



"SCALING UP LOW HANGING FRUITS!"

MACRO CASCADE

A production platform processing cultivated seaweed into a range of value-added products

PhD Urd Grandorf Bak, R&D Ocean Rainforest

AQUACULTURE EUROPE 2019

"EU EATIP Day: Low impact – High output: Promoting food security and new value chains in aquaculture"

October 9, Berlin, Germany



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eCOAST
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Rethink Tomorrow

OCEAN RAINFOREST
SUSTAINABLE NORDIC SEAWEED

Hortimare



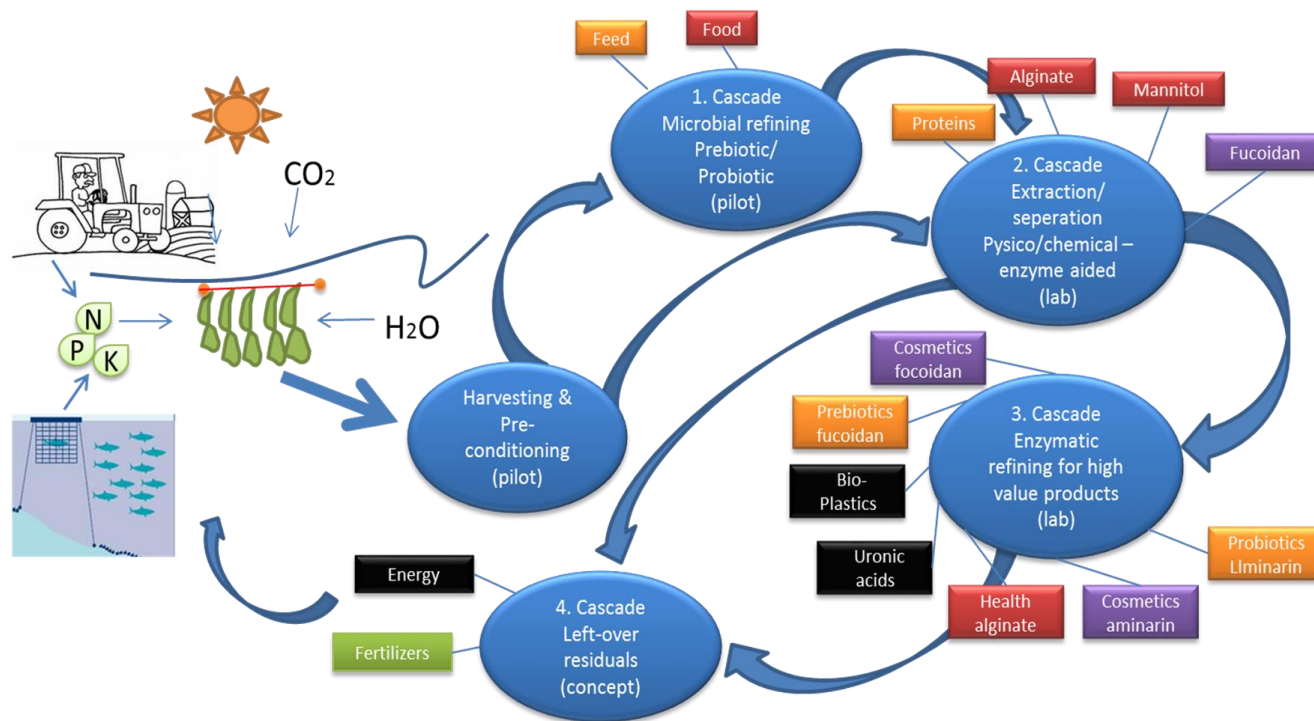
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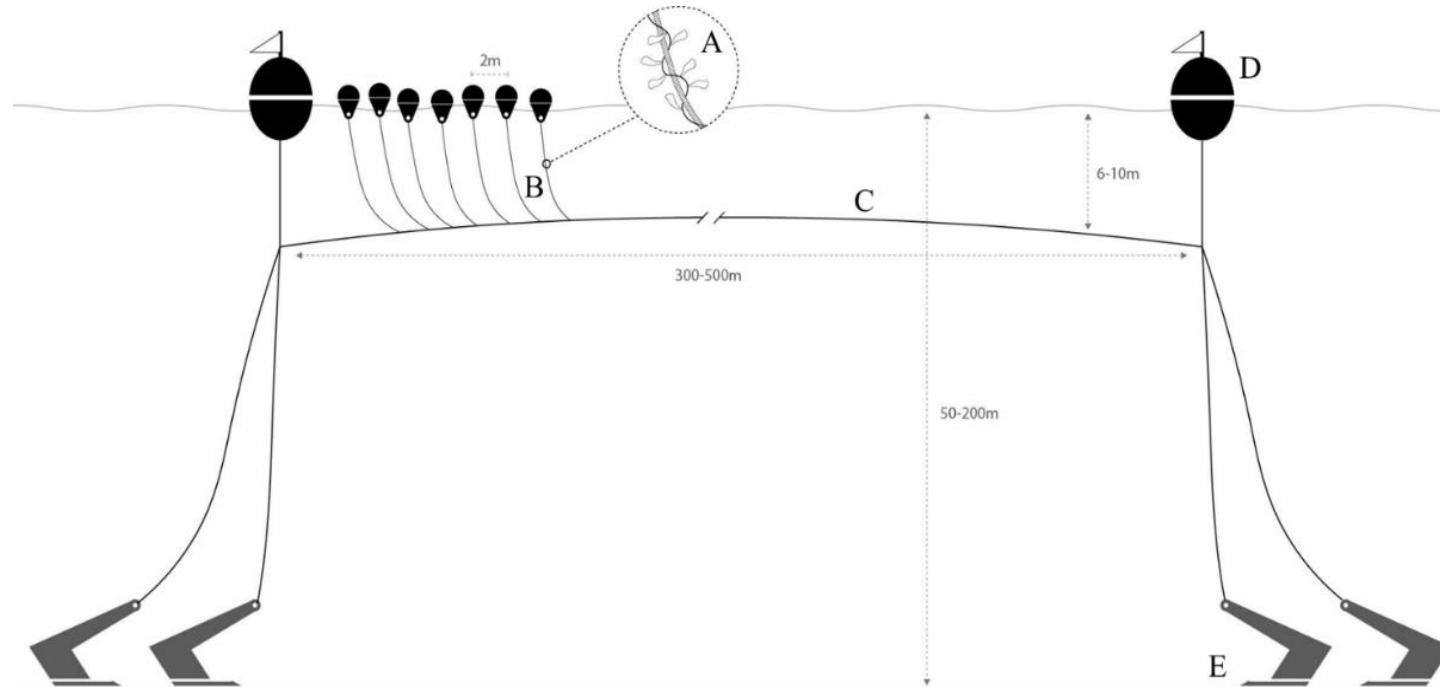
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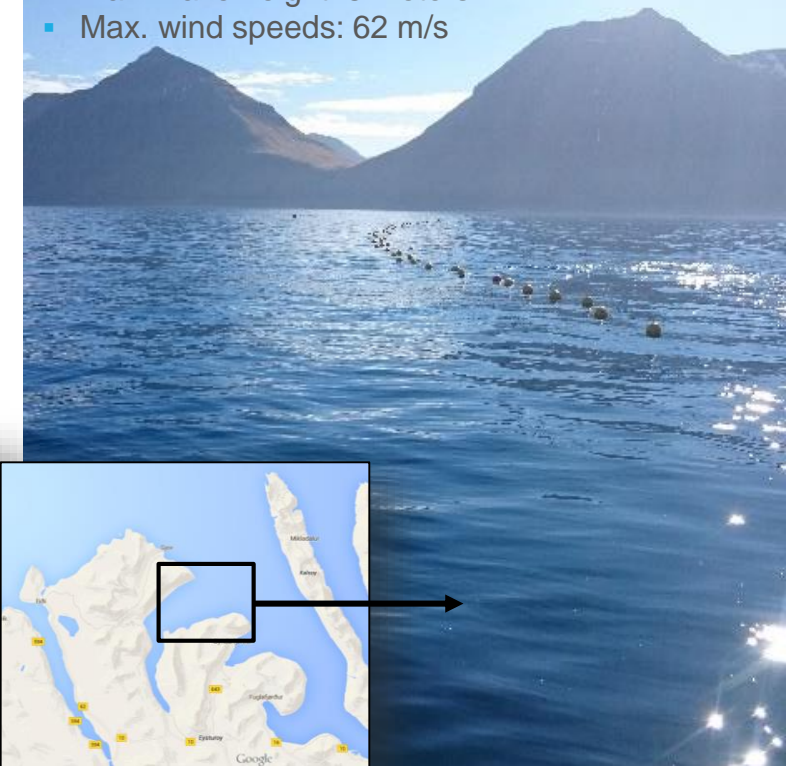
Macro Cascade project:
 Funded by BBI JU
 Budget 4.2 mio EURO
 Started: 1st October 2016
 Ends: 1st October 2020
 12 partners
 Three sub-contractors

