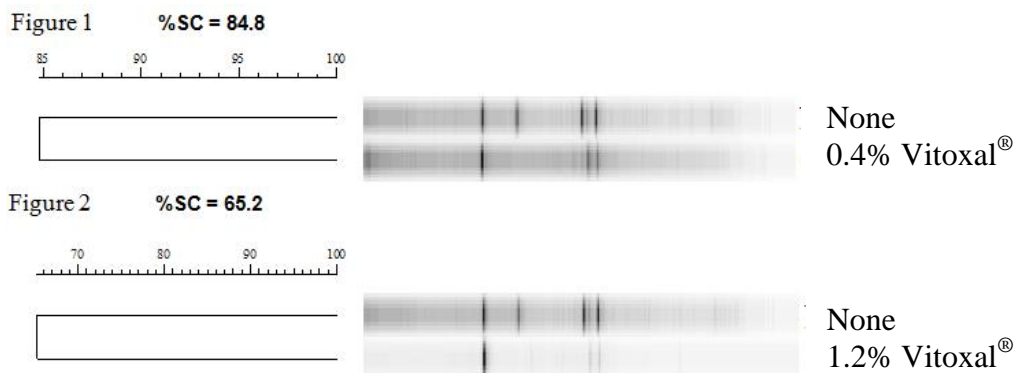


## VITOXAL® THE PREMIUM SHRIMP FEED ADDITIVE TECHNICAL DATA SUMMARY

### LABORATORY ANALYSIS:

The use of Vitoxal in laboratory studies to control pathogens in shrimp, carried out under the direction of Dr. Addison Lawrence at the Texas AgriLife Research Mariculture Laboratory, in Port Aransas, Texas, produced very positive results. It was hypothesized that Acidified Calcium Sulfate (Safe<sub>2</sub>O brand ACS 100®) blended with a neutral carrier and added to shrimp feed could be used as a source of acid (protons). The feed so treated when fed to shrimp would alter the pH of the shrimp gut, making it more acidic. Such conditions are in general not conducive to the replication of a subset of the microbiota, i.e., gram-negative bacteria, leading to significantly less gram negative bacteria, such as *Vibrio spp.* and *Pseudomonas spp.*, resulting in healthier more viable shrimp.



As shown in Figures 1-2, addition of Vitoxal to shrimp feed at concentrations of 0.4 and 1.2% produced a concentration dependent change in the microbial of the shrimp gut bringing about changes in the 16S ribosomal RNA gene fragment banding pattern. The pattern changes in relation to the control (labeled "None") and is concentration dependent. Vitoxal added at 0.4% had minimal effect on the microflora of the gut whereas addition of Vitoxal at 1.2% selectively alters the population of bacteria now dominated in the microbiota. All of these changes resulted in no adverse effects on survivability or shrimp growth.

### CHEMISTRY:

Vitoxal® is a blend of sodium/calcium aluminosilicate mixed with Acidified Calcium Sulfate (Safe<sub>2</sub>O brand ACS 100®).

### VITOXAL MECHANISM OF ACTION:

Vitoxal's mechanism of action is multi-functional. First, Vitoxal decreases the pH in the shrimp gut, promoting a change in the structure and ion molecular exchange of the bacterial cell membranes with a selective effect on gram-negative bacteria. Secondly, it promotes eradication of intestinal parasites, as in the case of gregarines, trophozoites and NHP (*Necrotising hepatopancreatitis*) because it is an obligate intracellular parasite, i.e., it replicates inside the immune cells within the body cavity. Third, studies show the addition of Vitoxal's prebiotic can dramatically enhance the capacity of the shrimp immune system to attack and phagocytize pathogens.

- Vitoxal works by altering the gut flora and controlling pathogens in the shrimp, which allows the shrimp's immune system to keep/minimize itself from disease.
- This gut flora alteration creates an environment for a bacteria population shift to more favorable bacteria (gram-positive) --- promoting healthier shrimp.

### ADVANTAGES OF VITOXAL:

- Vitoxal is an alternative to antibiotics, probiotics, and other pH modifiers that are currently in the market. Vitoxal works immediately, continuously, and selectively on the microbiota that is present in the shrimp gut. Its mechanism of action is the acidification of the gastrointestinal tract which lowers the pH which has been shown to facilitate a change in cellular membrane structure of pathogens leading to microbial stasis and/or death. In addition, Vitoxal, added to shrimp feed has an anti-parasitic effect in that it suppresses gregarine trophozoite levels.
- Addition of Vitoxal to feed, even at levels up to 2%, has no toxic effect on the shrimp.
- Unlike probiotics, there is a direct measurable effect on the microbiota, and Vitoxal can be added at the feed mill at a point of good product mixing.
- Vitoxal is not thermolabile in the pelletizing process.
- Use of Vitoxal in feed eliminates the need for additions of probiotics and prebiotics to the feed at the farm.
- Vitoxal allows the consumed feed to better "disperse" which enables better availability of nutrients resulting in healthier growth with higher survivability throughout the grow-out cycle and therefore better harvest yield.
- Vitoxal is non-toxic, leaves no residue in the shrimp (as is the case with antibiotics), and has no adverse effects on the environment.
- Vitoxal will not affect the organic status of organic shrimp in the marketplace.



### **Packaging:**

Vitoxal is sold in 20 kg pails.

### **Directions for Use:**

Vitoxal should be added during the manufacturer of the shrimp feed when mixing action is good.

### **Dosage:**

Apply at the rate of 1.0 to 1.5% of feed (or 10 kg to 15 kg per metric ton of feed) and is recommended for use throughout the growth cycle.

### **Storage:**

Unopened, the product can be stored at ambient temperatures in a dry environment for a minimum of one (1) year.