Kiel University
Christian-Albrechts-Universität zu Kiel

Faculty of Medicine

Fucoidans in ocular health – bio-activities with high (market) potential

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Germany

Interreg Deutschland - Danmark

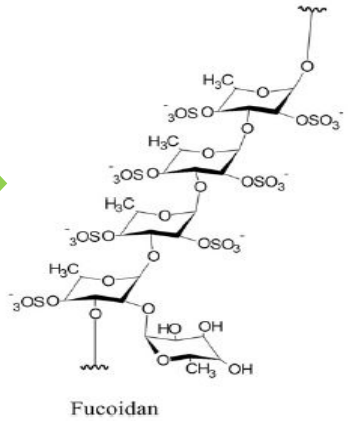
EUROPEAN UNION

FUCOSAN

Fucoidans

Constituent of brown seaweed (phaeophyceae, cell wall):
Complex sulphated polysaccharide (high content of L-Fucose)

- **Promising biological activities**
  - anti-oxidant
  - anti-inflammatory
  - anti-thrombotic
  - anti-angiogenic
  - Xxx



➡ Heterogeneous und versatile

Fotos: Fucosan

Garcia-Vaquero, Food Res Internat 2017; 99:1011

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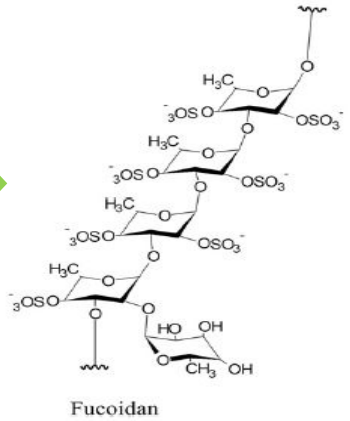

Ophthalmology **Regenerative Medicine** **Cosmetic**

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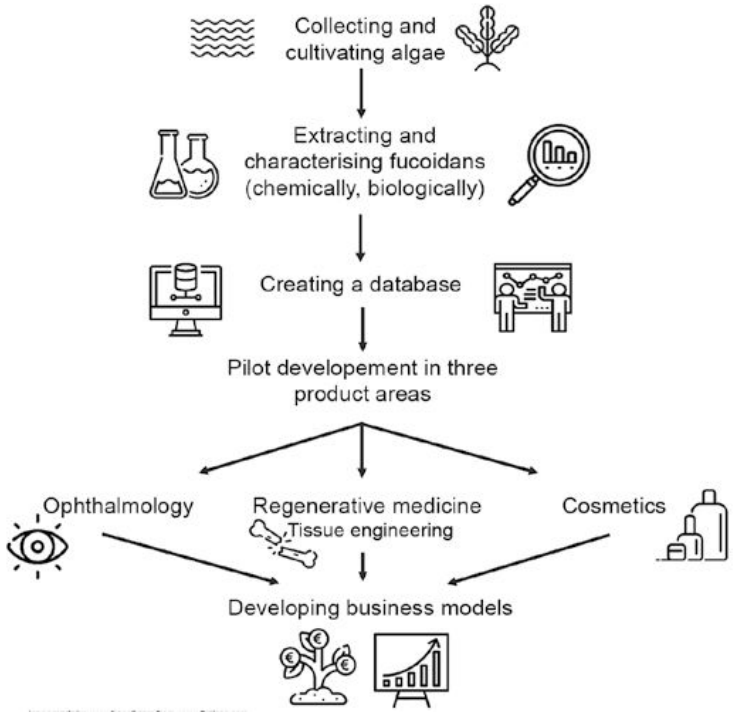
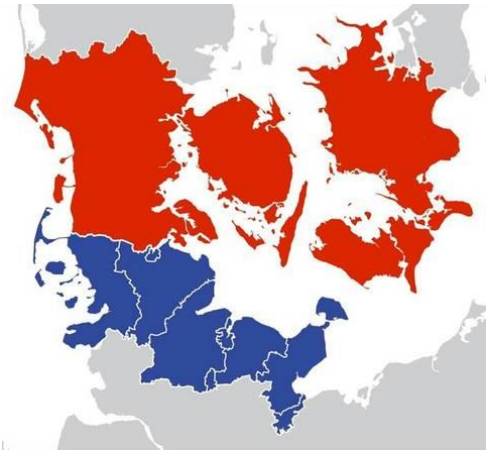
FucoSan – Health from the sea

