



Loc Tran

Loc is founder and director of ShrimpVet Laboratory in Vietnam. He leads a team of more than 70 researchers in shrimp health management, focusing on genetics, breeding and seed production, diagnostics and disease management, and farming technologies. He has a Ph.D. in aquaculture pathology from the University of Arizona, where he studied under renowned aquaculture pathologist Don Lightner.

FOUNDER & DIRECTOR
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Science in Shrimp Farming and Recent Innovations in Hatchery and Production Systems in Vietnam

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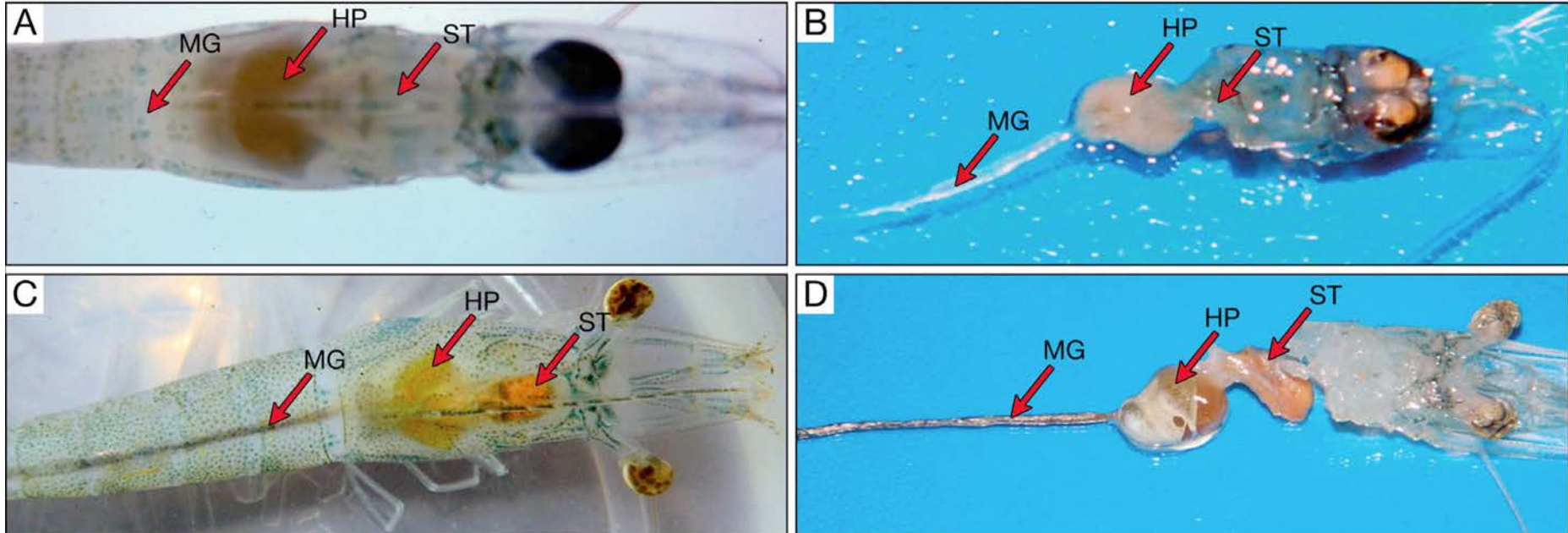


Some Recent Updates

- Asian shrimp production in 2017-2018:
 - Increasing; prices plunged (second quarter).
- Major challenges:
 - EMS/AHPND, WSSV, EHP, White Feces Disease, SHIV?
 - Antibiotics residue.



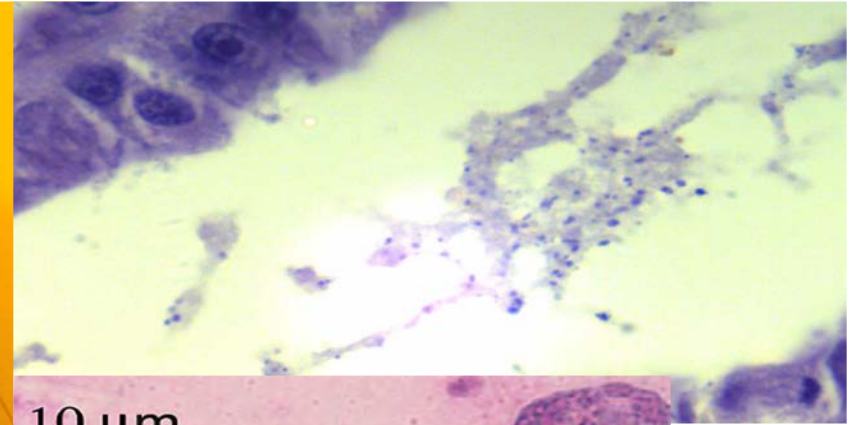
Back to the Old School EMS/AHPND



Gross signs of EMS/AHPND affected *Penaeus vannamei*.

