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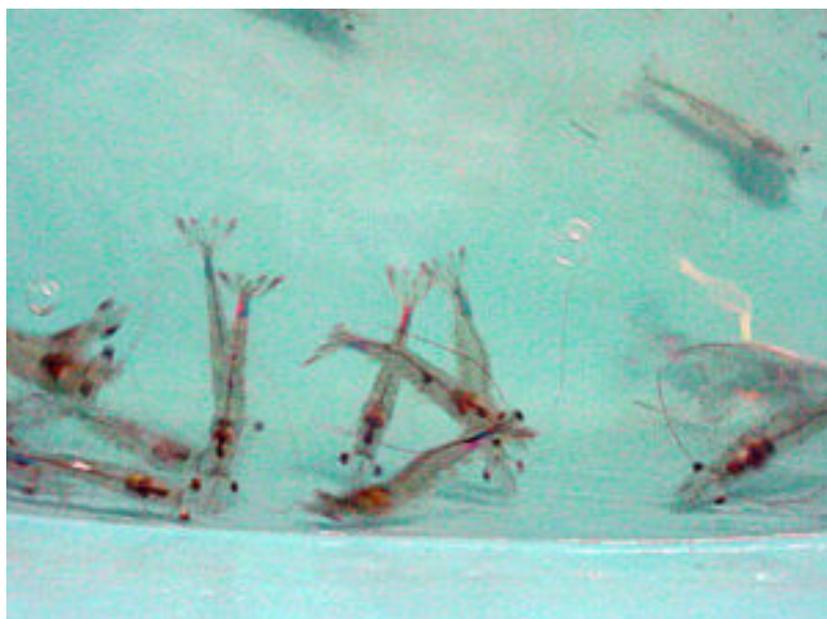
Health &amp; Welfare

# Study assesses fatty acid requirements, lipid levels of juvenile Pacific white shrimp

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## Experiment conducted at Texas A&M University



Experimental shrimp in an indoor recirculating water system.

Lipid levels for commercial shrimp feeds typically range 6 to 8 percent. It is recommended that they not exceed 10 percent because of decreased shrimp growth and increased mortalities, which are likely a result of nutrient imbalances or deficiencies related to energy and the toxic products of lipid oxidation.

Elevated dietary lipid levels affect the body composition of shrimp and can limit food consumption, ultimately resulting in nutrient deficiencies. However, increasing the digestible energy content of fish diets by lipid supplementation has in some cases shown a protein-sparing effect, with improvements in feed and protein utilization, as well as reduced nitrogen losses to the environment.

Studies with fish also have indicated that quantitative requirements for essential fatty acids (EFAs) increase with greater

total dietary lipid, but this information is not known for shrimp.

## Lipid levels tested

A recent six-week experiment at the Shrimp Mariculture Project of Texas A&M University in Port Aransas, Texas, USA, tested three dietary lipid levels (3, 6, and 9 percent of diet) and three levels (0.5, 1, and 2 percent of diet) of an omega-3 highly unsaturated fatty acid (HUFA) mixture. The mixture contained 416 mg eicosapentaenoic acid per gram and 237 mg docosahexaenoic acid per gram for a total of 778 mg total omega-3 fatty acids per gram.

Wheat starch, palmitic acid and stearic acid were adjusted to compensate for increasing dietary lipid and omega-3 HUFA levels. *Litopenaeus vannamei* postlarvae with a mean initial weight of 0.38 grams were stocked into 10, 32-liter replicate tanks/dietary treatment at a density of 4 shrimp per 0.09 square meter. The indoor recirculating water system with aeration was kept at a temperature of 30.0 degrees-C and salinity of 25.0 ppt.

## Shrimp biological performance

A significant main effect of omega-3 HUFA on final weight was observed at the end of the trial. The final average weight of shrimp fed omega-3 HUFA at 0.5 percent of diet (4.77 grams) was not different from those fed 1 percent (4.46 grams), but was significantly higher than those fed 2 percent omega-3 HUFA (4.34 grams) (Table 1).

## Gonzalez-Felix, Shrimp performance, Table 1

	Final Weight (g)	Instantaneous Growth Rate (% per day)	Survival (%)
<b>Lipid level</b>			
3%	4.54	5.94	86.7
6%	4.52	5.83	87.5
9%	4.51	5.87	85.3
<b>HUFA level</b>			
0.5%	4.77a	5.98	85.6
1.0%	4.46ab	5.77	87.2
2.0%	4.34b	5.88	86.7

Table 1. Shrimp performance at the end of the feeding trial.

Elevated dietary lipid content primarily affected lipid in shrimp tissues, resulting in significantly higher lipid in the hepatopancreas and muscle tissue of the shrimp. Nevertheless, shrimp growth showed no correspondence to total lipid deposition in tissues or the total level of any particular fatty acid.

## Conclusion

This study failed to detect an increase in the quantitative EFA requirements of juvenile *L. vannamei* when increasing the supplementation level of dietary lipid. Results suggested that *L. vannamei*, omnivorous open-the-lycum shrimp, can satisfy their omega-3 HUFA requirements when supplied at 0.5 percent of diet, which is lower than the 1 percent level usually recommended for marine shrimp.

Depressed growth was observed in shrimp fed HUFAs at 2 percent of diet. The study also showed that increasing the dietary lipid level affected the lipid composition of shrimp by increasing lipid deposition in hepatopancreas and muscle tissue.

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