InterReg5a – Deutschland - Danmark
-> EU Programme to support the German-Danish Border Region





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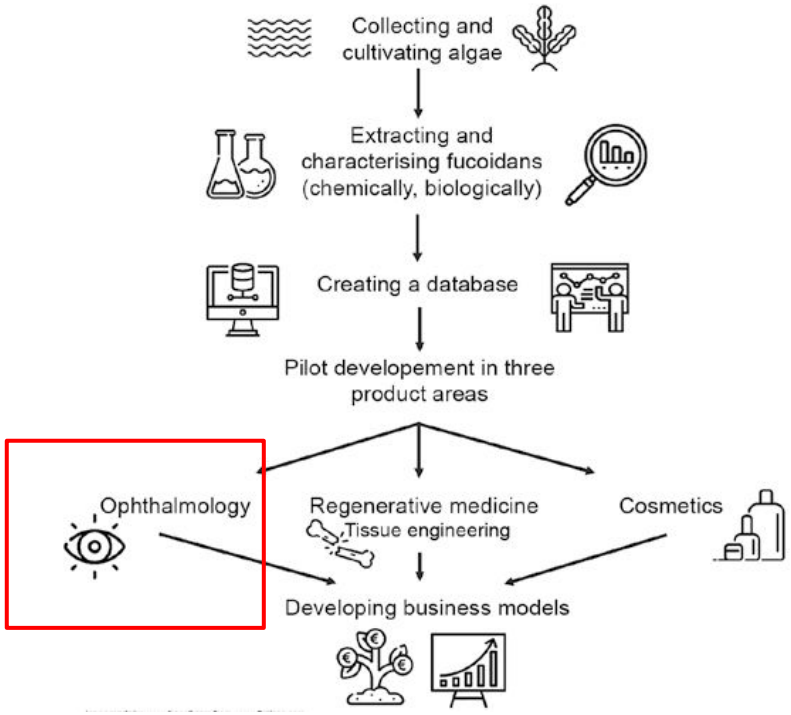
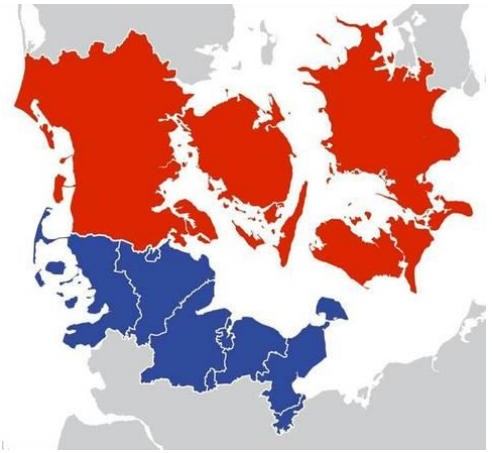