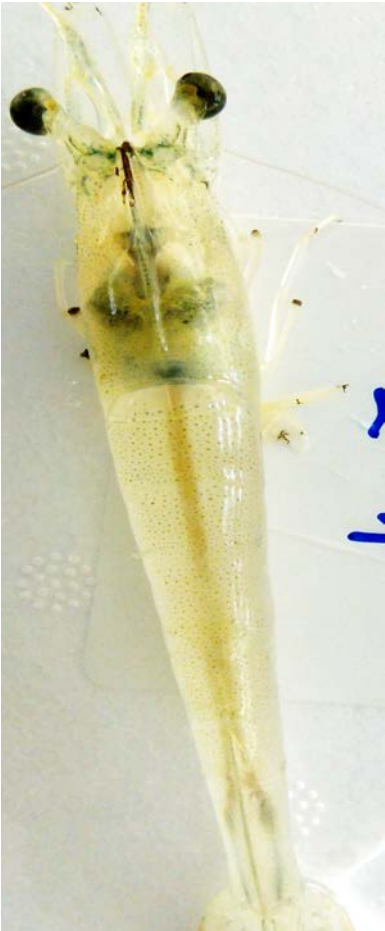
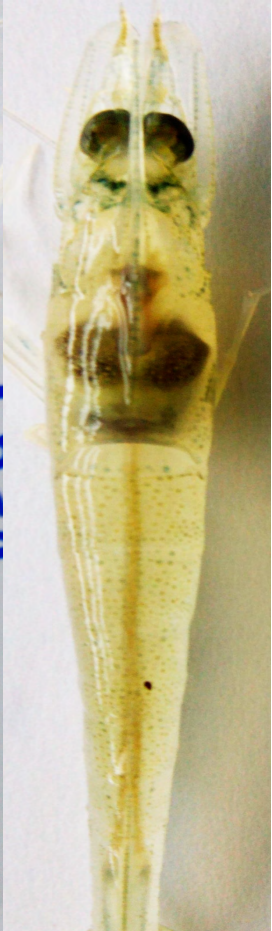
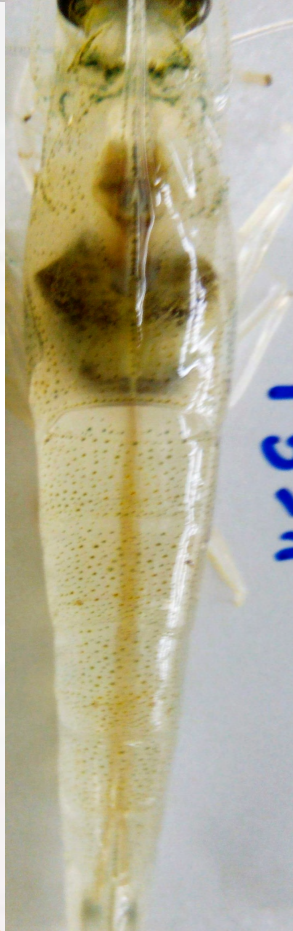
- ✓ A and B display a pale, atrophied hepatopancreas (HP), and an empty stomach (ST) and midgut (MG).
- ✓ C and D show a normal size HP with dark orange color, and a full stomach and midgut.

