórcios probióticos são de grande valor para o bem-estar dos organismos, pois produzem compostos com muitos efeitos benéficos à saúde. Recentemente, o cultivo de microalgas com a adição de probióticos tem ganhado atenção para interações entre espécies produtoras de compostos bioativos neste sistema de co-cultivo.





Equipe de trabalho na Península de Santa Elena, Ecuador



Resultados do teste microbiológico em náuplios de camarão em salmoura às 24 horas

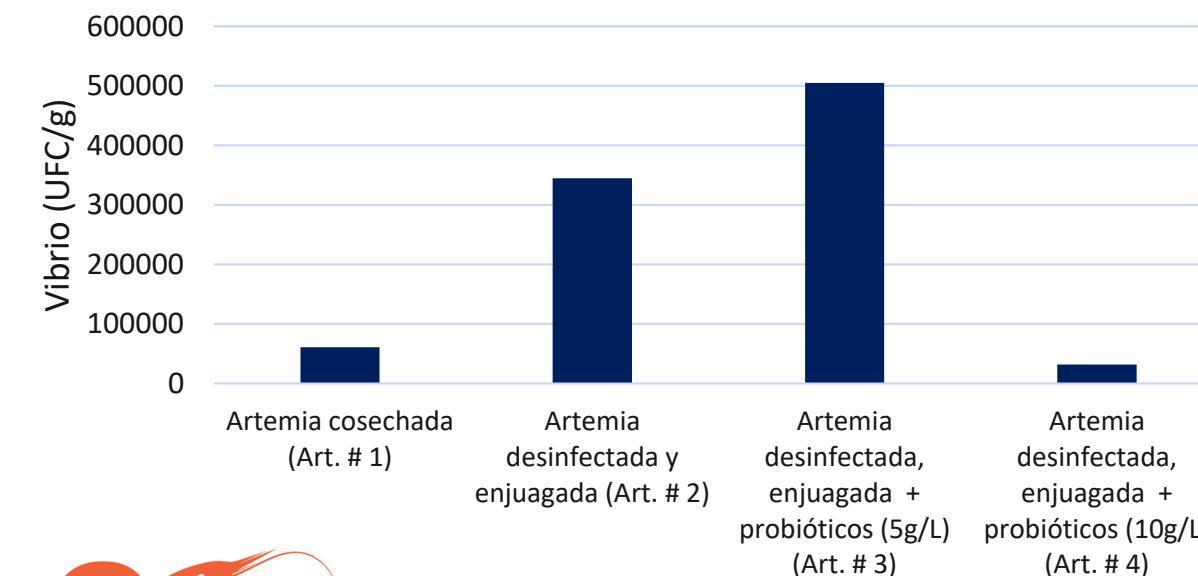
Culture Media		ARTEMIA			
		Artemia cosechada (Art. # 1)	Artemia desinfectada y enjuagada (Art. # 2)	Artemia desinfectada, enjuagada + probióticos (5g G2/L) (Art. # 3)	Artemia desinfectada, enjuagada + probióticos (10g G2/L) (Art. # 4)
TSA		3.33E+05	7.73E+06	4.73E+07	1.22E+08
TCBS	Amarillo	2.33E+04	1.24E+05	8.60E+04	6.00E+03
	Verde	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	TOTAL	2.33E+04	1.24E+05	8.60E+04	6.00E+03
CHROM VIBRIO	Verde Azul	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Azul	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Turquesa	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Púrpura	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	TOTAL	6.07E+04	3.45E+05	5.05E+05	3.17E+04
CETRIMIDE		2.73E+03	1.02E+04	1.27E+04	1.23E+03
CHROM BACILLUS	Turquesa	0.00E+00	0.00E+00	1.90E+05	7.93E+05
	Blanca	1.57E+06	5.29E+06	6.30E+06	5.03E+05
	TOTAL	1.57E+06	5.29E+06	6.49E+06	1.30E+06
SABOURAUD		0.00E+00	1.00E+04	1.64E+07	3.32E+07

O tratamento com pasta de camarão em salmoura com consórcios probióticos reduziu a carga de Vibrio em 2 a 1 Log, de acordo com as contagens de ufc e por g em diferentes meios de cultura. A carga de consórcios probióticos benéficos é apreciada em comparação com o tratamento sem a aplicação de probióticos à pasta de artemia. Os dados obtidos a partir das cargas bacterianas correspondem à artemia concentrada em pasta antes da alimentação das larvas.