The MacroAlgal Cultivation Rig (MACR)



Funningsfjørður, Faroe Islands

- Water depth: 50-70 meters
- Water temperature: 7-11 °C
- Salinity: approx. 35 ‰
- Current: 1-3 knots
- Max. wave height: 8 meters
- Max. wind speeds: 62 m/s



Publication in Algal Research: Bak et al. (2018) "Production method and cost of commercial-scale offshore cultivation of kelp in the Faroe Islands using multiple partial harvesting"



Reliable seaweed biomass supply



Sep 2019 harvest

Growth since
May 2019

Reliable seaweed biomass supply



ELSEVIER

Contents lists available at ScienceDirect

Algal Research

journal homepage: www.elsevier.com/locate/algal



Production method and cost of commercial-scale off-shore seaweed biomass in the Faroe Islands using multiple partial harvesting. **Cost \$ / dry metric tonne**

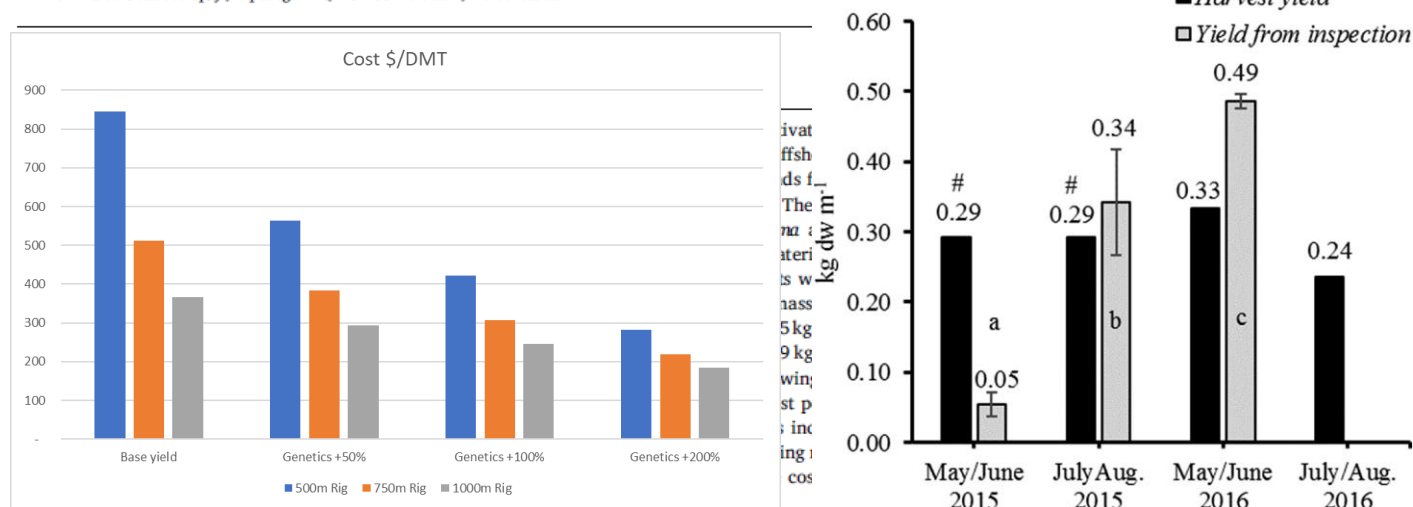
Urd Grandorf Bak^{a,b}, Agnes Mols-Mortensen^{c,d}, Olavur Gregersen^{a,*}