UKSH

OUH SDU

CAU Christian-Albrechts-Universität zu Kiel

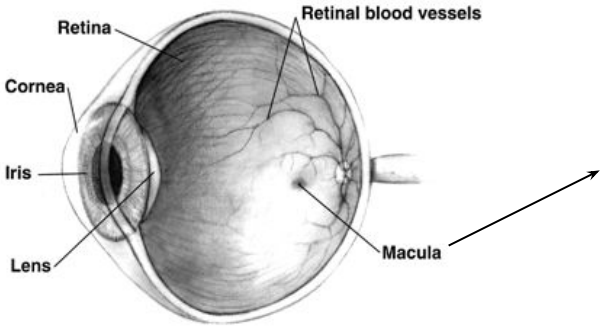
Danmarks Tekniske Universitet DTU

GEOMAR oceanBASIS sea.science.solutions. CRM Coastal Research & Management

CAU Kiel University Christian-Albrechts-Universität zu Kiel Faculty of Medicine

Age-related macular degeneration

Main cause for blindness of the elderly in the industrialized world



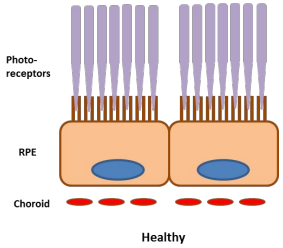


Foto: Wikipedia, privat

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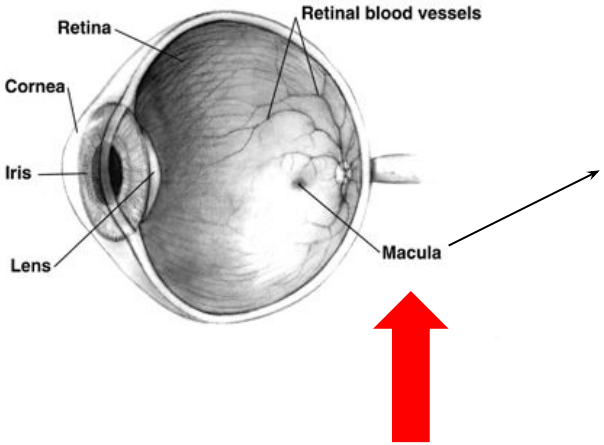

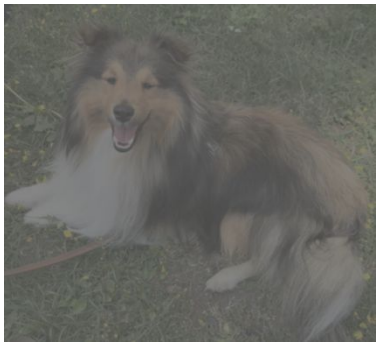

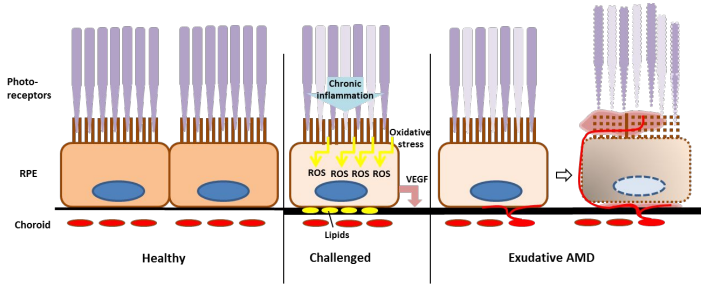

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Dörschmann & Klettner, Int J Mol Sc, 2020

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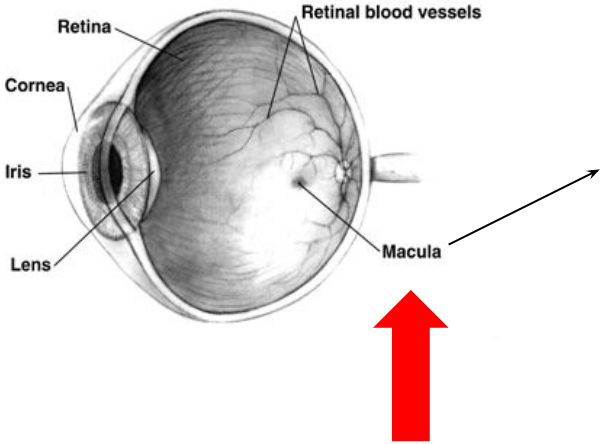
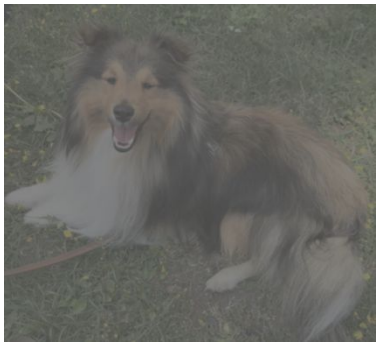
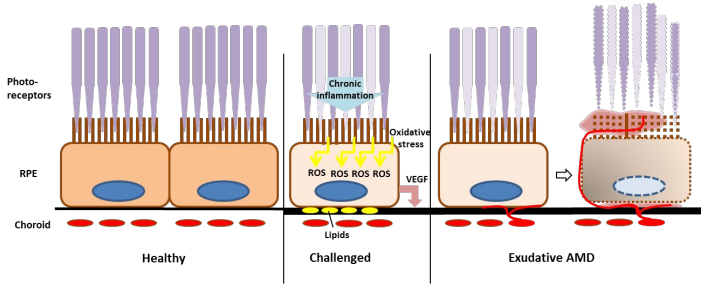
VEGF-antagonists







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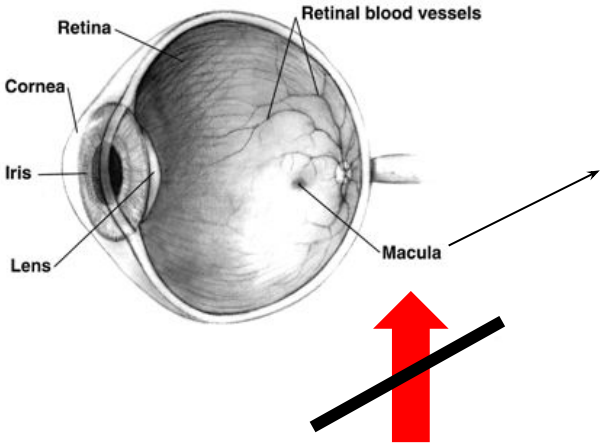

Fucoidan ?

