HØYVERDIGE PROTEIN FRA BIPRODUKT

FOU MOBILISERING| 20.09.2017

MØREFORSKING

UTFORDRING

Best mulig lønnsomhet på utnytting av biprodukt

- ✓ Fiskemel
- ✓ Fiskeolje
- ✓ Hydrolysat (enzym)
- ✓ Ensilasje

OMBORDPRODUSERT FISKEMEL FRA FERSKE BIPRODUKT

PROSJEKTER

- 2017-2020: Exploring the health effects of salmon **fishmeal**: A combined dietary interevention, animal study, cell experiment and omics approach (NFR, FHF).
- 2016-2017: Clinical testing of **fishmeal** in a rat-model for evaluation of health parameters (FHF).
- 2016: CodMarine: Codliver **oil** vs cod-oil (VRI M&R).
- 2016-2017: Utvikling av LC-MS som verktøy for peptidanalyser (M&R Fylke).
- 2015-2017: Improvement of processing of on-board produced **fishmeal** (Dep of Fisheries).
- 2015-2015: Utilization of **stickwater** fractions from fishmeal productions at-sea (M&R Fylke).
- 2015-2015: Utilization of **stickwater** fractions from fishmeal productions of pelagic rest raw materials (VRI).
- 2012-2013: Økt verdiskaping på **hvitfiskmel** (M&R Fylke).
- 2012: Økt verdiskapning på **hvitfiskmel** (VRI).

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Nutritional and functional properties of fishmeal produced from fresh by-products of cod (*Gadus morhua L.*) and saithe (*Pollachius virens*)

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- Fiskemel = protein av høy kvalitet
  - Liten årstidsvariasjon
  - Komplett protein (jfr egg, melk, kjøtt).
- Høyt taurin innhold.
- Høyt mineralinnhold (aske).
- Funksjonelle egenskaper ligner soya-mel.
- Bioaktive peptider påvist.

Table 4. Functional properties of selected WFM batches compared to soy bean meal (SBM). Values for each batch are expressed as mean ± standard deviation (n = 3).

	% Solubility	WHC *	ES (%)		
Sample			0 hrs	2 hrs	24 hrs
WFM 1	7.27 ± 0.42 ^{H}	2.37 ^{F}	86.03 ± 1.97 ^{A}	76.07 ± 2.48 ^{B}	63.35 ± 7.42 ^{E}
WFM 2	9.41 ± 0.02 ^{H}	2.35 ^{F}	77.33 ± 8.95 ^{A}	68.07 ± 2.1 ^{C}	62.05 ± 4.03 ^{E}
WFM 3	9.22 ± 0.07 ^{H}	2.43 ^{F}	91.60 ± 5.48 ^{A}	85.97 ± 2.32 ^{D}	71.05 ± 5.59 ^{E}
WFM 4	8.48 ± 0.09 ^{H}	2.31 ^{F}	89.53 ± 4.14 ^{A}	80.17 ± 6.67 ^{B}	62.50 ± 5.94 ^{E}
WFM 5	8.02 ± 0.23 ^{H}	2.33 ^{F}	86.03 ± 2.42 ^{A}	74.10 ± 9.71 ^{B}	53.40 ± 4.81 ^{E}
mean ± sd	8.48 ± 0.016	2.38 ± 0.06	84.00 ± 7.00	75.5 ± 6.90	62.1 ± 5.70
SBM	25.10 ± 0.03 ^{G}	2.45 ^{F}	79.37 ± 5.37 ^{A}	70.23 ± 2.51 ^{B}	63.20 ± 2.40 ^{E}

Different superscript letters in the same column denotes a significant difference ($P < 0.05$). * g/g dry matter.

Table 5. Angiotensin converting enzyme (ACE) inhibitory effect of fishmeal hydrolysed with Protamex.

Hydrolysis time (min)	% DH	IC50 (µg/ml)
0	4.83 ± 0.57	1850 ± 0.01
60	38.67 ± 1.21	102.78 ± 0.12
180	51.27 ± 1.79	36.27 ± 0.06

Data are presented as the protein concentration (µg/ml) needed to reach $IC_{50\%}$ in a 1 mU ACE-assay. The corresponding degree of hydrolysis (% DH) for each timepoint, is shown. Data are presented as the mean ± the standard deviation (n = 3).