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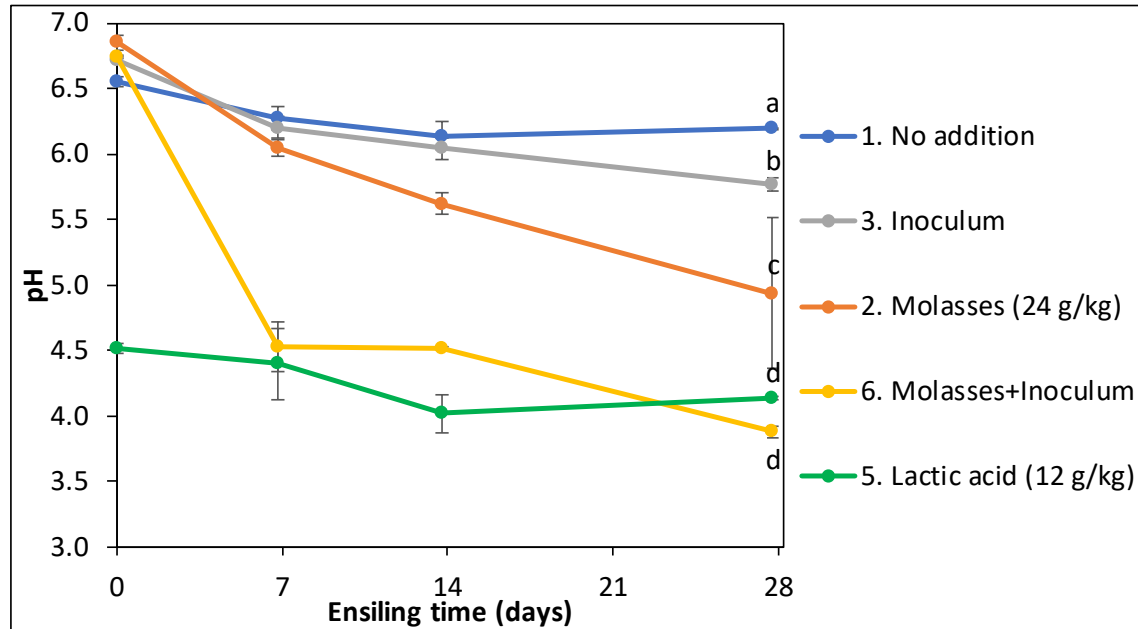
^c Fiskadling - Aquaculture Research Station of the Faroes, FO-430 Hvalvík, Faroe Islands

^d TARI - Faroe Seaweed Sp/f., Vípuvegur 14, FO-100 Tórshavn, Faroe Islands



Cost-efficient storage conditioning

Several treatments, lab scale



Letters indicate LSD groups ($P < 0.05$)

Pilot trial using IBC-container (3x1m³) and barrels with lactic acid treatment



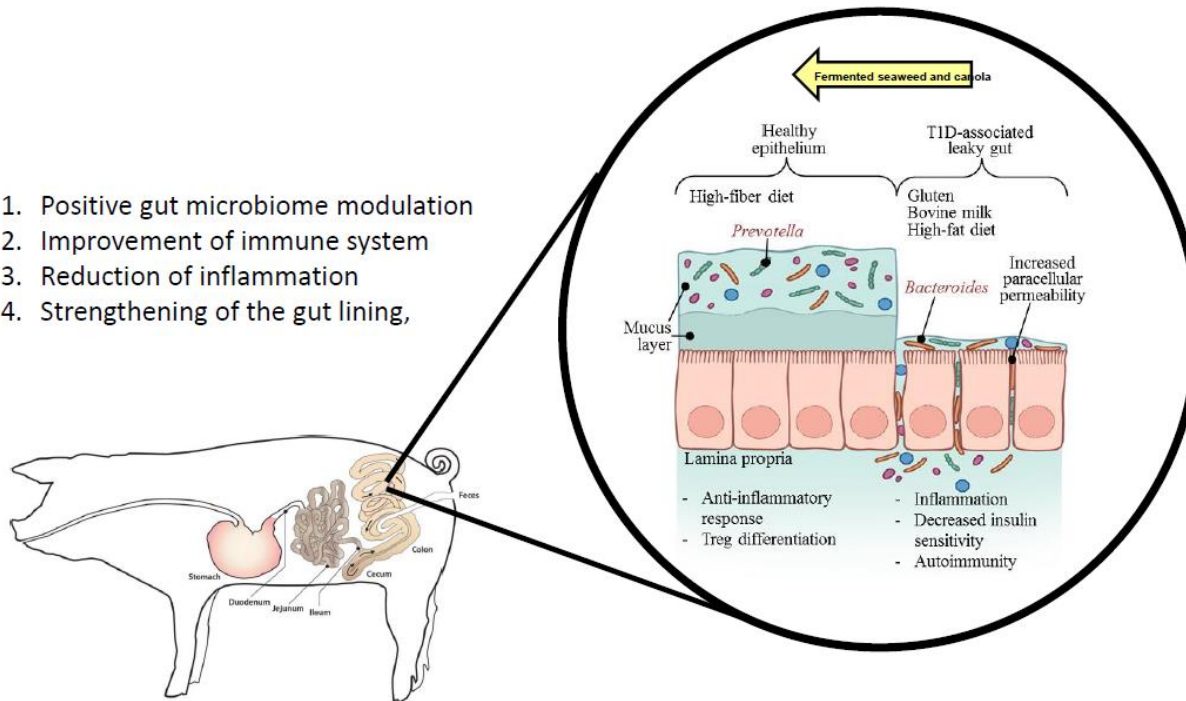
Successful ensilage has a good smell and green colour after 12 month of storage



