

Novofeed



Novel feed ingredients from sustainable sources

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Project Summary



- › Develop novel functional feed ingredients for aquaculture.
- › Functional feed ingredients are ingredients that provide an additional physiological benefit to the fish beyond the nutritional value.
- › These ingredients will be based on bioactive peptides isolated from salmon & sea bass/sea bream by-products.
- › Cross over approach



The Project team



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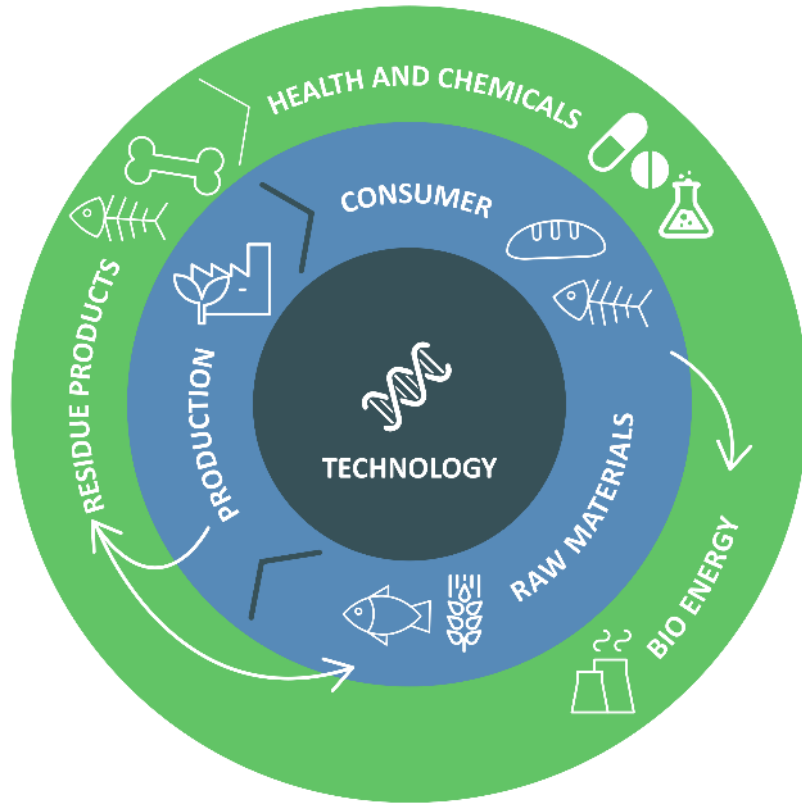
Partners



Advisory Board



BIOECONOMY



The bioeconomy encompasses the **production of renewable biological resources and their conversion into food, feed, bio-based products and bioenergy.**

Knowledge and Solutions
for
Sustainable and Resilient Aquatic Production



Nordic Centre of Excellence



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The European Bioeconomy in 2030



Delivering sustainable Growth by addressing the Grand Societal Challenges

- › Sustainable management of natural resources
- › Sustainable production
- › Improving public health
- › Mitigating climate change
- › Integrating and balancing social development
- › Global sustainable challenges