MØREFORSKING

Møre og Romsdal fylkeskommune

FISKEMEL BASERT PÅ ULIK RÅSTOFFSAMMENSETNING

3.1. Table 1. Proximate chemical analysis

	Sample	Protein (N*6.25)	Ash	Water	Watersoluble protein	Lipids	Na
1	Fishmeal, HG-production (Strand)	62.8	24.2	2.5	nd	9.1	nd
2	Fishmeal, Filet-production (Granit)	65.4	22.5	6.4	13.7	7.4	0.69
3	FD Stickwater	72.3	16.7	nd	98.1	1.2	nd
4	Fishmeal, muscle-protein	91.8	7.1	2.6	24.1	3.6	0.53

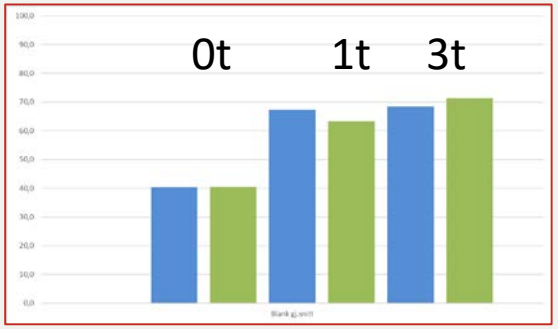
Ween et al. (unpublished)

- The effect proteins from fresh by-products are compared to proteins from fishfilet (muscle) proteins in obese rats (Zucker rats).

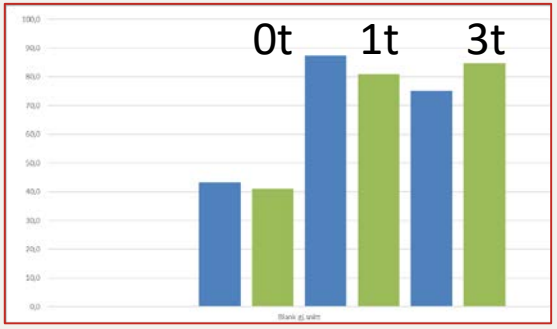
- Compared to ongoing human trials studying the effect of diets enriched in whitefish proteins.

KAN PROTEIN FRA BIPRODUKT REGULERE BLODTRYKK?

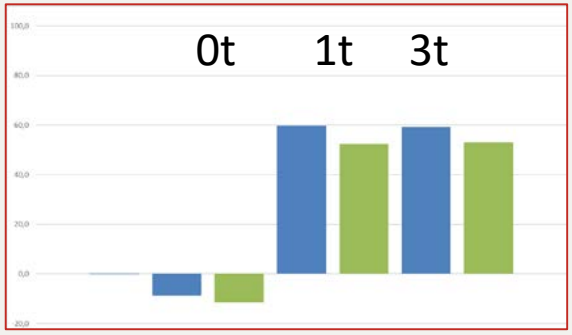
FISKEMEL basert på ulik råstoffsammensetning



Protamex

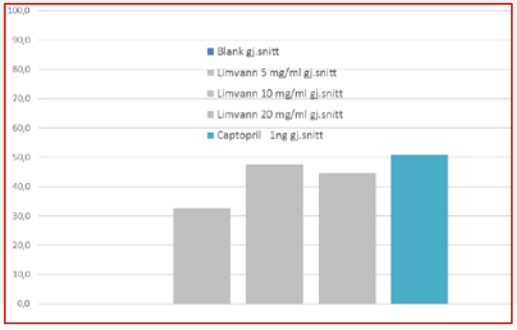


Alcalase



Simulert fordøyelse

LIMVANNSPULVER: HG



FISKEMEL AV FILÈT?

