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# OPTIMIZING FAT UTILIZATION IN FEEDS FOR MARINE FISH & TROUT

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Joining Forces to Add Value in Aquaculture

# CONTENT

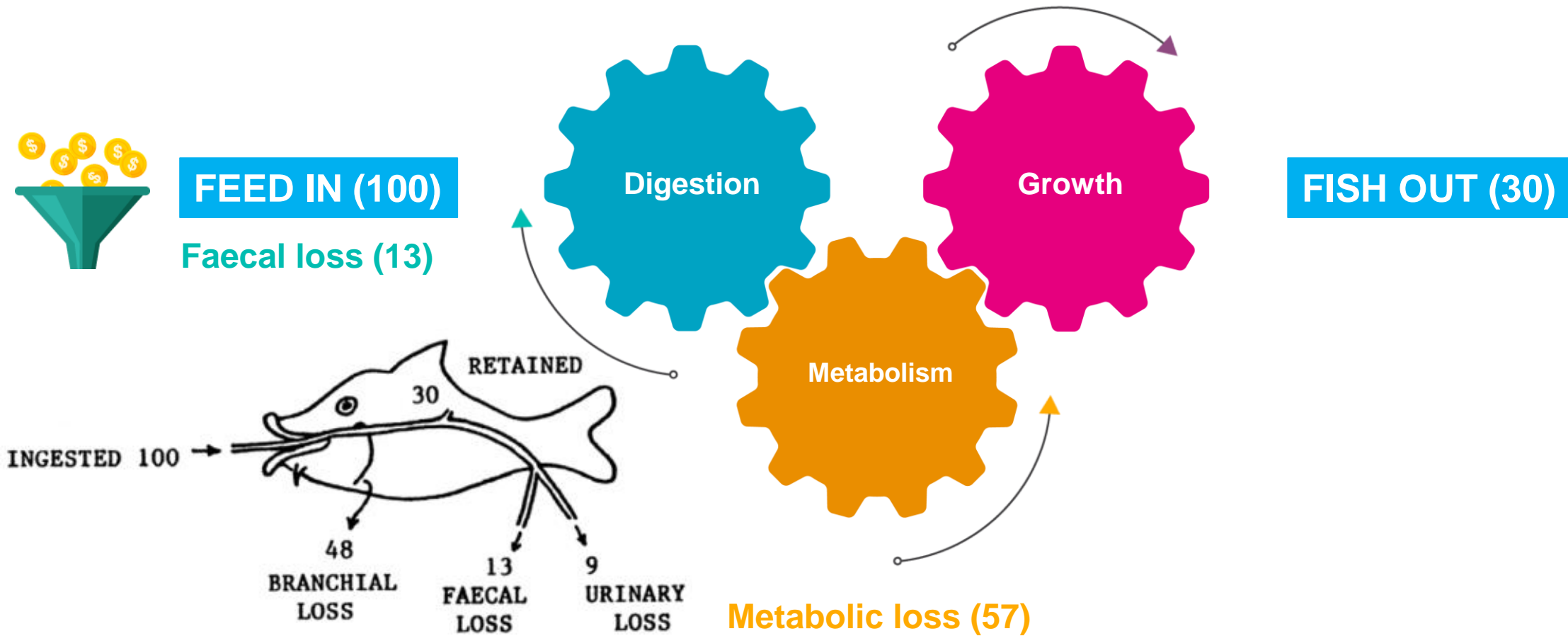
- Feeds & nutrient utilization
- Bile salts: role in digestion, synthesis
- Taurine: function
- Synergy bile salts & taurine
- Impact of feed quality & stress on bile salt status
- Solution



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# NITROGEN BALANCE: PRODUCER PERSPECTIVE