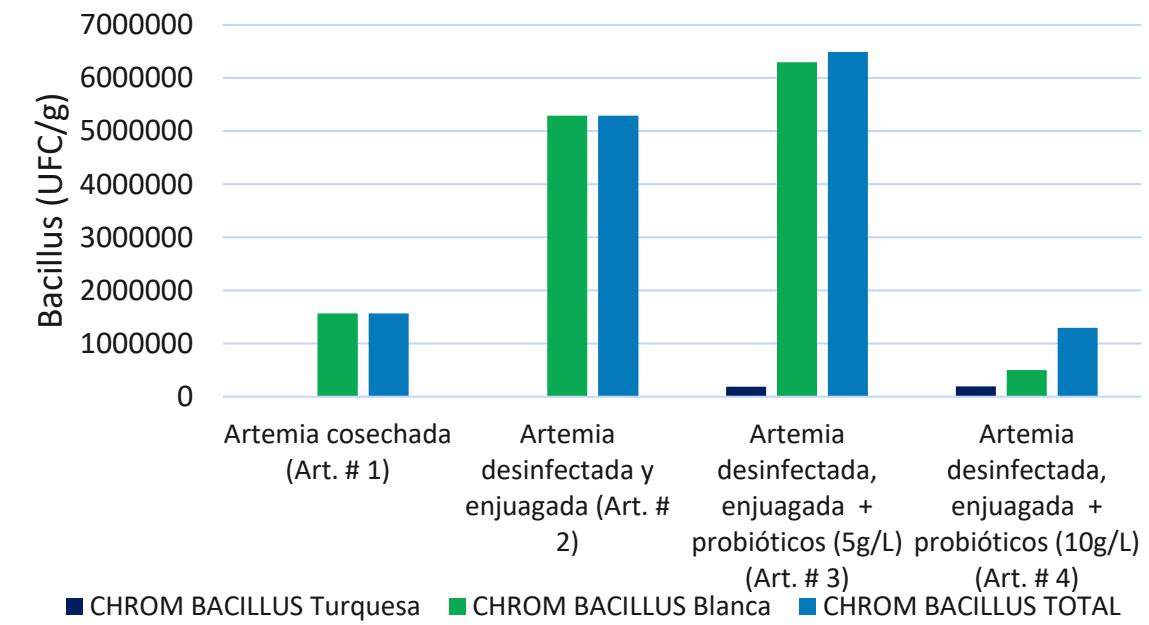


Resultados do teste microbiológico em náuplios de artemia às 24 horas

Vibrios totals en pasta de artemia con y sim Epicin G2
(CHROM Vibrio)