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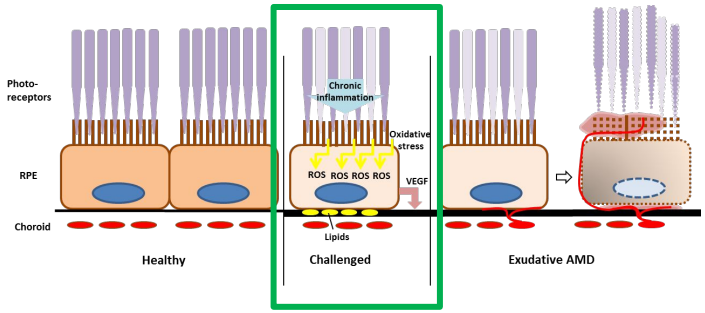

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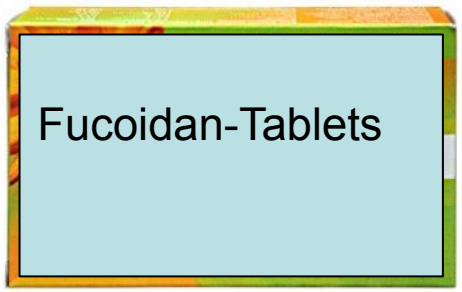
Fucoidan – potential product development

Therapeutic

Food supplement



Age-related macular degeneration – market potential

- ca. 20 million affected with AMD in Europe
- ca. 15 million affected in the USA
- global AMD market $5,335.7 million in 2015[1]
- expected to grow at 7.6% during 2016 – 2022[1]
- 196 million worldwide predicted for 2020[2]
- 288 Millionen Betroffen geschätzt für 2040[2]

One application VEGF-antagonist (Lucentis): 1300 € (ca. 9.100 €/year)

Current spending for dietary supplement per patient/year 150 €[3]

[1] *P&S Market Research, Market Analysis AMD*
[2] *Wong Lancet Glob Health. 2014, 2:e106-16*
[3] *Matamoros et al. Ophthalmologica. 2015,234:151*

Fucoidans

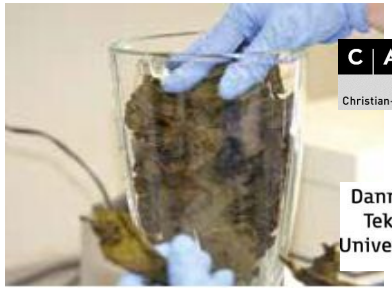
Algal species	Origin
Saccharina latissima	North Atlantic Ocean
Dictyosiphon foeniculaceus	Baltic Sea
Laminaria digitata	North Atlantic Ocean
Fucus vesiculosus	Baltic Sea
Fucus serratus	Baltic Sea
Fucus distichus subsp. *evanescens*	Baltic Sea
Laminaria hyperborea	North Atlantic Ocean
Ascophyllum nodosum	North Atlantic Ocean