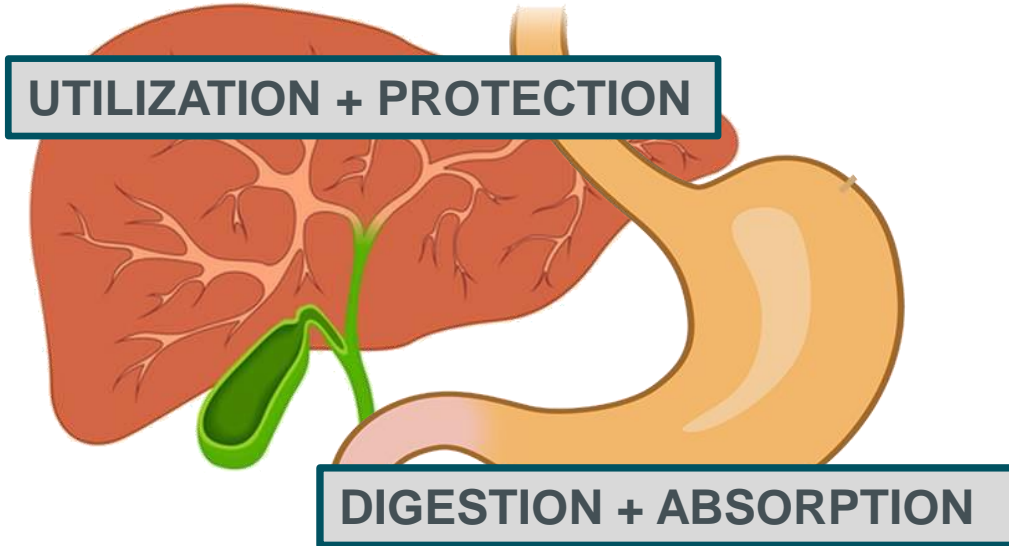


# LIPOGEST +

Natural enhancer of digestive and metabolic processes  
based on **bile salts** and **taurine**



# ROLE OF BILE SALTS



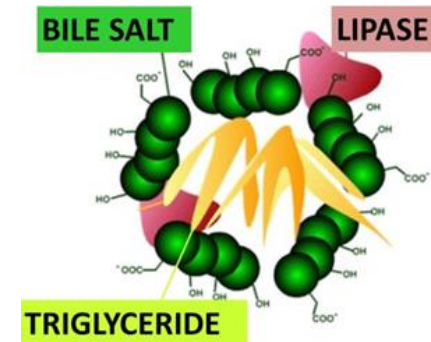
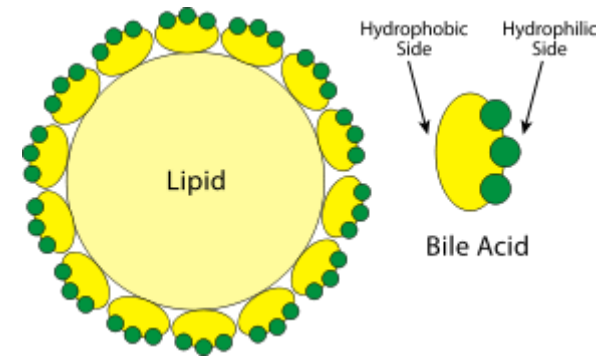
- Bile is a collection of molecules with both hydrophilic and hydrophobic parts that are synthesized in the **liver** from cholesterol, stored in the **gallbladder**, and secreted into proximal **intestine**
- **Functions of bile salts:**
  1. Enhance lipid dispersion and formation of small lipid droplets
  2. Activate and facilitate the actions of lipases
  3. Facilitate the formation of smaller micelles
  4. Improve absorption of lipids and lipid-soluble nutrients
  5. Enhance glucose absorption/transportation
  6. Facilitate the excretion of cholesterol and other toxic metabolites