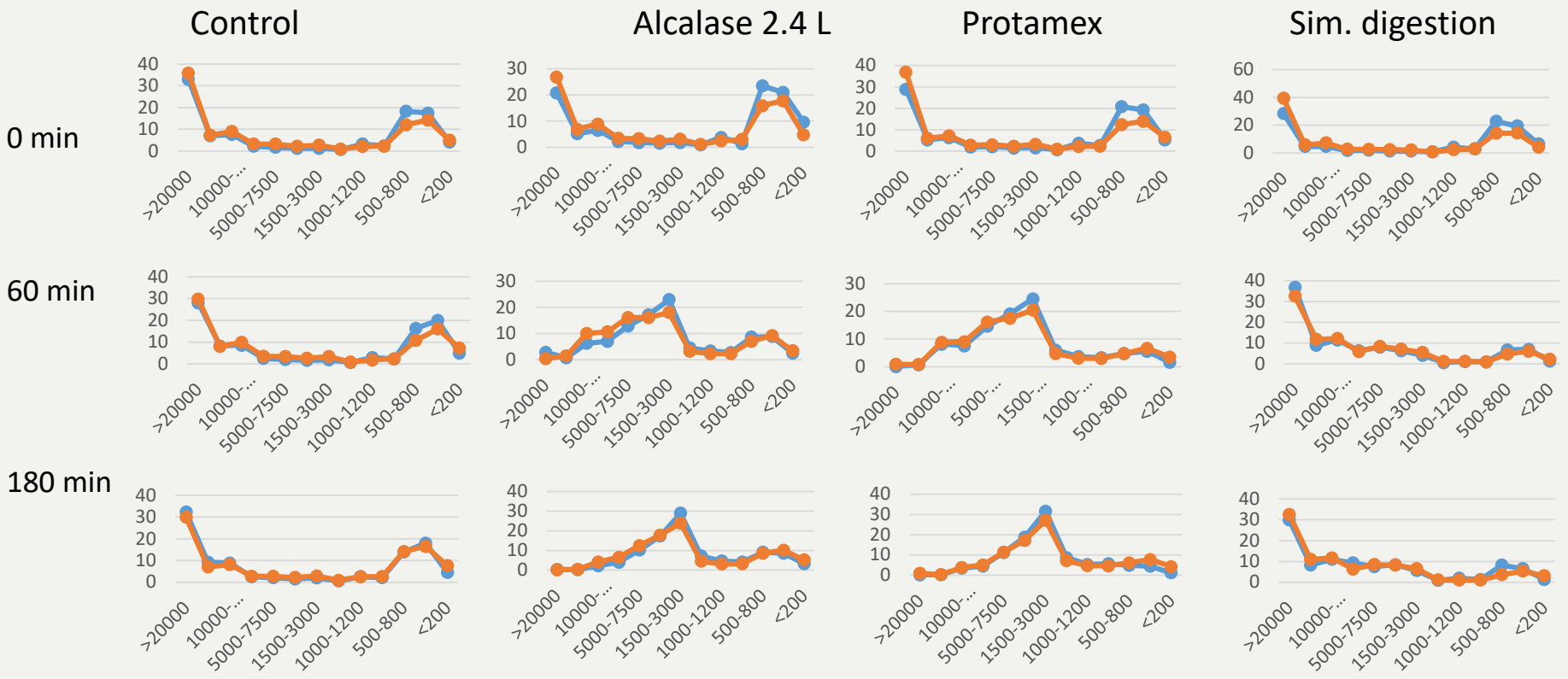
Avventer resultat

Ween, Stangeland et al (2017), unpublished

MØREFORSKING

Nofima

HYDROLYSERT FISKEMEL - PEPTIDPROFILER



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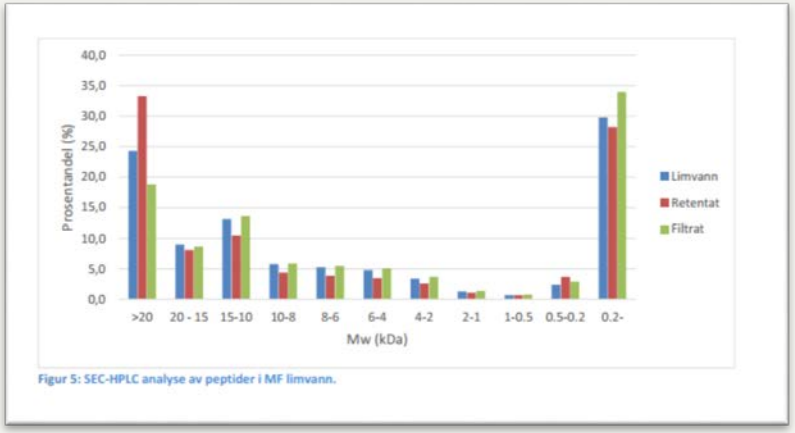
PEPTIDPROFILER I HYDROLYSERT FISKEMEL