Enterocytozoon hepatopenaei

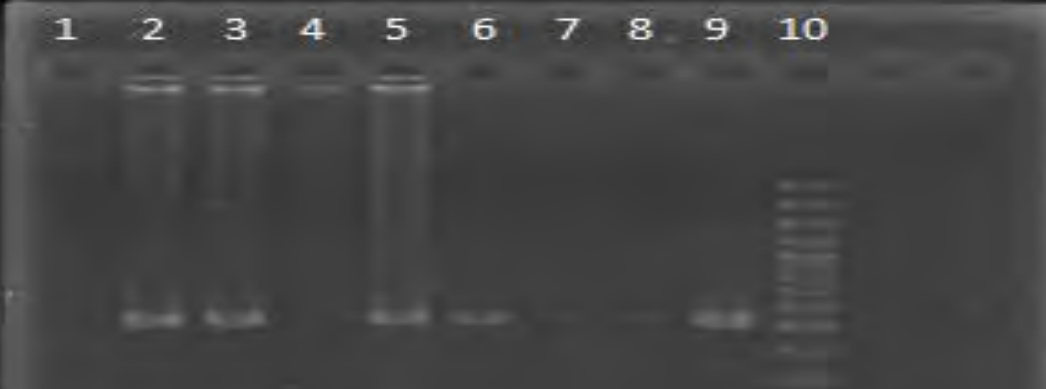




**SPF SHRIMP
(Control)**

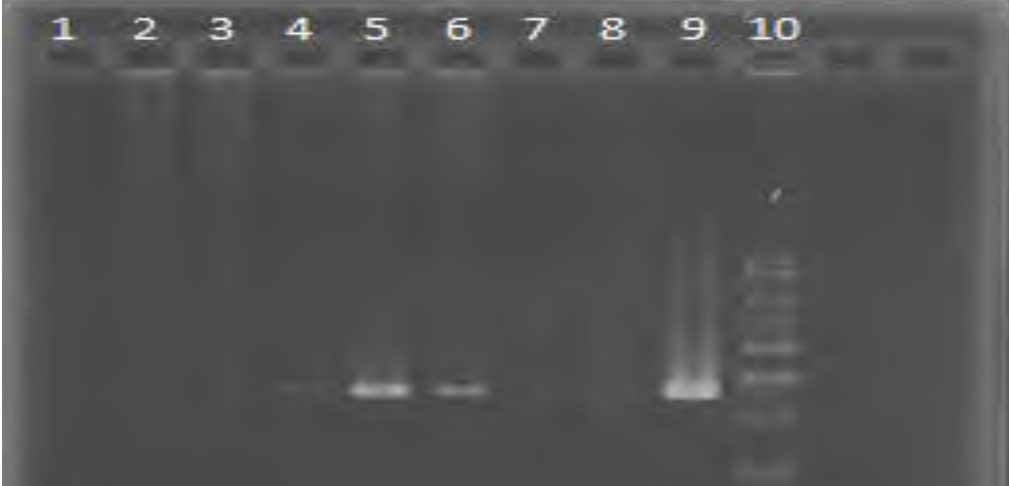


**WFD-INFECTED SHRIMP
(LABORATORY CHALLENGED)**



WELL	SAMPLE NAME	<i>Enterocytozoon hepatopenaei</i>	MOTE
1	NEGATIVE CONTROL	-	
2	GROW OUT SHRIMP	+	
3	GROW OUT SHRIMP	+	
4	PL ₅ (Shrimp)	-	
5	PL ₉ (Shrimp)	+	
6	BROOD STOCK FECES	+	
7	BROOD STOCK FECES	+	
8	BROOD STOCK FECES	+	
9	POSITIVE CONTROL	+	<i>DNA</i> <i>Enterocytozoon hepatopenaei</i>
10	LADDER		100bp

1 2 3 4 5 6 7 8 9 10



WELL	SAMPLE	<i>Enterocytozoon hepatopenaei</i>	NOTE
1	NEGATIVE CONTROL	-	
2	BLOOD WORM 1	+	
3	BLOOD WORM 2	-	
4	OYSTER	+	
5	SQUID	+	
6	BROOD STOCK MATURATION	+	
7	BROOD STOCK AT QUARANTINE	-	
8	GROW OUT SHRIMP	+	
9	POSITIVE CONTROL	+	<i>DNA</i> <i>Enterocytozoon hepatopenaei</i>
10	LADDER		150bp