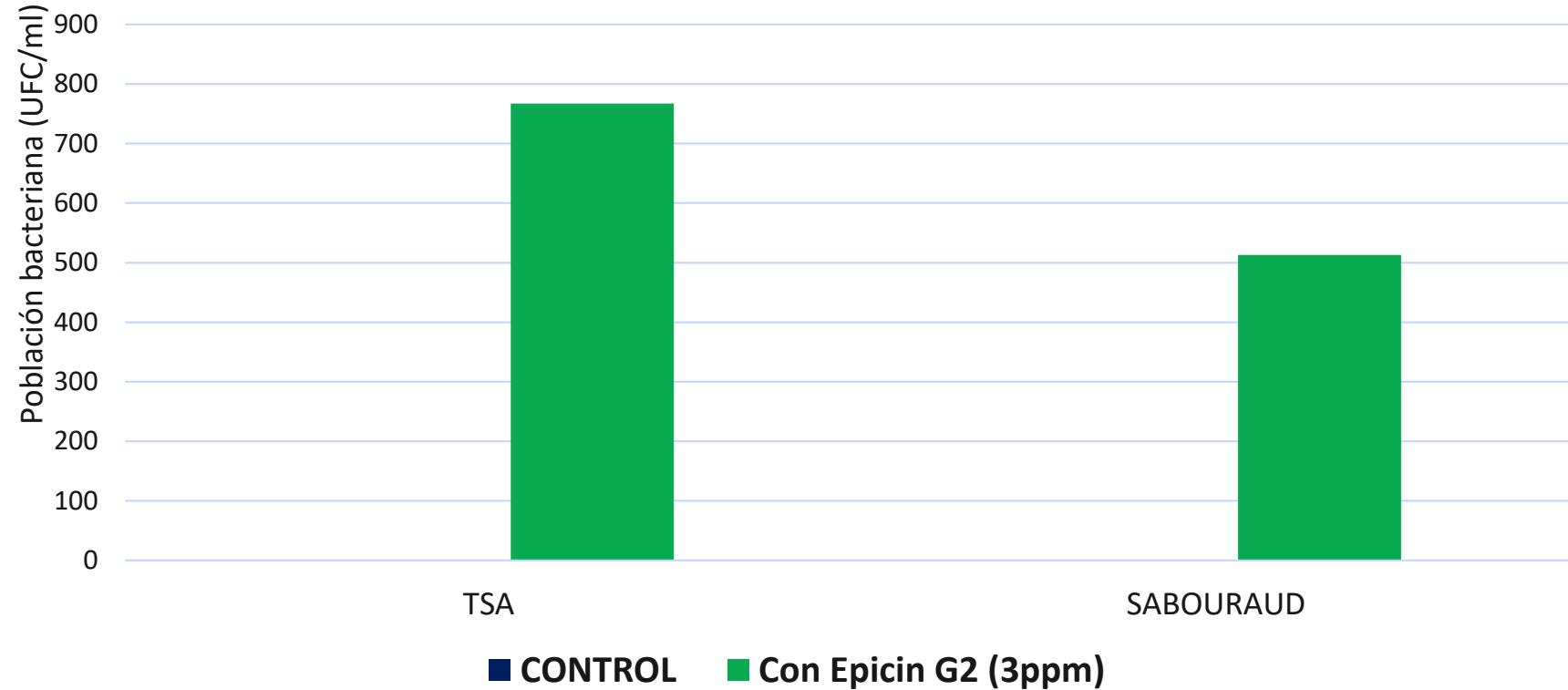


Bacillus totals en pasta de artemia con y sim Epicin G2 (CHROME Bacillus)

