



3rd Seaweed 4 Health Conference, online May 18-20, 2021



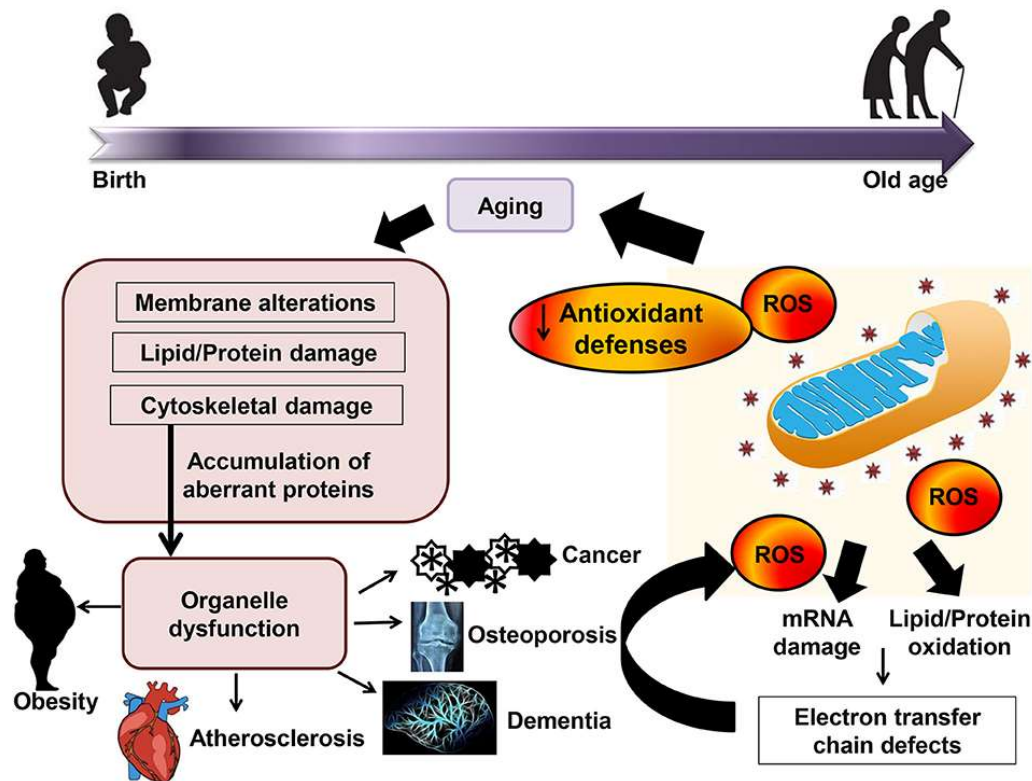
Can we be young forever?