Horizontal Transmission

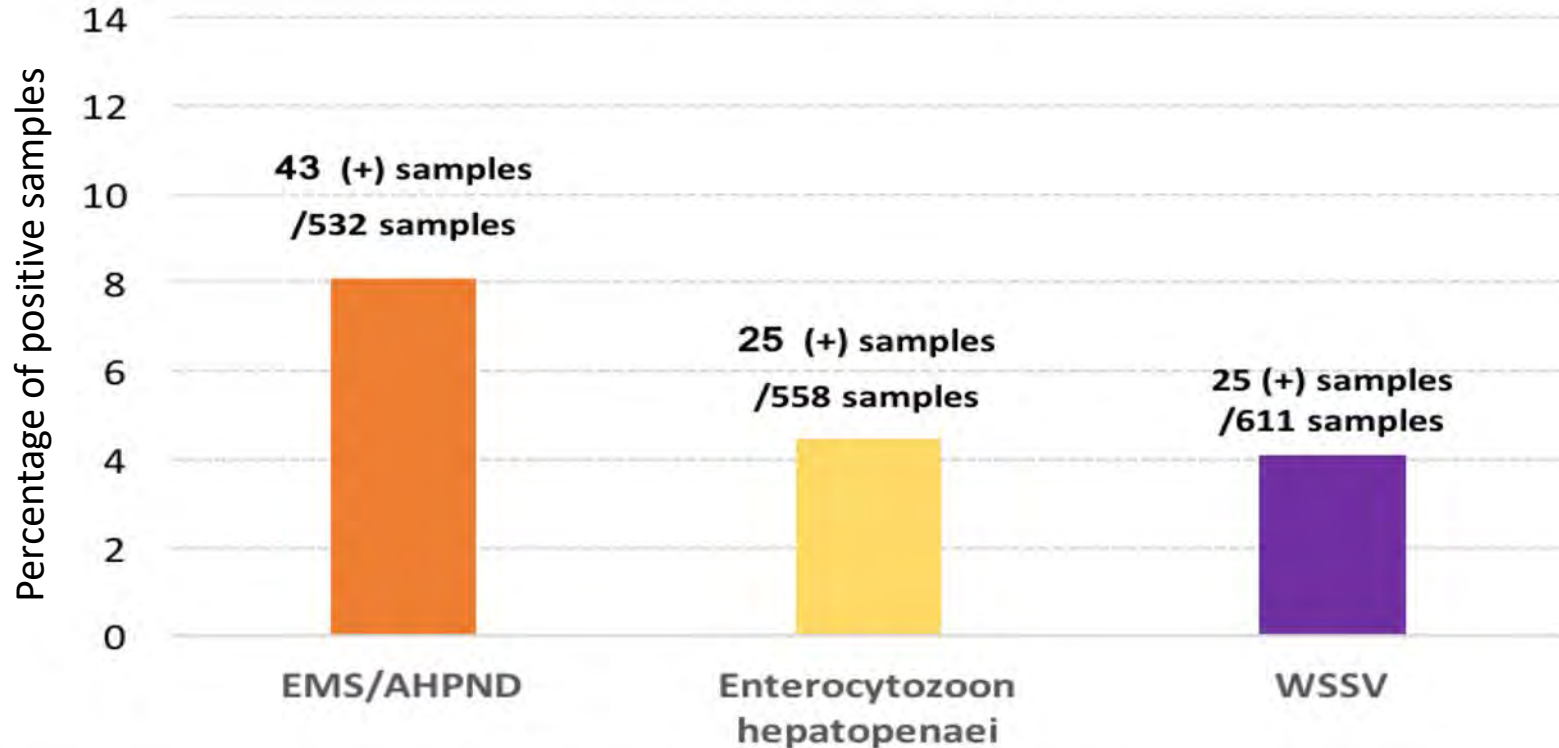


- Negative control (SPF shrimp) after 45 DOC)
- EHP-challenged shrimp after 45 DOC)



Warning?

PCR results in Q1 - 2018



Good PLs (*Penaeus vannamei*)?

1. Have to be clean of OIE-listed diseases (usually not an issue).
2. Have to be clean of EMS/AHPND and EHP (**most important**).
3. Antibiotics-free hatchery protocol.
4. Size variation ($CV < 12\%$).
5. ADG: minimum at 0.3 g/day to reach breakeven point.



What Can We Do About It?

Transmission from hatcheries:

1. Better biosecurity.
2. Check all inputs and outputs (broodstock, fresh feed, nauplii, water, and PLs).
3. Diseases of concern: EMS/AHPND, EHP, WSSV.



How to Control EMS/AHPND and EHP in Hatcheries?



- ⇒ PCR screening (enriched fresh samples): broodstock feces, live feeds, nauplii, PLs).
- ⇒ Freezing live feeds before feeding - alternatives for live feeds are desperately needed.
- ⇒ Impossible to keep the hatchery sterile - need to use probiotics to out compete Vibrios.
- ⇒ Biosecurity and microbiota balance in larval rearing are the two keys to keep PLs clean.

