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# Practical Strategies for Successful Harvests in Areas Plagued by WSSV and Other Pathogens

# What Is WHITE SPOT DISEASE?



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## What Is WHITE SPOT DISEASE?

- a viral infection of panaeid shrimp.
- is the lone virus of the genus *Whispovirus*, which is the only genus in the family *Nimaviridae*.
- In terms of virulence, one major WSSV strain appears to have caused the global pandemic.
- List of known hosts for WSSV has 104 species (all are decapods, except artemia)

Vlak - 6/4/2007 - Nimaviridae

### FAMILY NIMAVIRIDAE

#### TAXONOMIC STRUCTURE OF THE FAMILY

Family Nimaviridae  
Genus *Whispovirus*

Since only one genus is currently recognized, the family description corresponds to the genus description

### GENUS WHISPOVIRUS

Type Species *White spot syndrome virus*

#### VIRION PROPERTIES

##### MORPHOLOGY

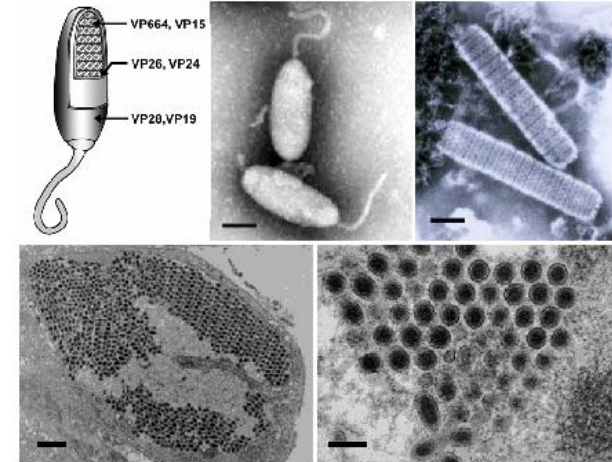


Figure 1: (Top) Morphology of virions of *White spot syndrome virus* (WSSV). (Left) Schematic illustration of the structure of a typical whispovirus virion. (Top center and right). Negative contrast electron micrographs of WSSV virions (center, courtesy of Marielle van Hulsten) and nucleocapsids (right, courtesy of Don Lighter) from hemolymph of infected *Penaeus monodon* shrimp. The bars represent 100 nm. (Bottom left) Thin section of WSSV-infected stomach



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## White Spot Syndrome Virus, Its Many Names:

- HHNBV-hypodermal & hematopoietic necrosis aculovirus (China 1993-94).
- CBV -China baculovirus(China ~1994).
- SEMBV/ Red Disease -systemic ectodermal & mesodermal baculovirus(Thailand, India 1994) .
- PRDV / PAV -penaeidrod-shaped DNA virus / penaeidacute viremia (Japan 1995).
- WSBV -white spot baculovirus(Taiwan 1996).
- WSBV -white spot bacilliform virus (China 2001)
- WSV -white spot virus (OIE 2000).
- WSSV -white spot syndrome virus (Taiwan 1996).
- WSSV -accepted by ICTV as type species in *Nimaviridae* *whispovirus*(8thReport ICTV, 2005).



## HISTORY OF WSSV IN THE AMERICAS

- 1995: first seen in Texas in farmed juvenile *P. setiferus*.
- 1995-98: found in imported frozen shrimp in USA.
- 1997 & 98: found in wild penaeids in Texas & SC.
- 1996 & 97: found in freshwater crayfish at National Zoo.
- 1997 & 98: in SC farm cumulative mortalities >99% in *P. stylirostris* & *P. vannamei*.
- January 1999: found in wild & farmed *P. vannamei* & *P. stylirostris* in Central America w/ severe losses.
- June 1999: found in Ecuador w/ severe losses.
- December 1999: reached Mexico.
- **January 2005: confirmed in Brazil.**
- February 2007: detected in Louisiana crayfish farms.



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## Recent WSSV Outbreaks

- 2016: Australia- *P. Monodon*: Logan River, QLD
- 2010-2012: Mexico- *L. vannamei*: Sonora, Sinaloa, Nayarit.
- 2012: Brunei – *L. stylirostris*
- 2012: Madagascar – *P. monodon*
- 2011: Saudi Arabia – *Fe. indicus*
- 2011: Mozambique – *P. monodon*
- Other countries already WSSV infected:
  - A few with WSSV-free compartments
  - Most continue to manage around WSSV.