Macroalgae as sources of antiaging compounds

M. Carmo Barreto, Gonçalo P. Rosa, Ana M.L. Seca
FCT-Azores University & cE3c-Azorean Biodiversity Group



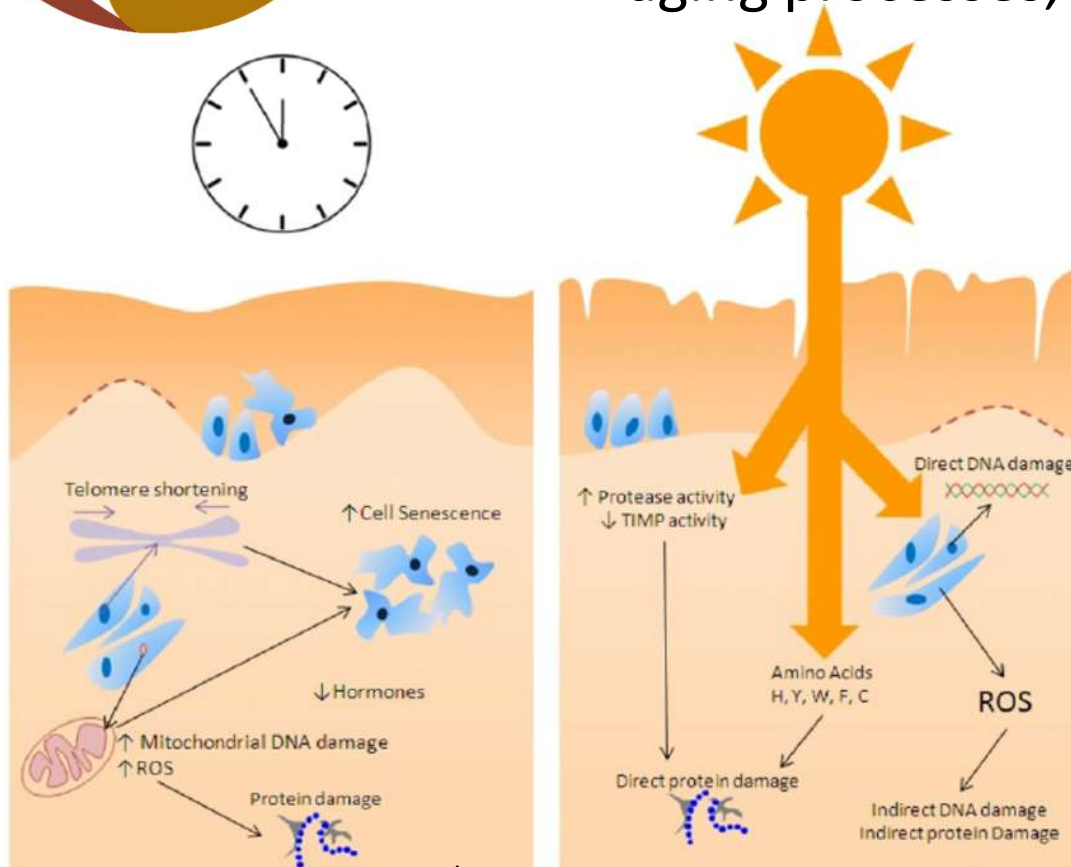
Aging: accumulation of degenerative damages, ultimately resulting in the death of an organism.



Skin structure and composition is markedly affected by aging processes, intrinsic or extrinsic.

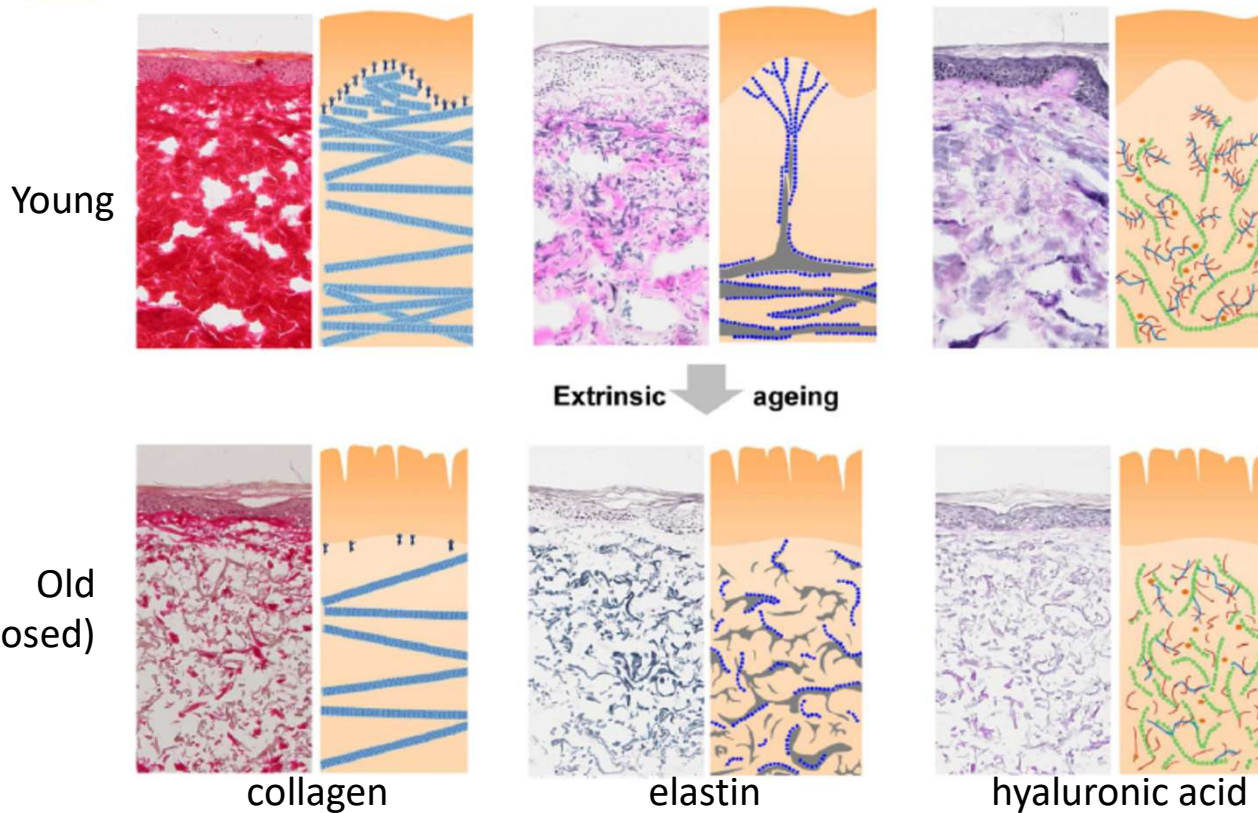
Skin aging – not only a matter of vanity!