How to Achieve a Healthy “Microbiota Balance”

LOG Density of Total Vibrio



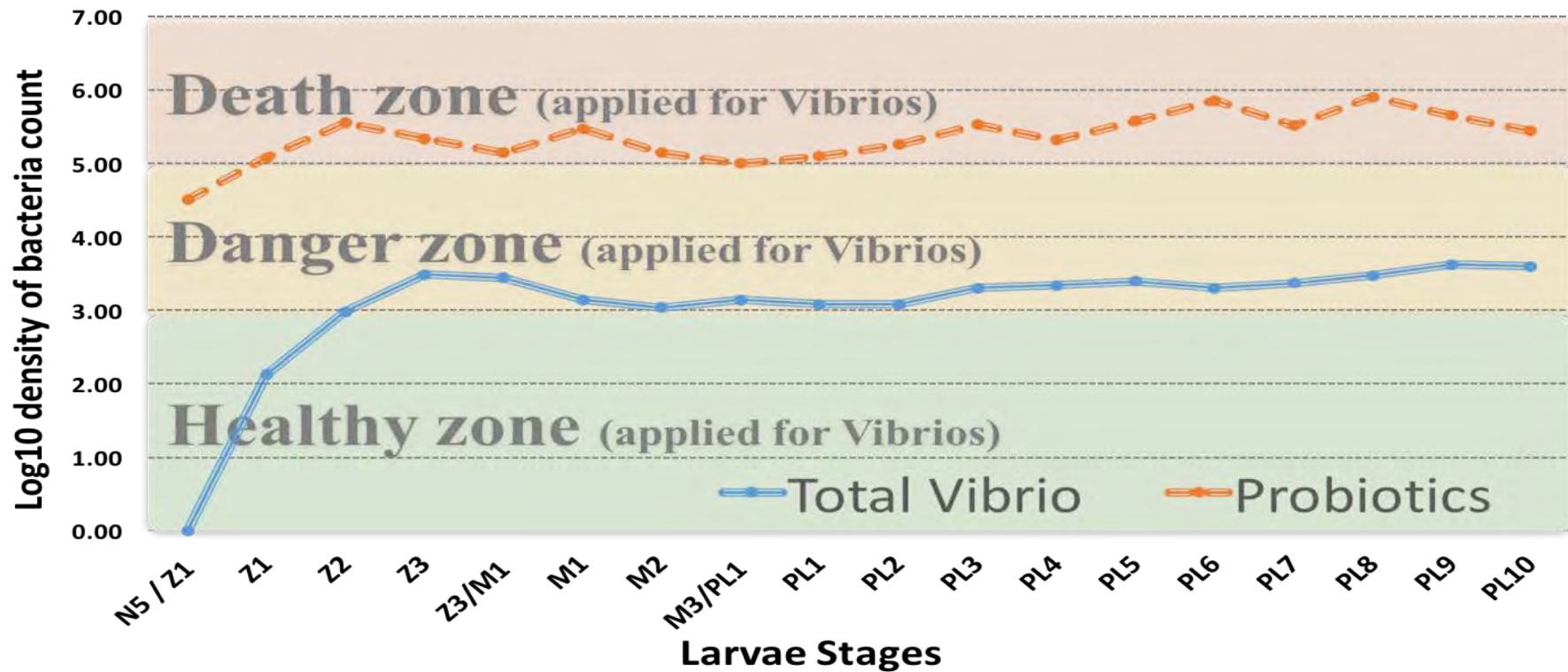
Figure 3. Typical pattern of Total Vibrio bacteria growth in larval tanks within shrimp hatcheries.

Some Facts About Bioremediation / Probiotics vs. Vibrio



How to Fix This?

Treatment tanks (using probiotics)



How to Manage EMS/AHPND and WFD at the Farm Level



1. Clean PLs (checked for EMS/AHPND, EHP, WSSV).
2. Clean pond – Clean water – Clean PLs.
3. Go back to the concept of “Microbiota Balance.”
4. Waste management: siphoning, probiotics, RAS, bioflocs, etc.
5. Probiotics consistently in feed and in water.
6. Nursery.
7. Functional diets.



Nursery



- 1000 – 5000 PLs/m³.
- 20-30 days.
- Harvest at 0.8-1.2 grams.
- Reduce risks (shorten the culture period), reduce cost.
- Faster rotation of the shrimp ponds.

Facts and Solutions



- The Bad: obligate pathogens - The Good: probiotics - The Ugly: opportunistic.
- The Bad/Ugly proliferate a lot faster than the Good.
- The Bad USUALLY WINS in 1 vs. 1 combat vs. the Good.
- Probiotics/Bioremediation is **never** the remedy for bacterial diseases, but it is a powerful **tool!**
- How to provide some advantages to the Good?
- => Give the Good a jump start (10^{4-5} CFU/mL inoculation), daily application (at 10^{4-5} CFU/mL) continuously. This has to be done BEFORE STOCKING.
- => No providing the Bad/Ugly with what they need (nutrient, inoculation, etc.).
- => Rule of Thumb: always have the Good at a proportion of at least **100/1** to the Ugly/Bad. If not, correct it.

See anything wrong?



Fermentation of Feed Ingredients?