## White Spot Disease Clinical Signs

- Sudden reduction in feeding, lethargic.
- Red discoloration in *P. monodon*, *P. vannamei*, *P. stylirostris*.
- Soft, loose shells
- White spots 0.5 to 2 mm under cuticle (less common in Western Hemisphere penaeids)
- **Up to 100% mortality within 3 days of onset of disease signs.**



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## White Spot Disease Clinical Signs

By the time you recognize signs of WSSV it is too late to do anything except emergency harvest

**PREVENTION** is the ONLY feasible option



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All Diseases  
in Farmed Shrimp  
Share  
4 Common Traits



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What are they?



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- **High Organic Matter**
- **High *Vibrio* Concentration**
- **Low Dissolved Oxygen**
- **Mismanagement**



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Disease is a  
**CONSEQUENCE**  
of  
Poor Culture Conditions  
and  
Mismanagement



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Poor Culture Conditions  
**CAUSE** STRESS.

Stress Creates  
Opportunity for  
Infection



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The combination of stressful conditions and infection result in slow growth, dead animals and reduced profit.



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And  
DISEASE  
is  
EVERYWHERE

Why not reduce opportunity for infection?



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We can't eliminate disease  
but it is easy to improve  
conditions to survive  
disease challenges.

Some farmers are successful despite the  
presence of disease. What makes them  
different?



Knowing disease is everywhere doesn't it make sense to eliminate the 4 common traits of all disease?

- High Organic Matter
- High *Vibrio* Concentration
- Low Dissolved Oxygen
- Mismanagement



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High Organic Matter  
High *Vibrio* Concentration  
Low Dissolved Oxygen  
Mismanagement

Do tools exist to remedy these  
issues?



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# YES!

These issues are easy to resolve



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High quality probiotics,  
like TERMINATE,  
work to resolve all four  
of the common traits

- High Organic Matter
- High *Vibrio* Concentration
- Low Dissolved Oxygen
- Mismanagement



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# High Organic Matter



Managing accumulated organic matter is critical.

Organic matter contributes to problems like:

Hydrogen Sulfide

High Ammonia

High Nitrite

High Nitrate

High Biological Oxygen Demand



It is habitat for pathogens and *Vibrio* thrive in it.



Probiotics directly consume  
decaying organic material  
converting it to bacterial biomass  
creating a living filter and live  
feed for shrimp.



While consuming organic  
material the probiotic bacteria  
also  
competitively exclude  
pathogens  
including *Vibrio*

Managing pond bottoms and keeping organic matter to a minimum helps manage the other common traits associated with all disease.

I submit  
managing pond bottoms  
is the most important job  
of any farmer.

# High *Vibrio* Concentration

*Vibrio* are everywhere and many are beneficial.

A small handful cause the majority of disease in the world

High quality probiotics outcompete *vibrio* for space and nutrients.