- ↓↓ Protective barrier against infection, water loss, extremes of temperature, UV damage, harmful chemicals...
- ↓↓ Vitamin D synthesis
- ↓↓ Sensory functions
- ↓↓ Self esteem



Naylor et al., 2011, doi: 10.1016/j.maturitas.2011.04.011

Both intrinsic & extrinsic ageing have negative impact on fibroblast and keratinocyte viability and function and on structural molecules.

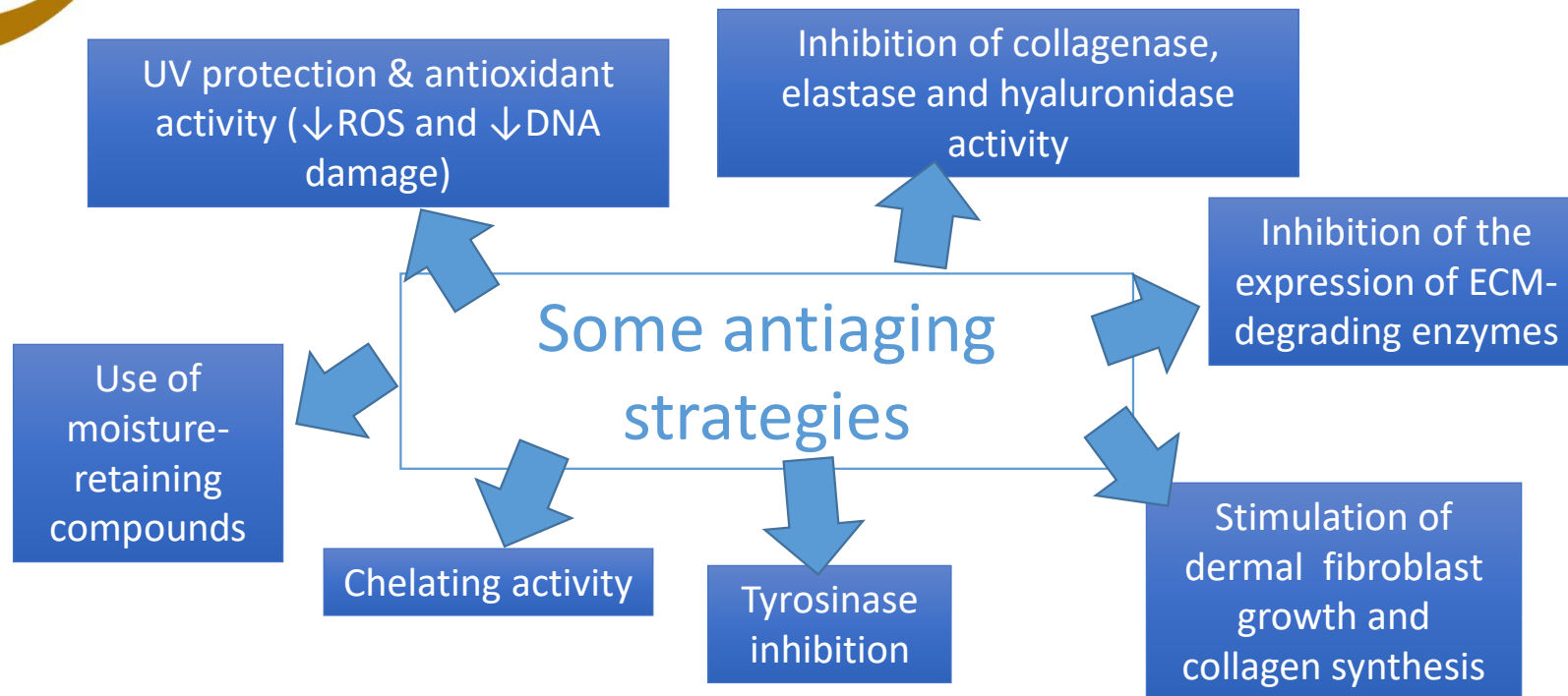


- Collagen, elastin and hyaluronic acid synthesis decreases.
- Collagenase, elastase and hyaluronidase expression and activity increase.
- Tyrosinase deregulation

Loss of structure, elasticity and moisture. Wrinkles, hyperpigmentation spots.



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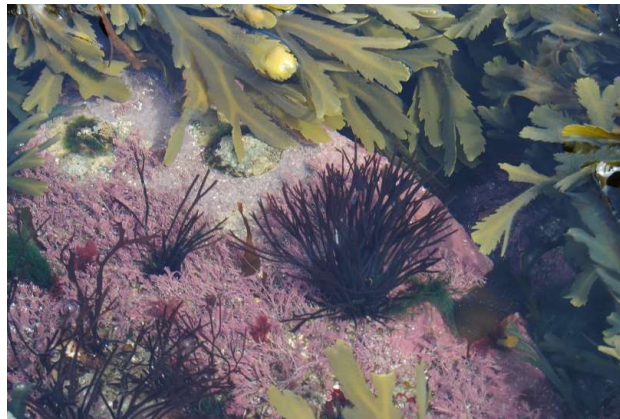