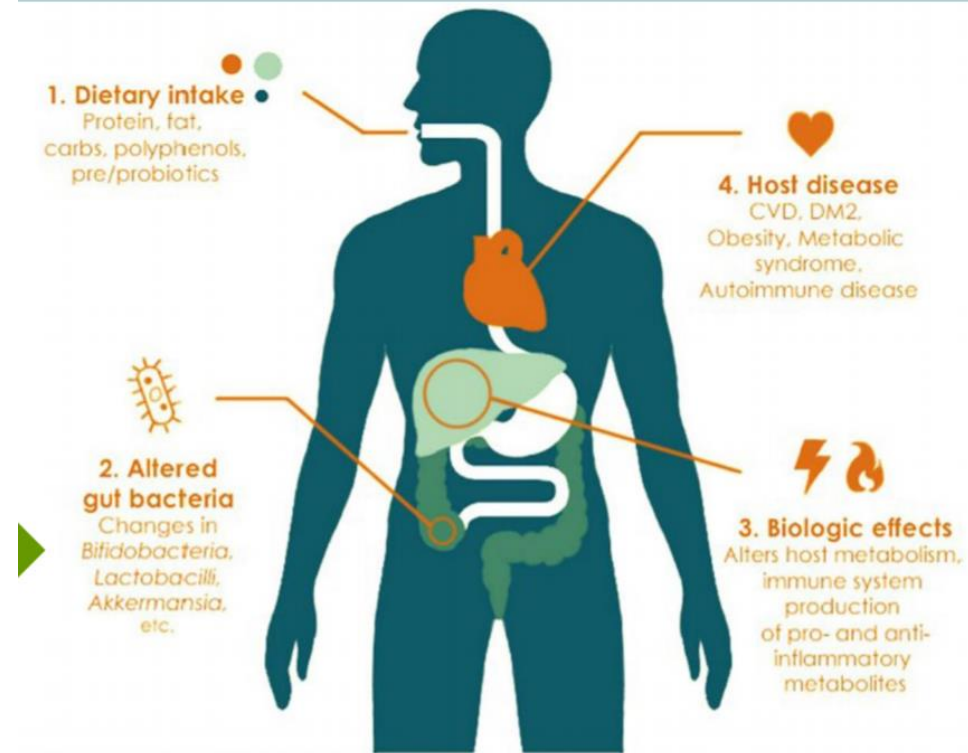
Functional ingredients for improved health in animals and human beings

Tested on 600 pigs

1. Positive gut microbiome modulation
2. Improvement of immune system
3. Reduction of inflammation
4. Strengthening of the gut lining,