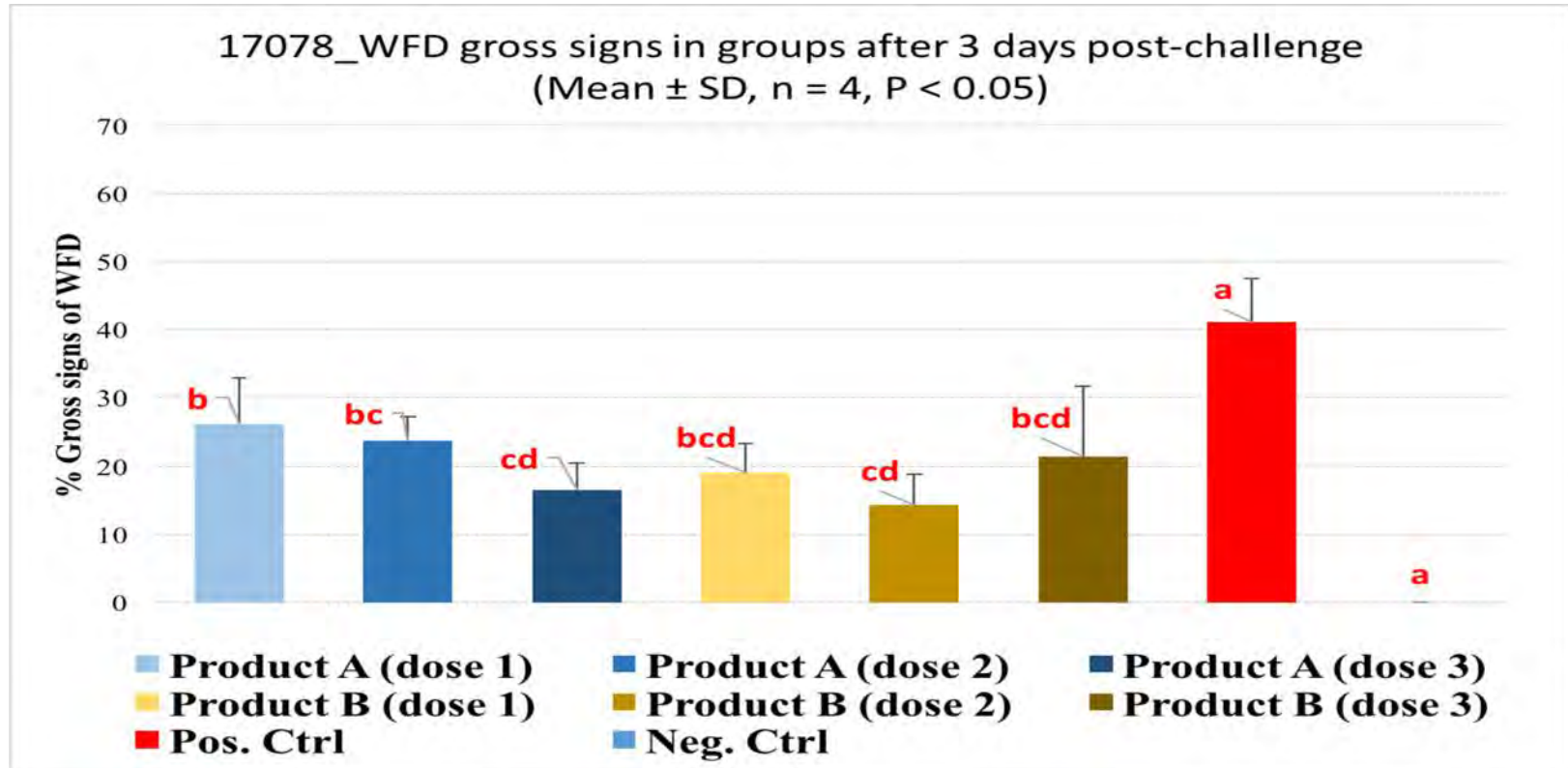
Feeding shrimp with fermented corn/soybean?

- Disrupt nutrients needed for *Vibrio*.
- “Flush out” *Vibriosis* in the shrimp gut.
- Provide an abundance of probiotics community.

Functional Diets?

