



Purpose of study

Soy Proteins Impact on Bile Acid and Taurine Status

Effects of Soy Proteins on Bile Acid and Taurine Status in Fish

Ronald W. Hardy, Ph.D., Aquaculture Research Institute, University of Idaho

Purpose / Goal

The project will develop a model for bile acid metabolism-interference and taurine deficiency using cholestyramine and soystatin (a bile acid-binding peptide). Assess the cholesterol, taurine and sulfur-amino acid effects when added to rainbow trout diets using physiological and genomic tools.

Study Design

An eight week feeding trial, examining thirty tanks with 15 fish each, allowed examination

of 5 randomly assigned diets. Growth, feed performance, thermal growth unit coefficient*, feed conversion ratio, protein efficiency ratio and nutrient retention efficiency measurements were taken.

Diet

- 1 ▶ Fishmeal (FM)-based control diet
- 2 ▶ Diet 1 with 0.03% soystatin corresponding to 30% soybean meal
- 3 ▶ (FM+CHOL): Diet 1 with 3.5% cholestyramine
- 4 ▶ Diet containing 30% soybean meal (negative control)
- 5 ▶ Diet 4 supplemented with taurine equivalent to levels in Diet 1



Soybean efficiency



Increased soybean use

Results

Diets

- Taurine levels in diets ranged from 0.19% (Diet 4) to 2.21% (Diet 5)
- Analyzed cholesterol levels in diets were similar, ranging from 1251 mg/kg (Diet 4) to 1352 mg/kg (Diet 2)

Growth trial

- Fish fed the Fishmeal + Cholestyramine diet (Diet 3) had significantly lower ($P < 0.05$) final weight (49.7 g/fish) than the fish fed all other diets (69.2 -71.7 g/fish), but there was no significant difference ($P > 0.05$) among the other diets

Whole-body proximate composition and nutrient retention

- Protein retention in fish ranged from 24.7% (Diet 3) to 33.9% (Diet 2)
- Lipid retention ranged from 11.4% (Diet 3) to 59.2% (Diet 4) whereas energy retention varied from 15.9% (Diet 3) to 37.7% (Diet 2 and 4)
- Protein, lipid and energy retention of fish fed Diet 3 were significantly lower than those of fish fed other diets

Chemical analysis

- The taurine level in serum and muscle ranged from 107 $\mu\text{mole/L}$ from Diet 4 to 174 $\mu\text{mole/L}$ in Diet 5, indicating 0.21% in Diet 4 compared to 0.33% in Diet 3, respectively
- Total bilirubin in the liver, gall bladder and digesta of the experimental fish did not vary significantly among the dietary treatments ($P > 0.05$)
- Total cholesterol in the liver of the experimental fish did not vary significantly among the dietary treatments ($P > 0.05$)

Summary

The research demonstrates that feed constituents that interfere with bile acid recycling can cause major disruption of bile acid metabolism. Results were inconclusive as to the potential confounding effect of dietary soybean meal on taurine metabolism in fish.

Key takeaways

Feed constituents that interfere with bile acid recycling can cause major disruption of bile acid metabolism. Soy proteins do not contain taurine whereas animal or fish-derived feed ingredients are rich sources of taurine. Soystain did not show significant differences in impact compared to soybean meal or other diets.

Ronald W. Hardy, Ph.D., Aquaculture Research Institute, University of Idaho

*The coefficient of thermal expansion can be defined as the fractional increase in length as the temperature rises.



Soy Aquaculture Alliance

Andy Tauer, Executive Director | 8425 Keystone Crossing, Suite 200 | Indianapolis, IN 46240 | (317) 644-2862 | atauer@soyaquaalliance.com

© 2019 Soy Aquaculture Alliance. Feeding new opportunities. Funded with soybean checkoff dollars.