Targeted hydrolysis approach

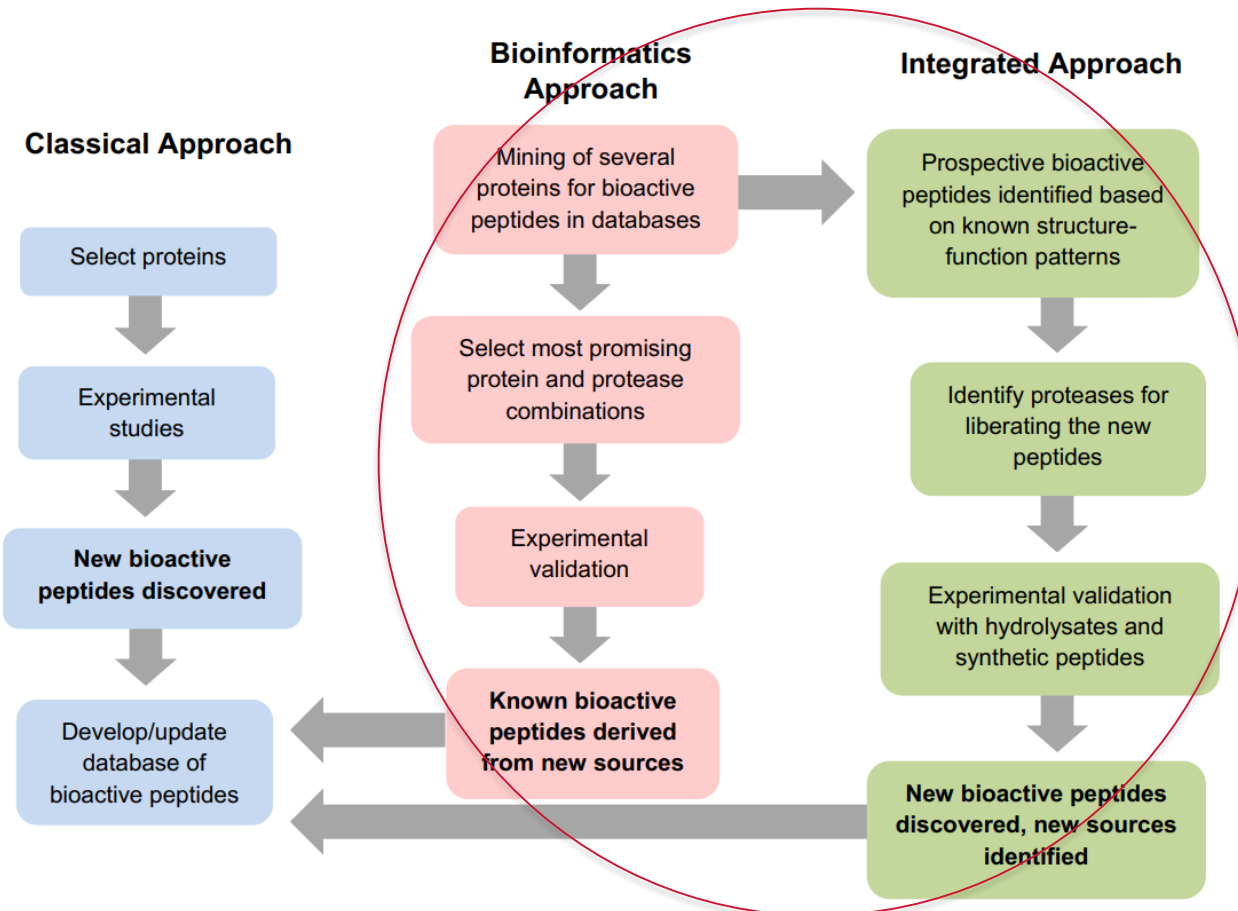
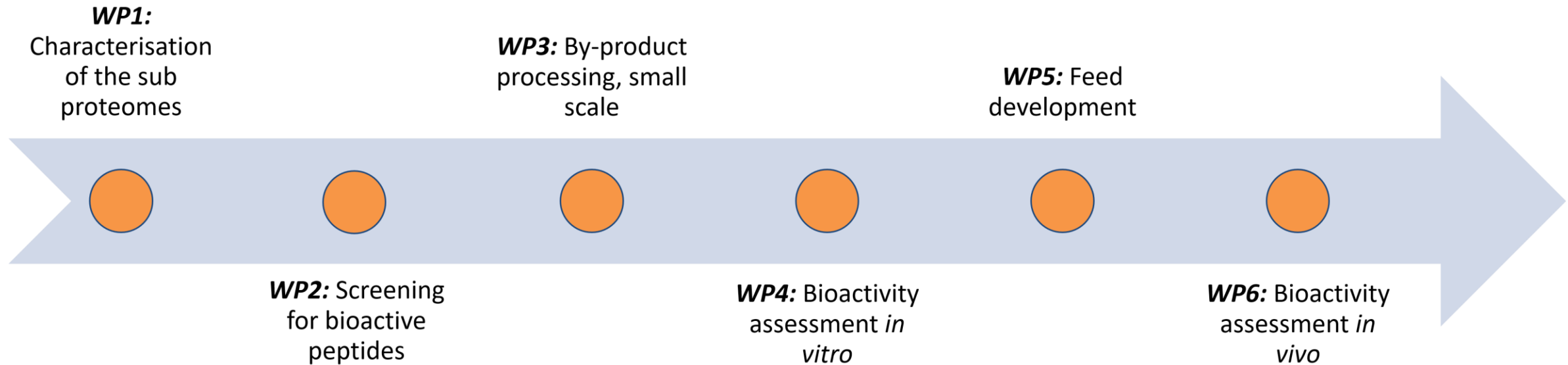