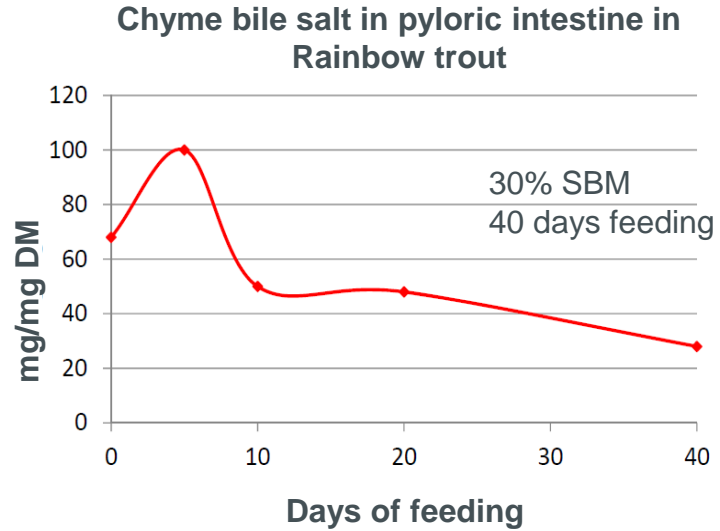


# BILE SALTS: natural enhancer of fat digestion

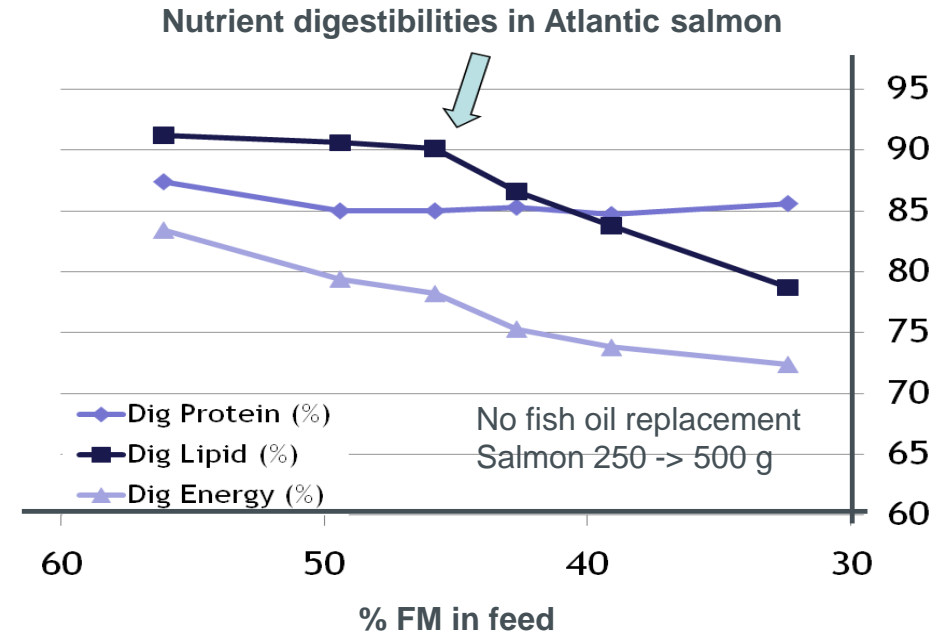
- natural emulsifier
  - Optimal emulsifier properties
  - Essential for lipid digestion/absorption (micelle formation)
- co-factor lipase
  - Co-factor for the action of BS dependent lipase (BSDL, triacyl glycerol lipase)
  - Bridge function to contact enzyme and substrate (bile acid hydrophilic group combines with lipase, hydrophobic group combine with lipid)
- Transport and absorption of the **fat-soluble vitamins & carotenoid pigments**



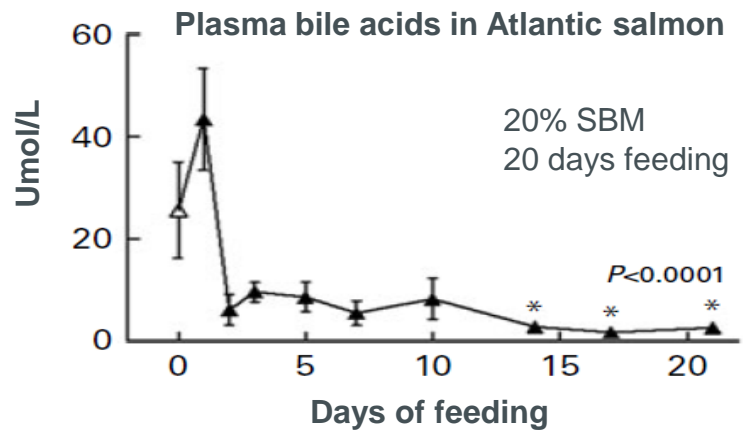
# PLANT-BASED FEEDS, BILE SALT STATUS, AND LIPID DIGESTION



Romarheim et al., 2008



Kroghdal et al., 2003



Kortner et al., 2013

- Plant-based feeds negatively affects bile acid status and lipid digestibility
- A spike in bile salt levels is followed by a drastic reduction

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# WHY LIPOGEST +

- Current production practices disturb bile salt status and impair lipid digestion
  - Reduced synthesis
  - Reduced reabsorption / Increased excretion
  - Reduced taurine absorption
- **LIPOGEST +**
  - Synergy between bile salts and taurine
  - Bile salts to improve emulsification in intestine and restore/maintain general status
  - Taurine to warrant the synthesis, status and emulsification properties of bile salts
  - **↑ ↑ growth performance and health**