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Marine macroalgae are often rich in compounds that confer protection against environmental stresses, such as desiccation, temperature changes, sun exposure (UV, ROS formation), predation...



High tide:

- Submerged in water



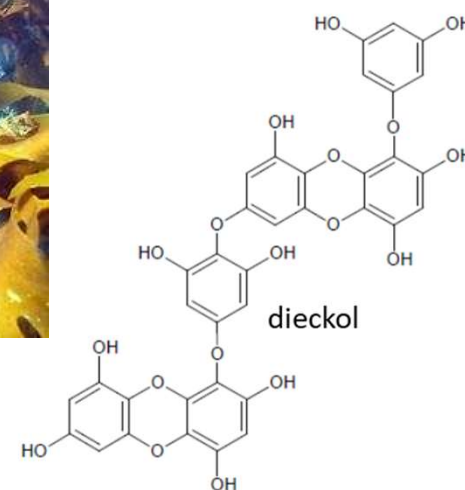
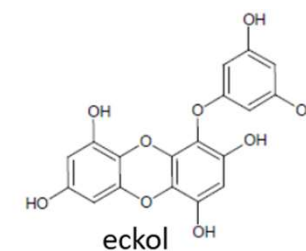
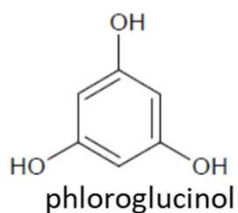
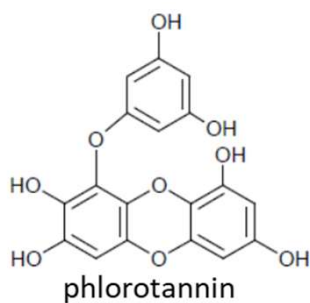
Low tide:

- Exposed to air (desiccation, UV)

These compounds are often bioactive, namely: antioxidant, UV protective, retain moisture, antibacterial, cytotoxic, anti-inflammatory, inhibit several enzymes...

Chemically diverse compounds and activities:

Polyphenolic compounds: UV protection and tyrosinase inhibition (e.g., *Ecklonia cava*)