Saccharina latissima
Sugar kelp

Laminaria hyperborea
Cuvie/Tangle

http://www.seaweed.ie/descriptions/Laminaria_hyperborea.php

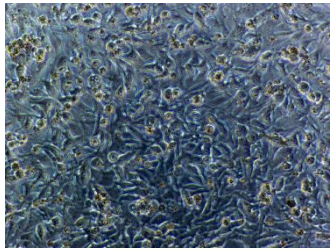
FucoSan Workflow Ophthalmology

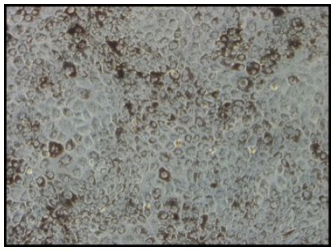


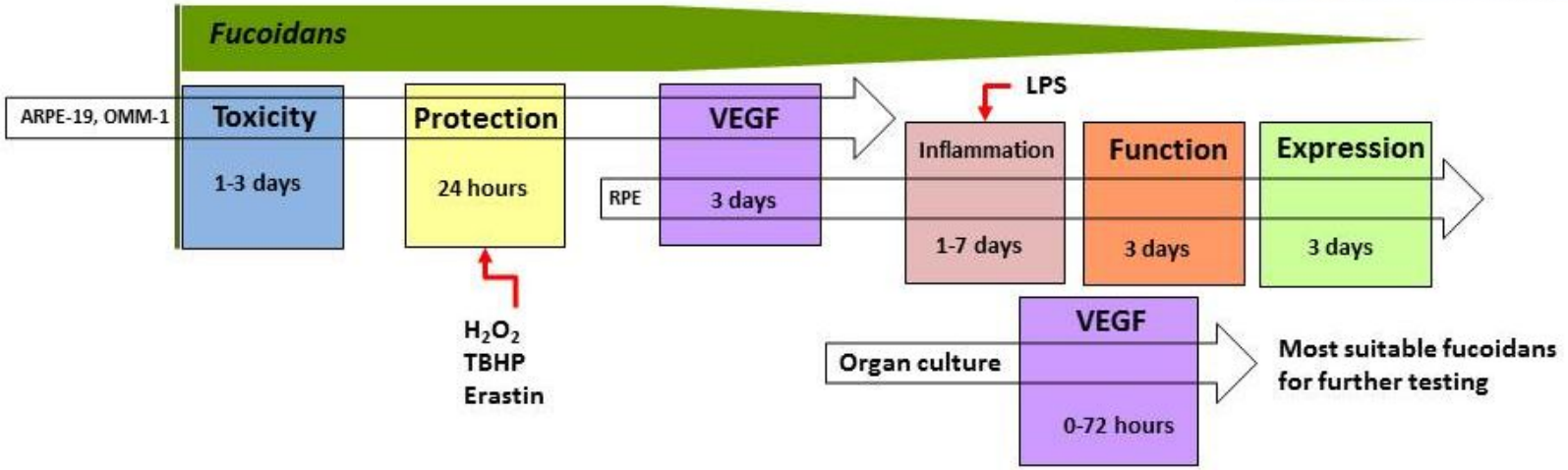
SEC-UV-MALS-DLS-VIS-RI

Fotos: Fucosan, UKSH-Ophta, CAU-Pharma

Fucoidan Workflow Ophthalmology







Basic charactisation > 80 soluble extracts✔

Ongoing tests of promising extracts

Fotos: UKSH-Ophta

Fucoidane

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Laminaria digitata	North Atlantic Ocean
Fucus vesiculosus	Baltic Sea
Fucus serratus	Baltic Sea
Fucus distichus subsp. *evanescens*	Baltic Sea
Laminaria hyperborea	North Atlantic Ocean
Ascophyllum nodosum	North Atlantic Ocean

Saccharina latissima
Sugar kelp

Laminaria hyperborea
Cuvie/Tangle

http://www.seaweed.ie/descriptions/Laminaria_hyperborea.php

Identified extracts for further testing

Challenges

- High amount of algae would be needed (wet weight Algae = 0.7 % fucoidan)
- Sustainable harvest (farming?)
- Enviromental conditions of harvested algae should be similar (-> Influence on fucoidan structure

Algae dry masses (%) and yields of fucoidans (%) related to both the algae wet and dry mass, respectively.

	Algae dry mass (%)	Yield wet mass (%)[a]	Yield dry mass (%)
F.v.-fuc	31.7	0.8	2.6
F.s.-fuc	25.0	0.7	2.9
F.e.-fuc	21.7	1.0	4.5
D.f.-fuc	12.3	0.6	2.0
L.d.-fuc	13.3	0.7	2.2
S.l.-fuc	10.9	0.6	5.3

[a] The wet mass was determined after dripping off of the washed algae (last washing with 70% (v/v) ethanol) on cellulose cloth. (n = 3).

Bittkau et al. Algal Res, 2010, 101759

Foto: Fucosan

Many thanks to

Benefactors

Michaela Dithmer

Philipp Dörschmann

All FucoSan Partners

Dette projekt finansieres af midler fra Den Europæiske Fond for Regionaludvikling. | Dieses Projekt wird gefördert mit Mitteln des Europäischen Fonds für regionale Entwicklung.