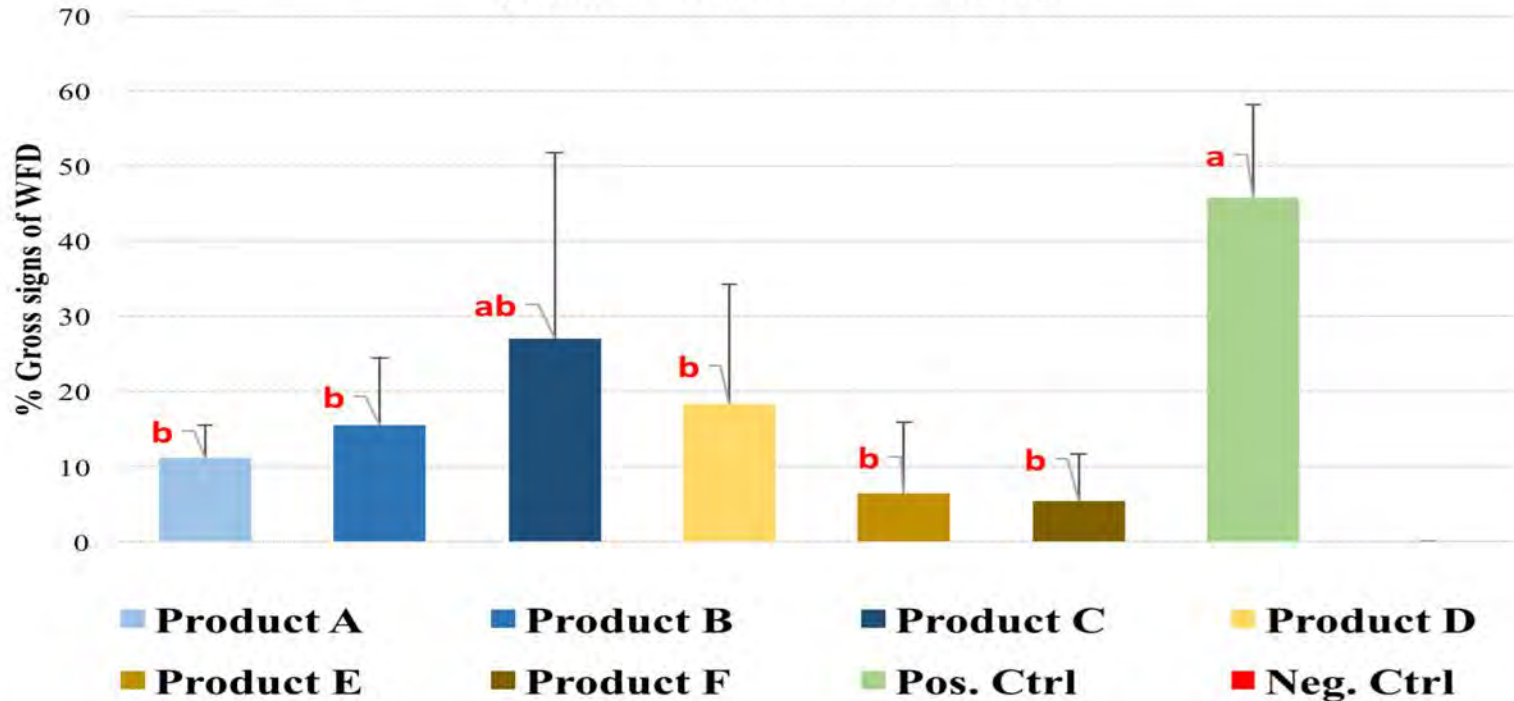


How to Translate Lab Trial to Pond Trial



Functional Diets?

17097_WFD gross signs in groups after 3 days post-challenge
(Mean $\pm$ SD, n = 4, P < 0.05)

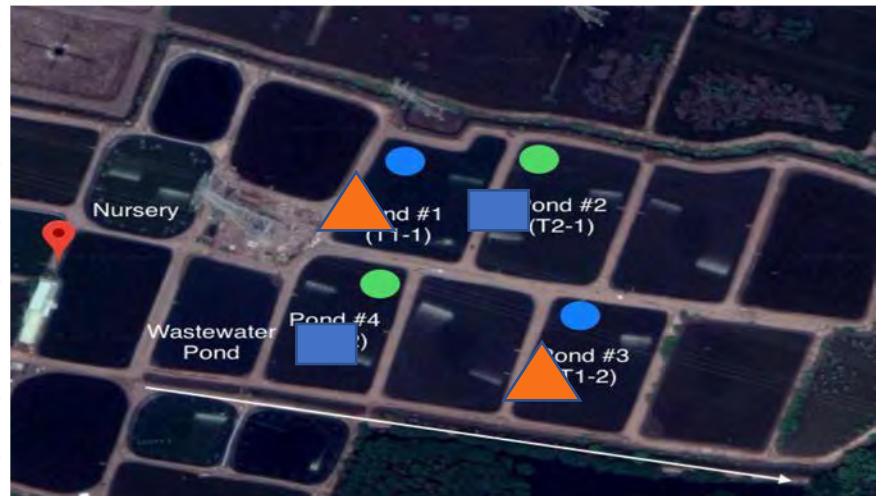


A Pond Trial with a Functional Diet



- Location: Dong Nai, Vietnam.
- Duration: Dec-2017 – March-2018.
- DOC: 100 -- 70 days of grow out, plus 30 days of nursery.