Figure from: Bioinformatics approaches, prospects and challenges of food bioactive peptide research Chibuikwe C. Udenigwe

Workflow and methodology



WP 1 Characterization of the subproteomes



Objective:

Isolate proteins from different protein sources (fish by-products) and identify the constituents of the subproteomes by mass spectrometry-based protein profiling

Status

- *Task 1.1 Optimization by-product handling*
 - Work have been done to identify and optimize the parameters that are critical for achieving high quality products from the fresh raw material evaluated.
- *Task 1.2 Sample preparation and protein recovery*
 - Sample preparation methods have been optimized: proteins isolated by use Isoelectric precipitation (ISP) and acetone precipitation.
 - Proteins isolated from:
 - Atlantic salmon (head, skin, viscera)
 - Sea bass (head, skin, viscera, bones)
 - Sea bream (head, skin, viscera, bones)
- *Task 1.3 Proteomic profiling of different subproteomes by LTQ-MS/MS*

Workpackage 2 Screening for bioactive peptides



Objective

Assess the potential of the different subproteomes to serve as a source of bio-active peptides by use of a computational approach (*in silico approach*).

- *In silico* digests of the subproteomes will be performed according to singular and multiple protease specificities.
- The *in silico* peptide profiles will be matched with known bioactive peptides structures/motifs in the databases
- Based on *in silico* digestion and potency evaluation, the most promising protein/hydrolysis combination will be selected



Workpackage 3 Byproduct processing small-scale

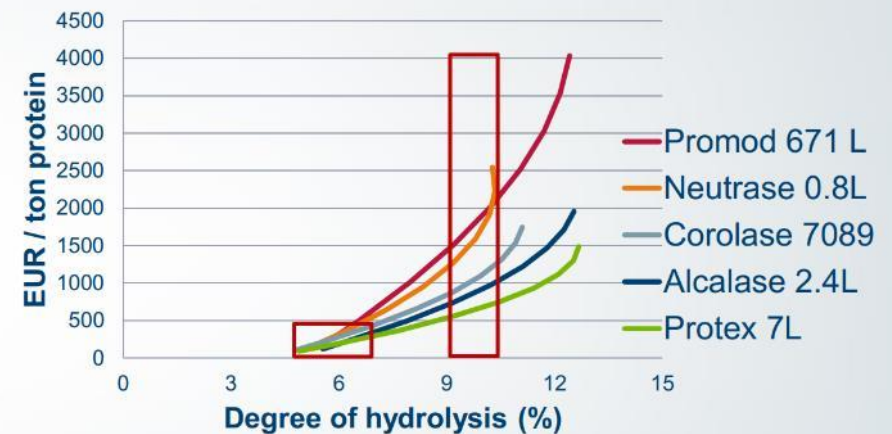


Objective

To extract and validate the bioactive peptides of interest from the selected fractions of byproducts and produce feed with different inclusion levels.

- Targeted hydrolysis
 - Enzyme specificity
 - Enzyme to substrate ratio
 - Temperature
 - Time
 - pH
- Confirm presence of selected bioactive peptides
- Small scale feed production

Enzyme cost-efficiency



Aspevik, Egede-Nissen, Oterhals. A systematic approach to comparison of the cost efficiency of endopeptidases to hydrolyze Atlantic salmon (*Salmo salar*) by-products. *Food Technology and Biotechnology*, 2016, 54, 421-431.

Workpackage 4 Bioactivity assessments *In-vitro*



Objective

immunomodulatory properties of bioactive fractions will be assessed using *in vitro* cell culture studies

- › Focus on immunostimulatory, anti-inflammatory and anti-microbial activities
- › Cell culture based on two major immunocompetent organs: head kidney and liver
- › Select exposure concentrations and end-point measures for effects of bioactive fractions in salmon and sea bass/bream

Workpackage 5 Feed development



Objective

Process and product optimization, upscaling and inclusion of bioactive compounds in formulated feed

- Up-scaled optimization of hydrolysis process
- Peptide inclusion protocols
- Feed production



WP 6 Bioactivity assessments *in-vivo*



Objective

Assess the properties of bioactive fractions using *in vivo* feeding studies.

- The effects of the bioactive fraction on growth performance, gut health and stress resistance will be investigated.
- These experiments will complement and support the potential immunomodulatory and antimicrobial effects of the bioactive fraction indicated in WP4.



Sustainable and resilient aquatic production

Feed resources



Production



Processing