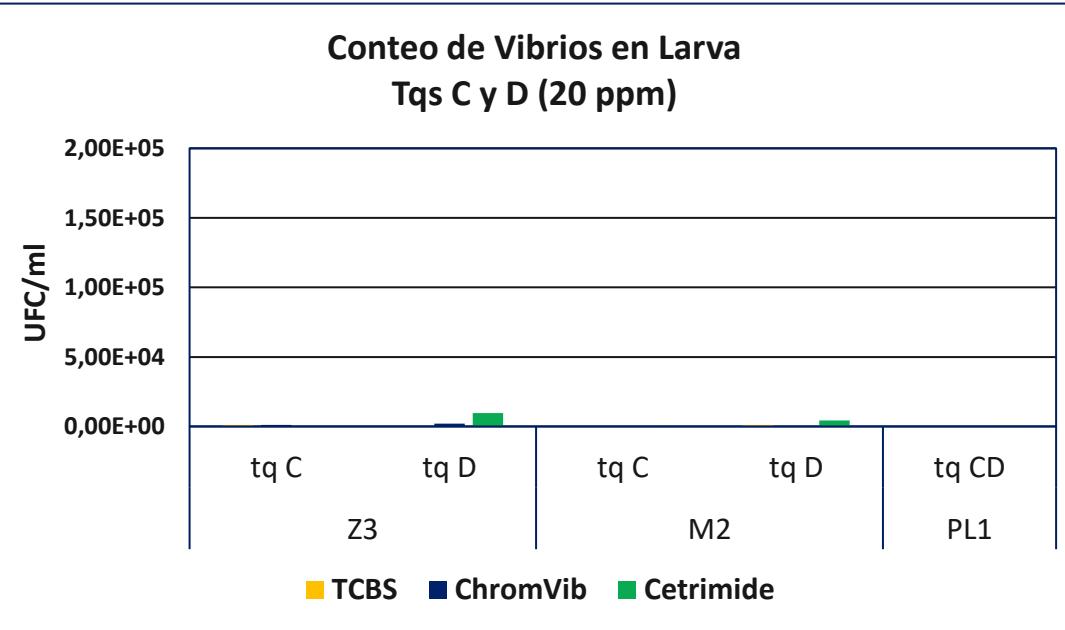
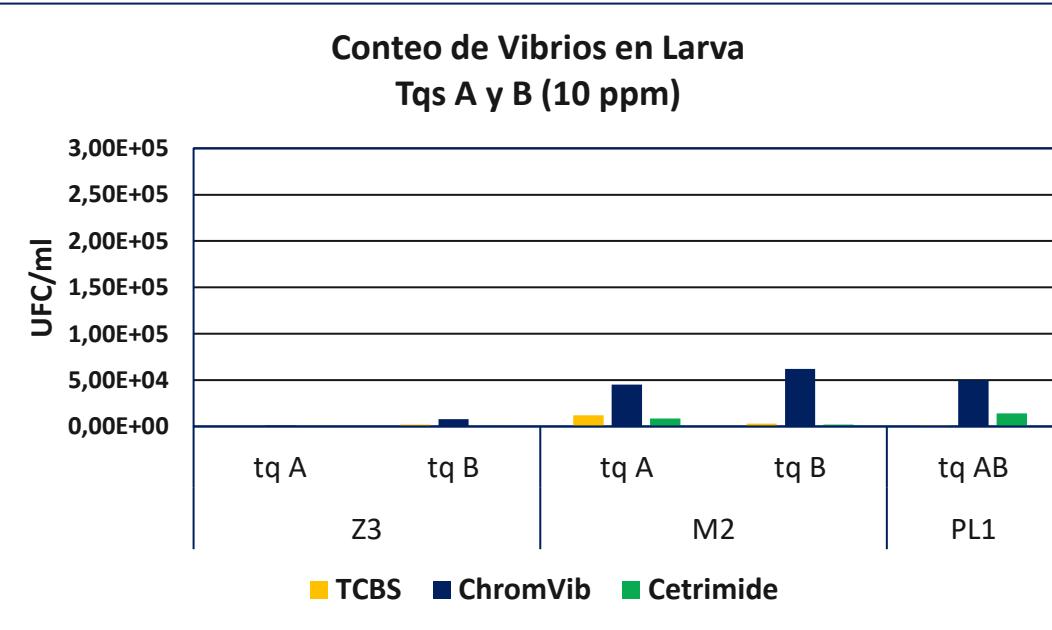
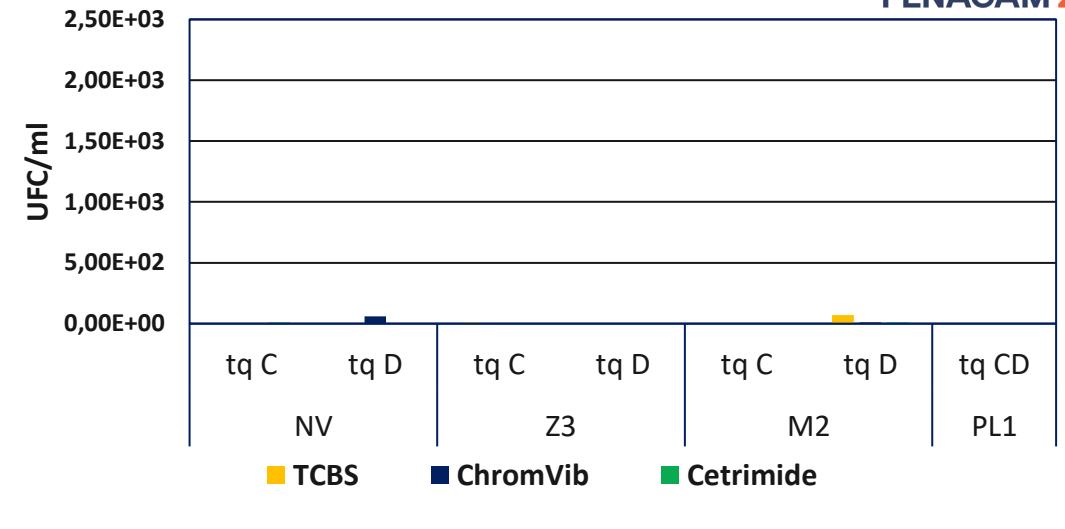
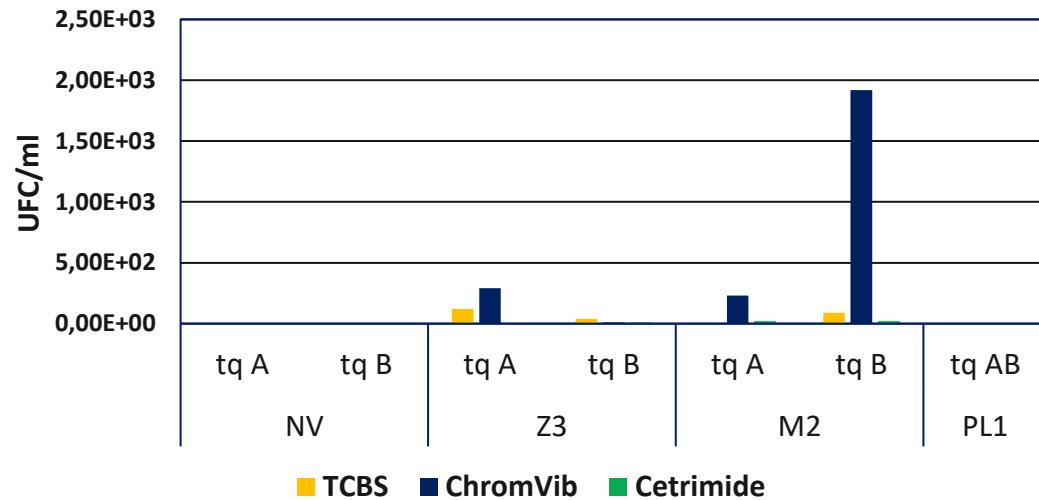


Resultados de testes microbiológicos em náuplios de microalgas em 24 horas

Probióticos em cultivo maciço de algas com y sim Epicin G2



Experiencia em uma larvicultura de Mar Bravo



Conclusões.

- O desenvolvimento de técnicas transcriptômicas como a Metagenômica está permitindo que a indústria aquícola estabeleça protocolos operacionais na aplicação de aditivos funcionais que melhoram a saúde animal.
- A incorporação de aditivos funcionais em rações balanceadas oferecem benefícios à produção aquícola.
- A incorporação de consórcios probióticos em alimentos vivos como microalgas e náuplios de artemia ajudará a manter um melhor equilíbrio bacteriano que estimula a eubiose no trato digestivo de larvas e pós-larvas de camarão.





Enquanto minha
mãe acreditava
que eu estava
estudando.



THE FUTURE OF AQUACULTURE IS IN BIOTECHNOLOGY
The Science of Survival

Obrigado Fenacam 24

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