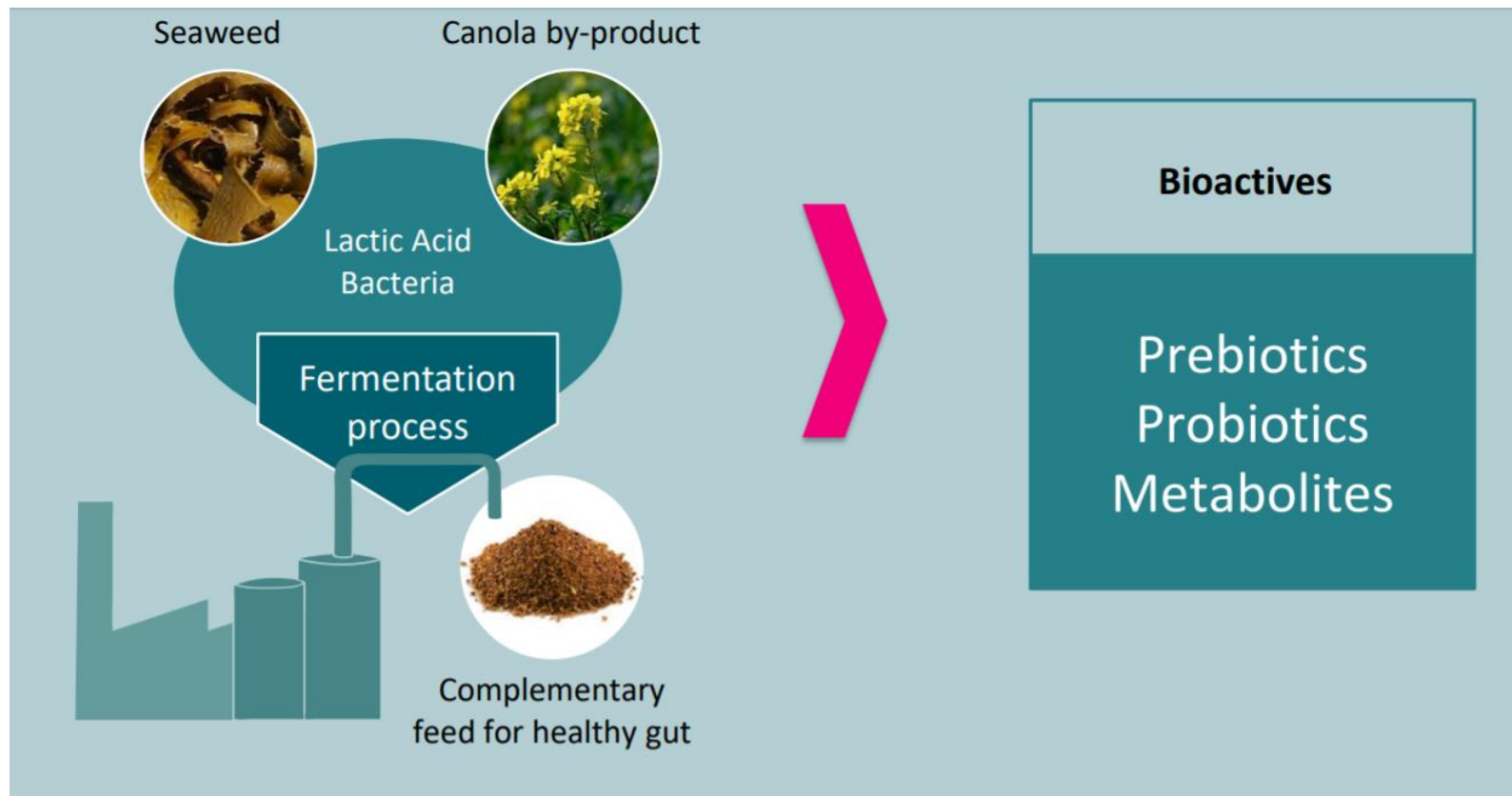


Currently testing on 30 patients

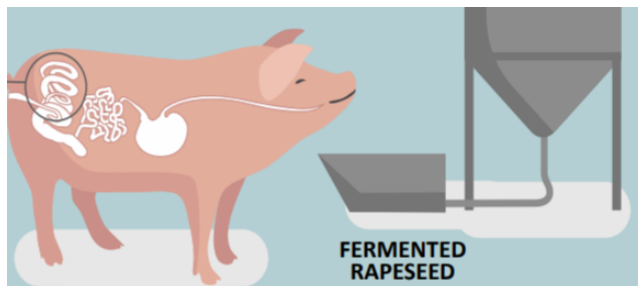


Credit: J Transl Med. 2017; 15(1):73. doi: 10.1186/s12967-017-1175-y

Functional ingredients for improved health in animals and human beings

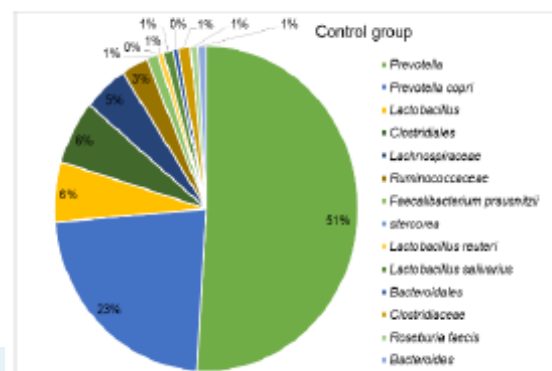


Functional ingredients for improved health in animals and human beings

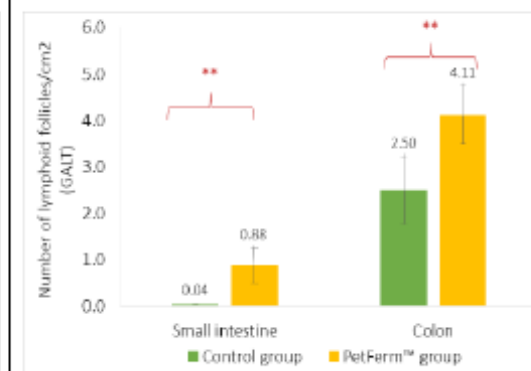


STILL WAITING
FOR THE
CLINICAL
TRIAL
RESULTS!