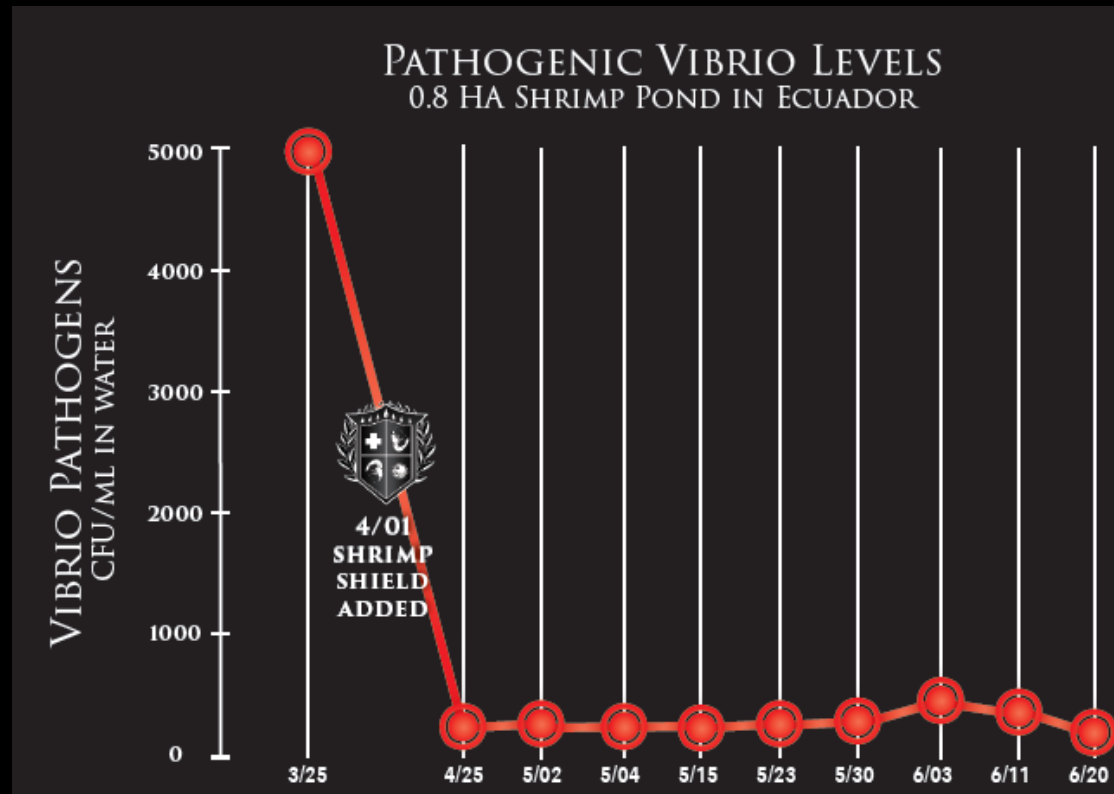
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# Using high quality probiotics as directed dramatically reduces Vibrio Concentrations

Which bacteria do you prefer to dominate your ponds and hatcheries?

Probiotic bacteria offer many benefits beyond competitive exclusion.





*Vibrio* grow fast and exploit any opportunity to infect shrimp worsening any disease.

WSSV has been detected in healthy animals without clinical symptoms or mortalities, indicating that infection by WSSV does not necessarily result in high mortality, and secondary infection by opportunistic pathogens, such as *Vibrio* spp., would expedite the onset of the disease.



By reducing *Vibrio* populations you reduce the impact of other disease agents like WSSV and EHP or White Feces Syndrome.



Using probiotics known to inhibit and suppress *Vibrio* dramatically improves production and yield



# Low Dissolved Oxygen

Managing accumulated organic matter is critical.

Organic matter contributes to problems like:

Hydrogen Sulfide

High Ammonia

High Nitrite

High Nitrate

High Biological Oxygen Demand

It is habitat for pathogens and *Vibrio* thrive in it.

What to do to

# Low Dissolved Oxygen

Get a good Dissolved Oxygen meter and use and maintain it  
Measure oxygen at multiple locations in ponds especially near the bottom where shrimp congregate.

Incorporating aeration equipment is highly recommended and a good investment especially as stocking densities increase.

Use high quality probiotics to reduce biological oxygen demand (BOD)



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**Probiotics reduce biological oxygen demand by consuming organic matter.**

**This frees available oxygen for use by shrimp.**

**Continued use of probiotics from year to year improves oxygen availability as the organic matter does not accumulate.**



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# Mismanagement

Mismanagement is a single word describing numerous problems that result in disease, mortality and poor harvests.

Typical symptoms of mismanagement are:

Poor water quality

High organic matter

High *Vibrio* concentration

Low Dissolved Oxygen



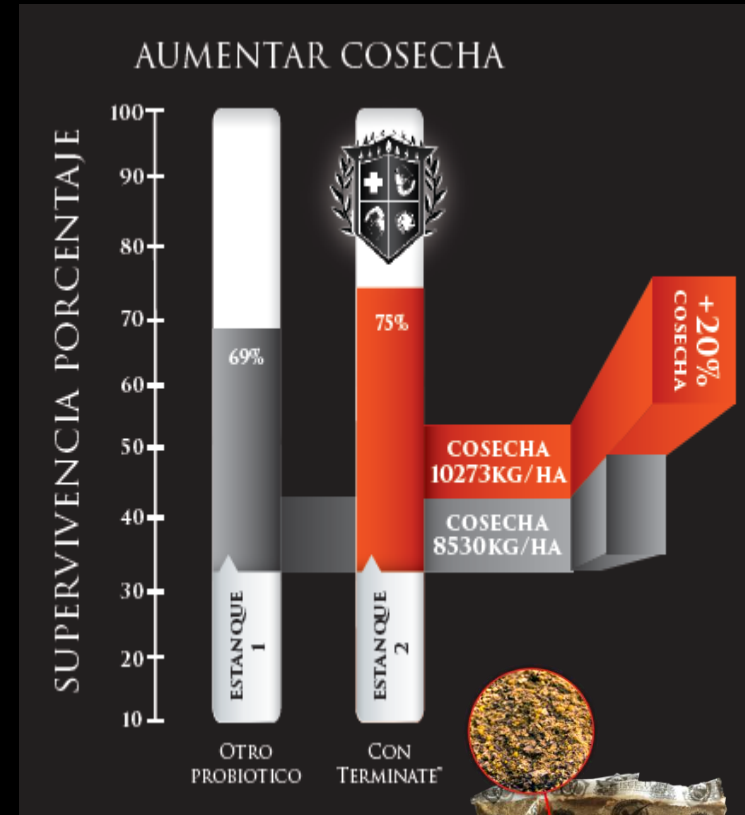
**When you use high quality  
probiotics you can resolve  
most symptoms of  
mismanagement.**



