

THESIS TITLE Effects of porcine bile acid supplementation on fat digestibility and functioning of the bile acid metabolism in rainbow trout (*Oncorhynchus mykiss*)

RESEARCH QUESTION Does bile acid supplementation to a plant-based diets improve nutrient (fat) digestibility?
What is the effect of bile acid supplementation on the expression of key genes involved in enterohepatic circulation of bile acids?

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LOCATION CARUS (Aquatic Research Facility) & ZODIAC buildings, Wageningen University

PERIOD January – June 2019

SHORT DESCRIPTION

This thesis will be part of a PhD project.

Total replacement of fishmeal by plant-protein sources is shown to be possible for various omnivorous and carnivorous fish species. Unfortunately, for the majority of carnivorous fish, the digestive system is neither built nor adapted to handle large amount of plant ingredients. This often results in poor fat digestion, reducing aquaculture production and profits. This reduction in fat digestibility is hypothesized to be caused by hampering of the bile acid metabolism and reduction of emulsification capacity of the total bile acid pool. Fibres in plant ingredients act as bile acid binders, and increase faecal bile acid loss. The majority of bile acids is continuously recirculated in a process known as enterohepatic circulation, and only a small part is lost via the faeces. Under homeostatic circumstances, faecal bile acid loss is replenished by de novo synthesis in the liver. However, capacity for de novo synthesis of bile acids is low due to the presence of rate-limiting enzymes. This means that beyond a certain threshold of faecal bile acid loss, the total bile acid pool in the body start to drop explaining for the reduction in fat digestibility. As part of this thesis, you will look if exogenous bile acid supplementation can be uses as an effective way to improve fat digestibility. Furthermore, using expression of key genes, you will study the functioning of the bile acid metabolism (bile acid synthesis and enterohepatic circulation) in rainbow trout as a model carnivorous fish species.

An experiment will be conducted in early 2019 with the following objectives:

- To determine whether bile acid supplementation can be used as an effective way to improve fat digestibility in rainbow trout.
- To gain fundamental knowledge on the functioning of the bile acid metabolism (bile acid synthesis and enterohepatic circulation) in rainbow trout.

The experiment will be conducted at the Aquaculture Research Facility of Wageningen University during a 6 weeks period. During this period you will do a feeding trial using diets with different levels of bile acid supplementation. At the end of the trial you will help with sampling of body tissues.

RESEARCH AIM/ SCOPE

The overall aim of the (PhD) project is to gain understanding of the interaction between diet composition (NSP levels, bile acid precursor levels, ...), nutrient digestibility and the bile acid metabolism in rainbow trout.

REQUIREMENTS

- Affinity with experimental work (experiment management, laboratory analyses)
- Good analytical and writing skills
- Interest in fish nutrition

OTHER INFORMATION

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