	Control		Protamex		Alcalase		Sim. digestion					
MW (Dalton)	HG	Filet	HG	Filet	HG	Filet	HG	Filet		#AA	Bioactivity?	Functionality?
>20000	26.5	17.8	3	3.1	0.6	2.8	1	3.3		>180	*	******
15000-20000	7.2	12.3	0.8	0.3	0.1	0.3	0.4	0.3			*	******
10000-15000	7.2	15	8.5	3.1	3.1	1.4	2.2	1.7		>137	*	****
7500-10000	2.7	5.8	9.2	6.1	5.1	3	5.4	4.3			*	****
5000-7500	2.6	4.6	16.7	16.2	11.1	10.1	15.2	13.3			*	***
3000-5000	2.2	3.1	20.2	22.8	19.5	19.8	21.6	20.8		>46	*	***
1500-3000	3.7	3.4	24.7	25.8	26.5	31.5	27.9	28.5		>27	**	**
1200-1500	1.2	0.9	4.7	1.6	5.7	6.9	5.6	5.9		>13	***	**
1000-1200	1.3	2.3	2.6	3.1	3.2	3.7	3.4	3.2		>11	***	**
800-1000	2	2.1	2.2	1.4	3	3.9	2.8	2.7		>9	****	*
500-800	6.8	11.7	2.6	2.9	3.7	4.8	2.5	2.9		>8	*****	*
200-500	9.2	10.8	3.3	4.5	4.3	3.3	3.4	3.4		>4.5	******	*
<200	27.5	10.2	1.5	9.1	14.2	8.6	8.5	9.6		>1-2	****	*

Hydrolysates of fishmeal treatet with enzymes for 24 h, LC-MS (Ween et al. unpublished).

LIMVANN – EN INTERESSANT PROTEINKILDE?

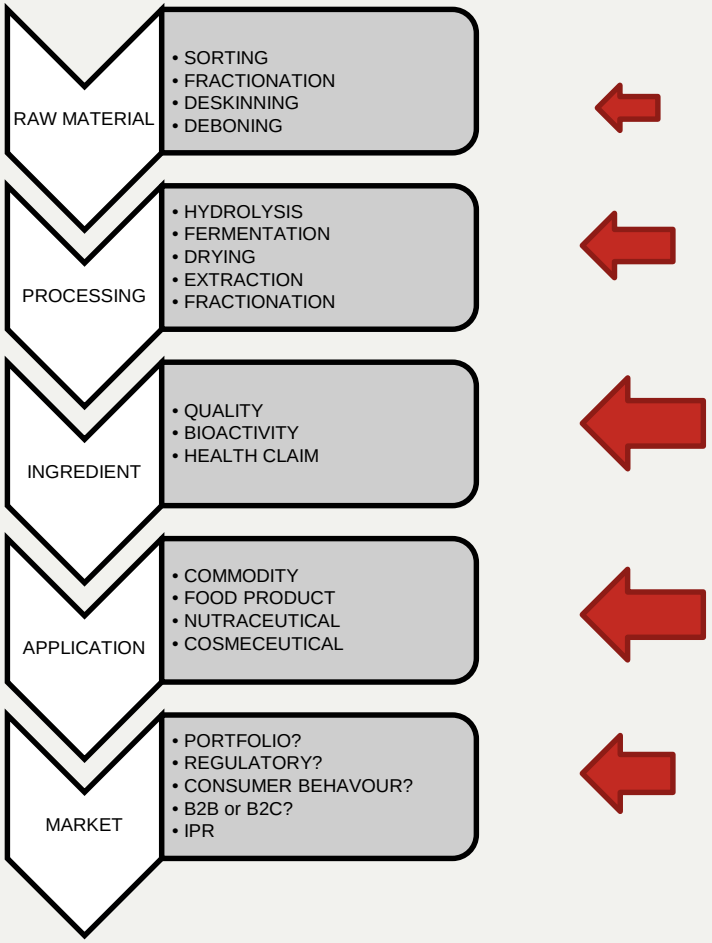
- Limvann: 8 – 12 % TS.
- Mikrofiltering, inndamping og frysetørking.
- Limvannspulver:
  - Lettløselig i vann
  - Lite lukt
  - Smak?
  - 95 % TS, 70 % protein
- Interessant peptidprofil
- Bioaktive peptider



Figur 5: SEC-HPLC analyse av peptider i MF limvann.

Prøve #	Konsentrasjon	% ACE hemming	ACE IC_{50} (mg/ml
1	10 mg/ml limvann	31.6	15.82
2	5 mg/ml hydr limvann	58.7	4.25
3	10 mg/ml hydr limvann	67.4	7.41
4	0.01 mg/ml Captopril	78.7	0.0064

FOKUS FREMOVER



EXPLORING THE HEALTH EFFECTS OF SALMON FISHMEAL: A COMBINED DIETARY INTEREVENTION, ANIMAL STUDY, CELL EXPERIMENT AND OMICS APPROACH

- Ramme: 11 mill kr.
- 1 phD-student + 1 postdoc.
- 3 years.
- Oppstart: høst 2017.