# Probiotics:

Probiotics are the easiest and likely least expensive tool to improve disease protection

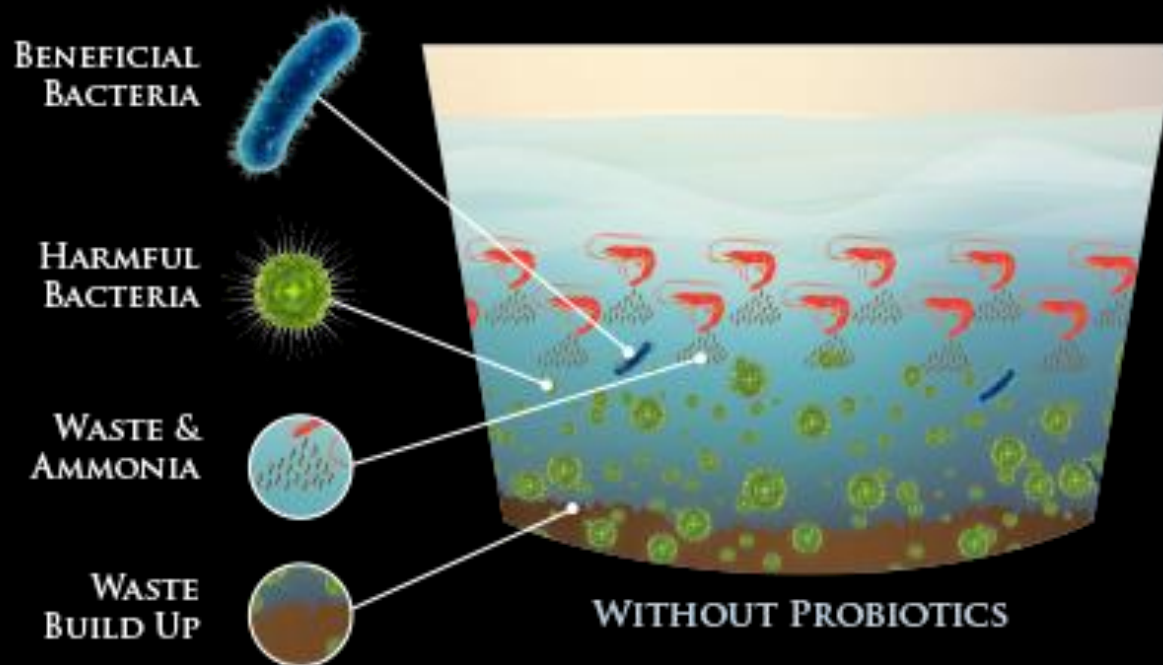
Additionally they improve growth rate, survival and yield resulting in higher profits.