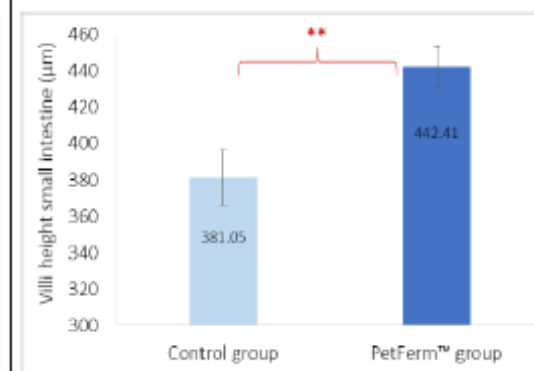
Gut microbial modulation



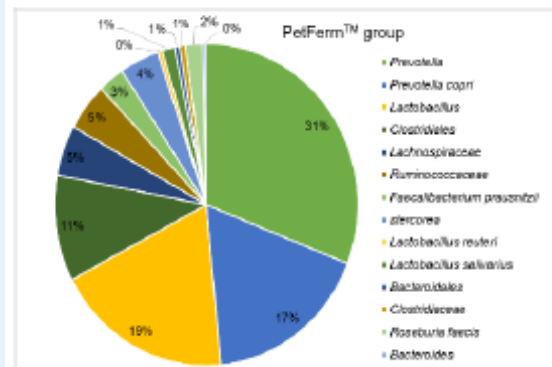
Improvement of the immune system



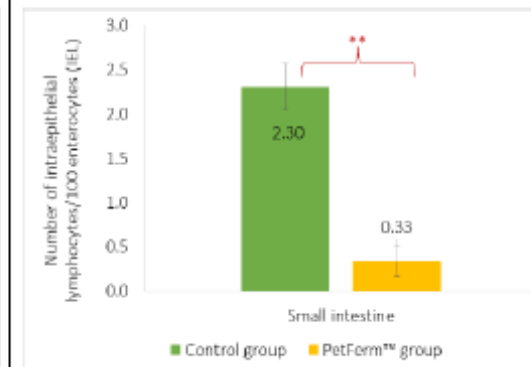
Strengthening of the gut lining



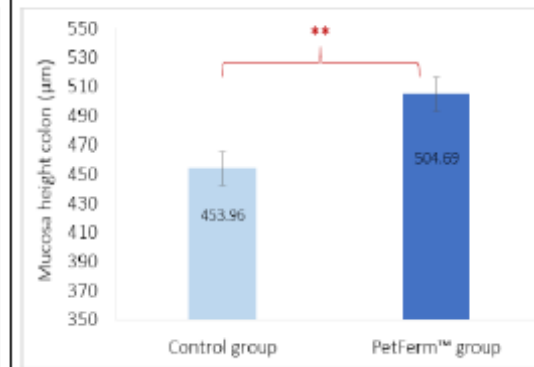
Gut microbial modulation



Reduction of low-grade inflammation

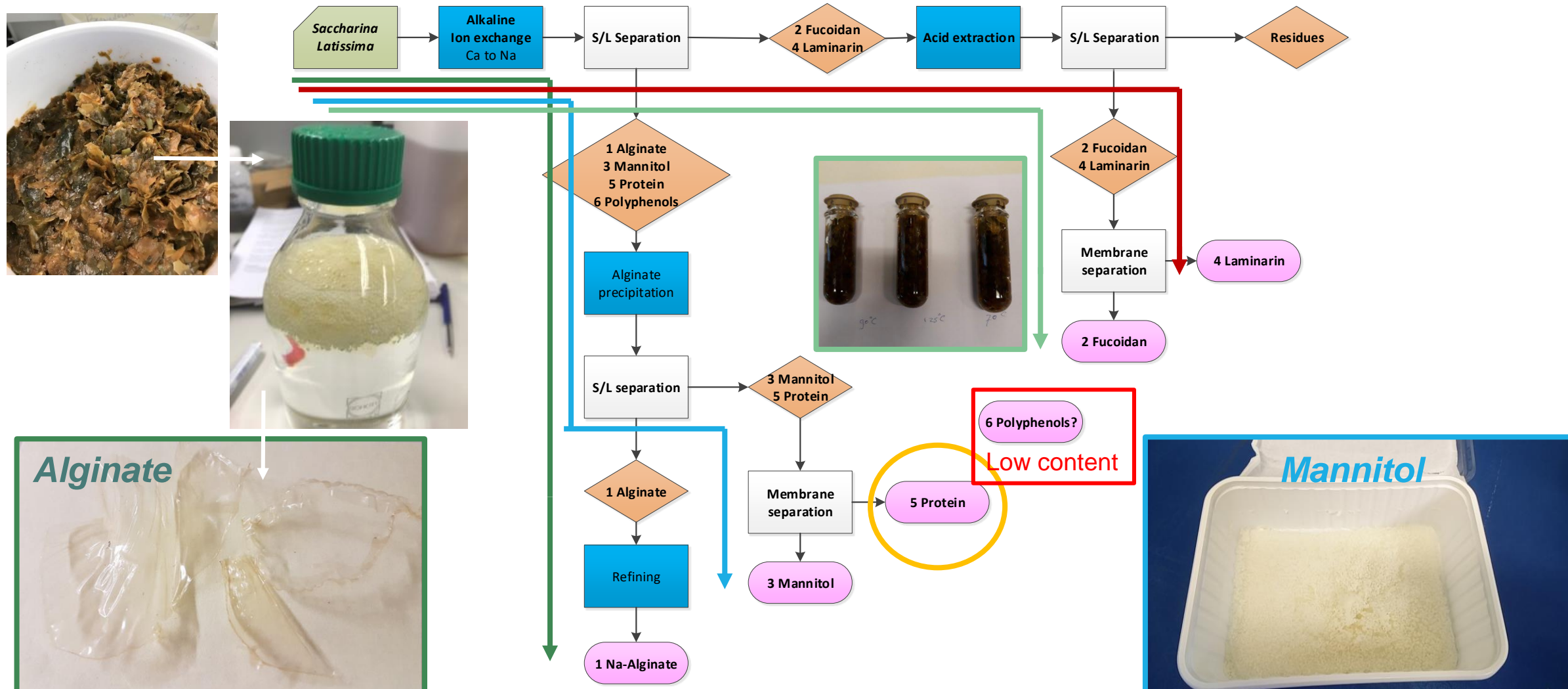


Thickening of colon mucosa



Figures are data from an *in vivo* trial in nursery pigs. Piglets were fed with a commercial basal diet used as positive control and with the addition of 2.5 % fermented seaweed and canola into the basal diet. Blood, gut content and gut tissues were sampled from N=10 piglets after 4 weeks of the dietary regimes. Differences between groups (T-test; $p < 0.05$).

Conceptual Biorefinery scheme





CO₂ uptake



Reduces global heating and
acidification of the oceans



Uptake of nutrients



Provides bioremediation of
excess supply of nutrients
(nitrogen and phosphorus)



Creates ecosystems



Provides ecosystems