Treatment	Control (T1)		Treatment (T2)	
Pond designation	Pond#1 (T1-1)	Pond#3 (T1-2)	Pond#2 (T2-1)	Pond#4 (T2-2)
Area (m ²)	2350	2380	2420	2180
Feed	Control		Functional diet	
Administration method	-		Incorporated in feed ingredients	
No. shrimp stocked	117,500	119,000	121,000	109,000
Density (pcs/m ²)	50	50	50	50



Disease Diagnostics Using Routine Histology and PCR Methods



Week			1		2		3		4	
Ctrl.	T1-1	HIS	WFD (G1-3)	WFD (G1)	-		WFD (G1)		WFD (G1-3)	
		PCR	-		-		-		EMS	
Ctrl.	T1-2	HIS	WFD (G1-3)	WFD (G1-3)	-		WFD (G1)		EMS (G3)	WFD (G1-4)
		PCR	-		-		-		-	
Treatment	T2-1	HIS	WFD (G1-3)	WFD (G1)	WFD (G1)		WFD (G1-2)		WFD (G1-2)	
		PCR	-		-		-		-	
Treatment	T2-2	HIS	WFD (G1-3)	WFD (G1-2)	EMS (G1-3)	WFD (G1)	EMS (G1)	WFD (G1-2)	EMS (G1-2)	WFD (G1)
		PCR	-		-		-		EMS	

Disease Diagnostics Using Routine Histology and PCR Methods



Week			5		6		7			8		
Ctrl.	T1-1	HIS	EMS (G2)	WFD (G1)	EMS (G1-4)	WFD (G2)	EMS (G1-3)	WFD (G3)	EHP (G1)	EMS (G1-3)	WFD (G1-4)	EHP (G1)
		PCR	EHP		-		EHP			-		
Ctrl.	T1-2	HIS	WFD (G1-2)		WFD (G2-3)		EMS (G1-2)	WFD (G1-2)		EMS (G1-3)	WFD (G1-2)	
		PCR	-		-		EHP			EMS	EHP	
Treatment	T2-1	HIS	-		WFD (G1-3)		WFD (G1)			WFD (G2-3)		
		PCR	-		-		-			-		
Treatment	T2-2	HIS	EMS (G1)	WFD (G1-2)	EMS (G1)	WFD (G2-3)	EMS (G2)	WFD (G2)		EMS (G1)	WFD (G1-3)	
		PCR	-		EMS		-			-		

Growth Performance, FCR and Survival in Ponds



Parameters	Ctrl. T1-1 (Pond 1)	Ctrl. T1-2 (Pond 3)	T 2-1 (Pond 2)	T2-1 (Pond 4)
Initial weight (g)	1.14 ± 0.03a	1.14 ± 0.03a	1.14 ± 0.03a	1.14 ± 0.03a
Final weight (g)	17.30 ± 2.95	18.63 ± 3.21	23.77 ± 2.85	19.32 ± 3.85
Weight gain (g)	16.10 ^c	16.72 ^c	22.12 ^a	18.86 ^b
ADG (g/day)	0.22	0.24	0.31	0.25
Survival rate	75.30%	86.85%	96.44%	78.03%
FCR	1.60	1.38	1.20	1.40

Take Home Messages



- ⇒ Biosecurity is a **MUST**.
- ⇒ Keeping a healthy microbiota balance is a **MUST**.
- ⇒ Probiotics/bioremediation is a **TOOL** - Probiotics need a **jump start**.
- ⇒ **Functional diets** have big potential.
- ⇒ **Antibiotics-free** hatchery and growout protocol are both achievable.
- ⇒ Make shrimp farming more science-based, more predictable, simple, and more **cost effective**.

A photograph of two men standing by a body of water, likely a shrimp pond. The man on the left is wearing a light blue shirt over a grey V-neck sweater and is smiling. The man on the right is wearing a red polo shirt, a red baseball cap, and is also smiling while holding two shrimps. One shrimp is held in his right hand, and the other is held in his left hand, which is extended towards the camera. The background shows a body of water with some structures, trees, and a power line tower under a blue sky with clouds.

Thank you!

BAD GUYS COME TOGETHER