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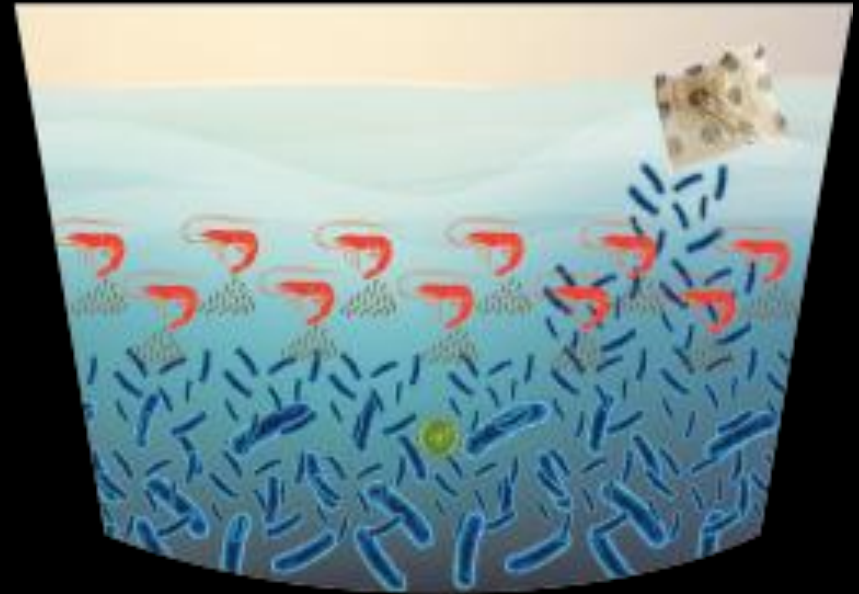
Without probiotics waste accumulates, water quality suffers, pathogens flourish & potential for disease increases.



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Probiotics consume waste & improve pond bottoms, consume ammonia & nitrite to improve water quality & outcompete pathogens to reduce stress and incidence of disease



WITH PROBIOTICS



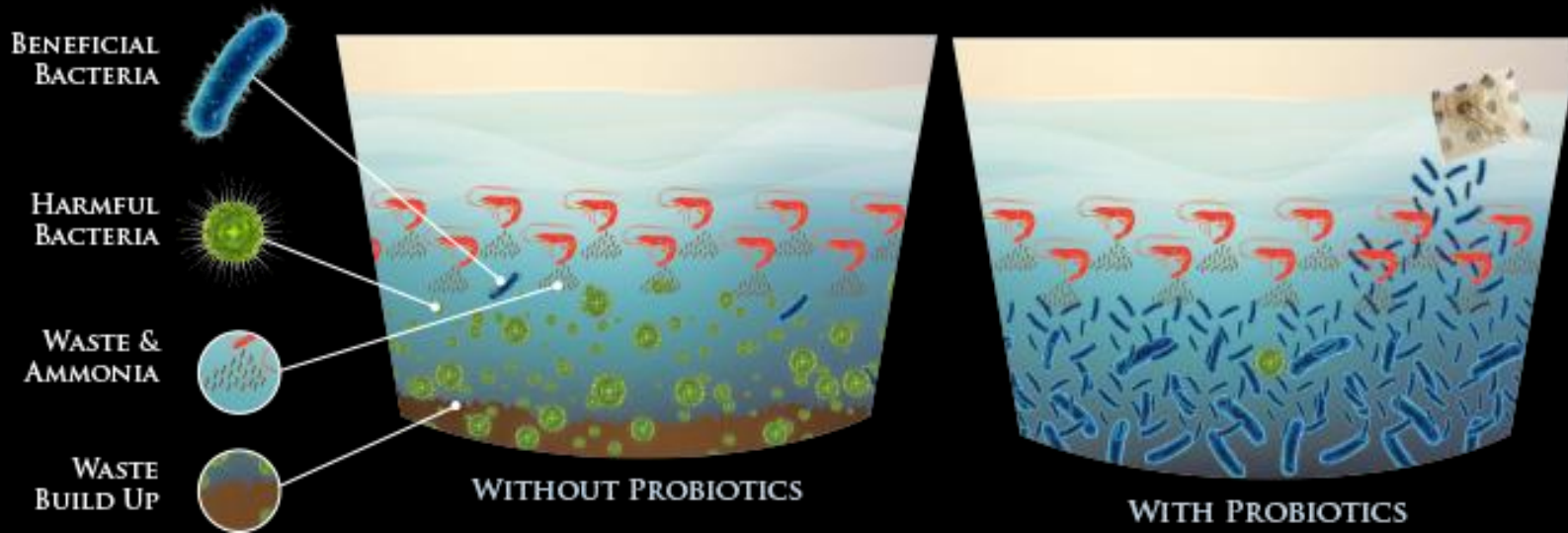
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Competitive exclusion of pathogens is a critical function of probiotics.

Probiotics dominate the microbiological community to reduce pathogenic bacteria.

The best shrimp farmers are great **bacteria farmers**.