services for fish and
other marine life

Summary

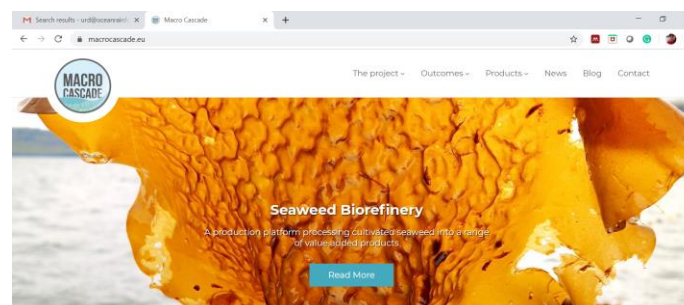
- Initial phase of selective breeding – crucial for the industry to grow
 - **Next step:** Continue breeding for increased yield per meter
- Good understanding of chemical composition and seasonal, site and depth variation (please ask for more info)
 - **Next step:** Product development and find market drivers
- Ensilage can overcome the challenge of year-around supply and it is a cost-efficient way compared to drying.
 - **Next step:** Scaling up and optimise logistics
- Fermented seaweed products can increase the gut health of pigs (and maybe also humans!)
 - **Next step:** Documentation of effect for patients and
- Seaweed fractionation with multiple products is proven in lab-scale
 - **Next step:** Pilot Biorefinery Plant close to biomass source! 12

Acknowledgement



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<https://www.macrocascade.eu/>



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