# LIPOGEST +: Natural & safe source of Bile Salts

- Approved as feed material in EU (\*)
- Purified, natural product from bovine origin
- Feed safety guaranteed
  - Extracted from healthy animals fit for human consumption from BSE free countries
  - Purified through extensive processing/extraction
  - Free of animal protein
  - Free of antibiotics
  - Conform EU legislation on contaminants (heavy metals & PCB/dioxin; EC directive 2002/32 and subsequent amendments to Annex I and II)



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# LAB TRIAL with TROUT – Germany

## Objective:

Screening of different concentrations of bile salts combined or not with taurine on performance of trout

## Experimental setup:

- Species: Trout (initial weight 15g) in triplicate
- RAS – 30 tanks of 50L - +/- 30 fish/tank
- Feeding to satiation, 4x/d for 8 weeks
- Temp 14°C, pH, O<sub>2</sub>, ammonia & nitrite monitoring
- Not ingested pellets siphoned & counted

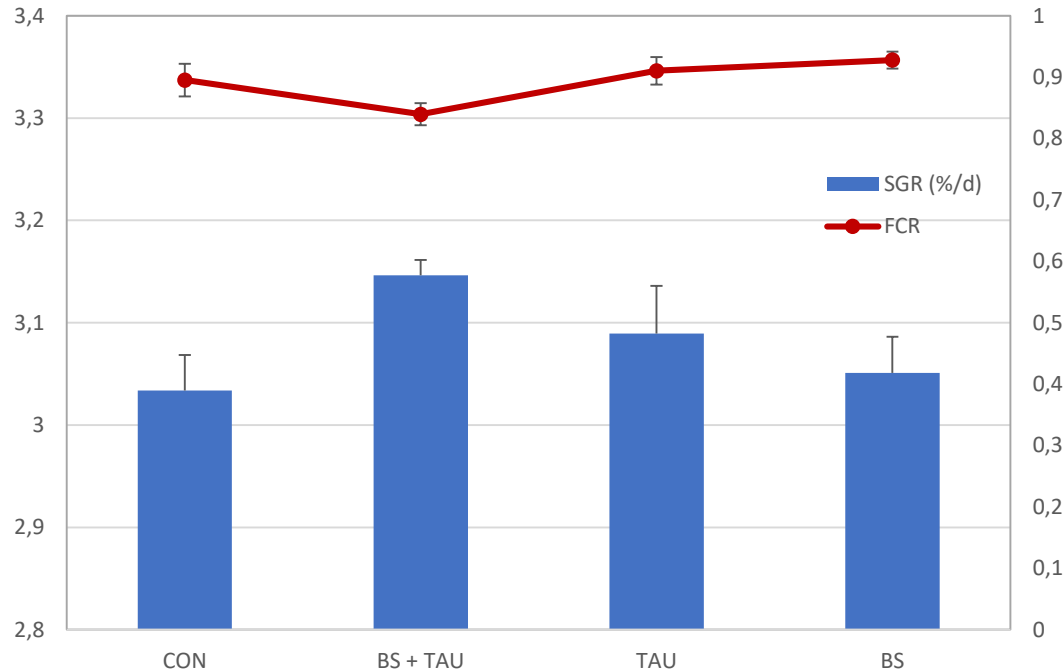
## Diets:

- LT fishmeal 15%
- Protein 45%/Lipids 19%
- Treatments including different combinations and concentrations of bile salts & taurine

Raw material	%
LT fishmeal	15,00
Soybeanmeal 44	30,00
Soy Protein Concentrate	1,95
Wheat Gluten	6,45
Corn Gluten	7,00
Poultry Meal	6,00
Haemoglobine Powder	6,00
Wheat Flour	11,03
Vit Min Mix	0,10
Vit C	0,07
Vit E	0,02
Mono Ca Phosphate	0,51
Methionine	0.13
Threonine	0.12
Fish Oil	4.00
Rapeseed Oil	5.62
Soybean Oil	6.00



# LAB TRIAL TROUT - RESULTS



- The supplementation with bile salts (BS) had a slightly positive effect on growth rate
- The supplementation of taurine increased the growth rate of the trout
- Supplementation of both Bile Salts combined with taurine significantly improved performance parameters



Synergistic effect of bile salts combined with taurine on performance of trout



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# TAKE HOME MESSAGE

## Digestibility enhancers based on bile salts and taurine – LIPOGEST +

- Better utilization of energy sources: more efficient use of fat in metabolic processes and less internal fat deposit
- Improve fat digestion and absorption by its strong emulsification properties
- Compensate for disturbed bile salt status in fish fed on plant based diets
- Improved performance results



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