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# Competitive Exclusion

VERY IMPORTANT TO UNDERSTAND

Use the law of competitive exclusion to your advantage.

Encourage good bacteria to dominate your water and reap the benefits.

Competitively exclude pathogens and watch your yields and profits grow.



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Why use Keeton Probiotics?

## Probiotics Decrease

- Ammonia
- Nitrites
- Nitrates
- Bottom sludge
- Animal stress
- Water exchange
- Pathogens & Disease
- Organic load
- Bad odors
- Feed costs
- Electrical costs
- Labor costs
- Use of antibiotics
- Environmental contamination



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Why use Keeton Probiotics?

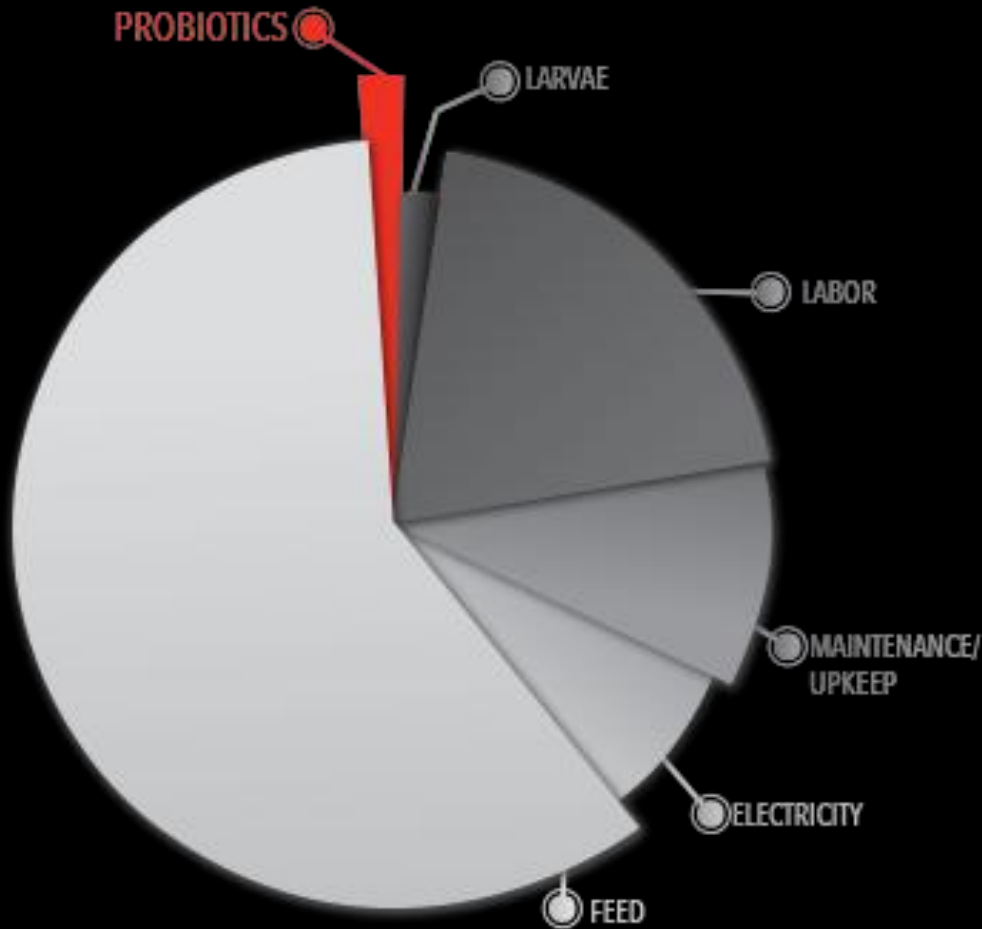
## Keeton Probiotics Increase

- Animal immunity
- Stress tolerance
- Disease resistance
- Growth rate
- Growth consistency
- Survival
- Dissolved oxygen
- Feed conversion rate
- Protein efficiency ratio
- Nutrient digestion
- Feed palatability
- Yield
- Profits



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Probiotics are a **minor expense** compared to other operating costs especially when compared to their return on investment



# Conclusion



Probiotics manufactured by Keeton Industries are the single most cost effective way to improve conditions to survive disease and improve production in areas plagued by diseases including WSSV.

# Thank You

Mike Moore

mike@keetonaqua.com

www.keetonaqua.com

+19705687754



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