MARINEHARVEST.COM

marineharvest

Salmon Meal 66%

Description

Salmon meal is made from fresh sustainable salmon by-products of Norwegian origin. All raw materials used in the production of this Salmon Meal are classified as category 3 material according the EU Regulation (EC) No 1774/2002. The production of the Marine Harvest Salmon Meal is GMP+ certified (no. 5210-2009-OTH-NOR- RvA) of The Norwegian Food Safety Authority (FSA) approval number: 120352.

Storage

Dry, cool and dark.

Additives

Antioxidants can be added upon request.

Traceable from start to finished product

Through our tracking and tracing program we can follow the salmon from roe to the finished meal. This traceability program is a great endorsement of how our presence throughout the production stages of the salmon value chain can bring real advantages for our suppliers, customers and consumers. We also believe it provides a practical demonstration of leadership in our market. CoA per weekly batch from external accredited lab.

Learn more about traceability at the Marine Harvest website: www.marineharvest.com

Country of origin

Norway

Packaging

Big bags – approximately 700 kg

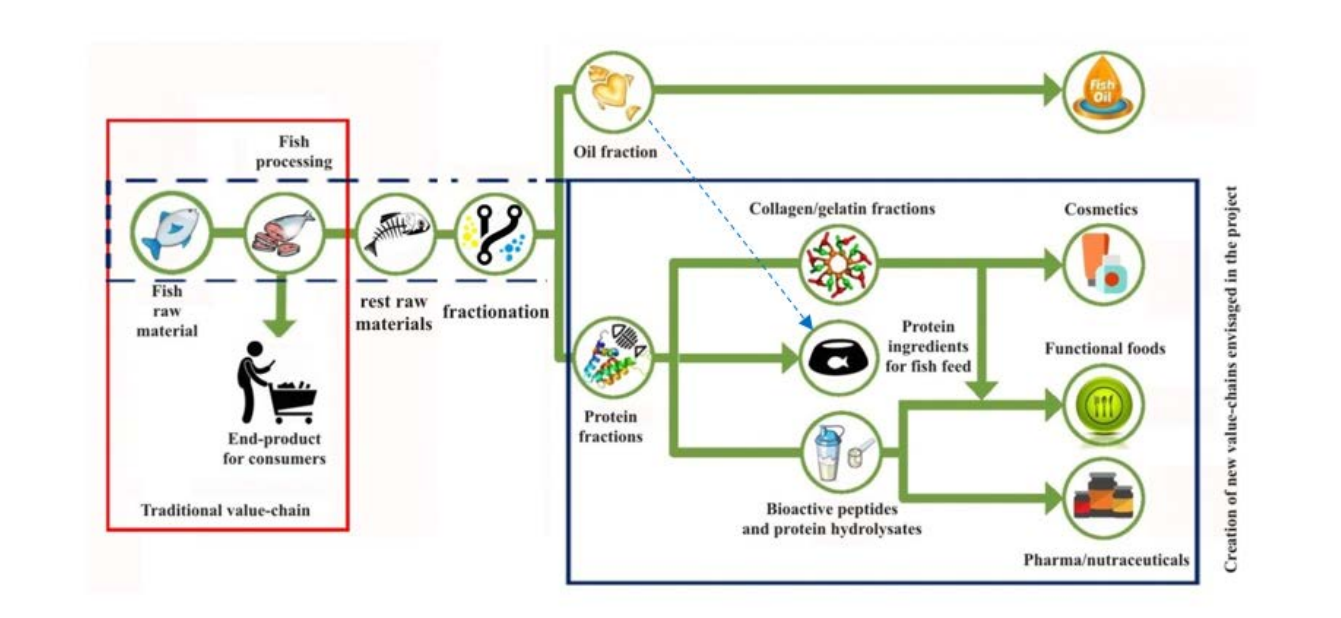
CHEMICAL	MIN	MAX
Protein	66%	
Fat	8%	14%
Ash	8%	14%
Water	5%	10%
TVN		0,2%
MICROBIOLOGICAL		
Salmonella	Negative in 25 gr	
Enterobacteriaceae	<10/g	

MØREFORSKING

marineharvest

FHF
FISKERI- OG HAVBRUKSNÆRINGENS FORSKNINGSFOND

SUSTAINABLE RECOVERY OF PROTEIN INGREDIENTS FROM SEAFOOD: SURPRISE



- Call: H2020 BBI JTI 2017
- Ramme: 48 mill kr.
- 11 partnere
- 4 år

MØREFORSKING

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