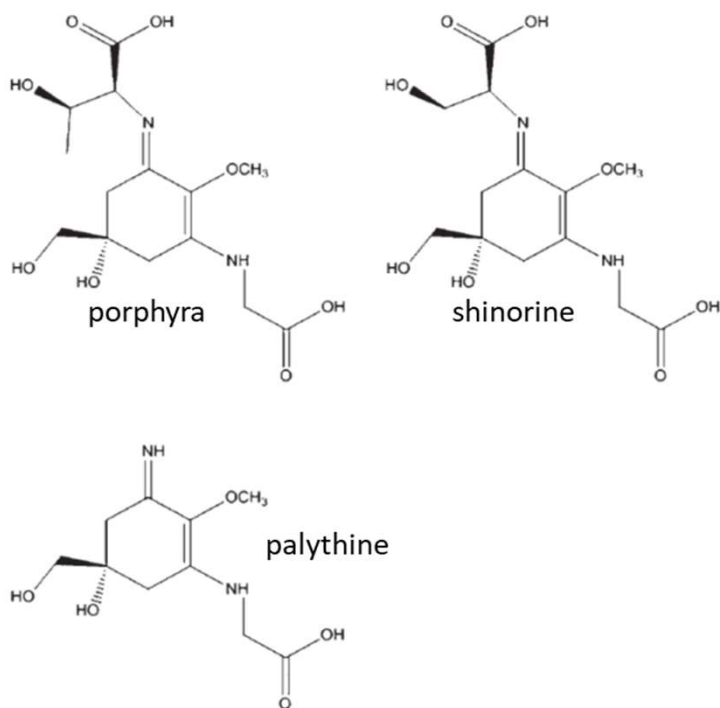


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Chemically diverse compounds and activities:

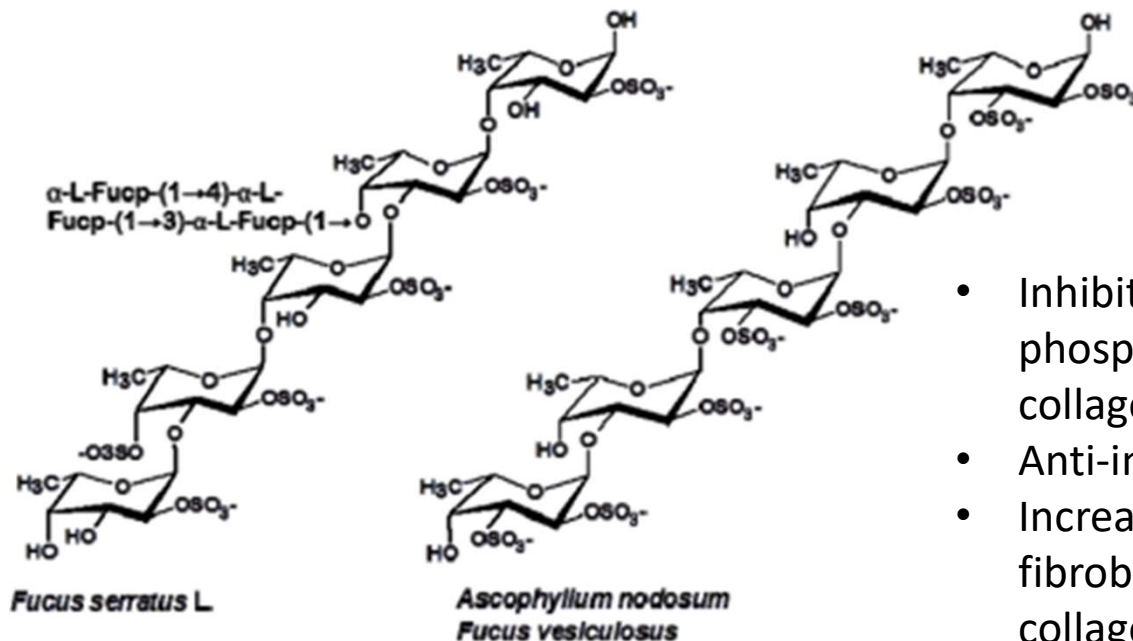
Mycosporine-like aminoacids isolated from *Palmaria palmata* and *Porphyra* sp: collagenase inhibitors



Hartmann et al., 2015, doi: 10.1055/s-0035-1546105

Chemically diverse compounds and activities:

Fucoidans (*Fucus vesiculosus* and *Fucus* sp.)



- Inhibition of hyaluronidase, phospholipase A2, and collagenase expression
- Anti-inflammatory effect
- Increase in nº of dermal fibroblasts & deposition of collagen & collagen tightness.



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The cosmetic industry usually works with seaweed extracts, therefore it is useful to carry out assays with extracts from:

- Beach-casts, as a whole or separated into groups (species / genera)
- Macroalgal species collected near the shore



Bioactivity
determination
concomitant with the
phytochemical
characterization of the
seaweed extracts.

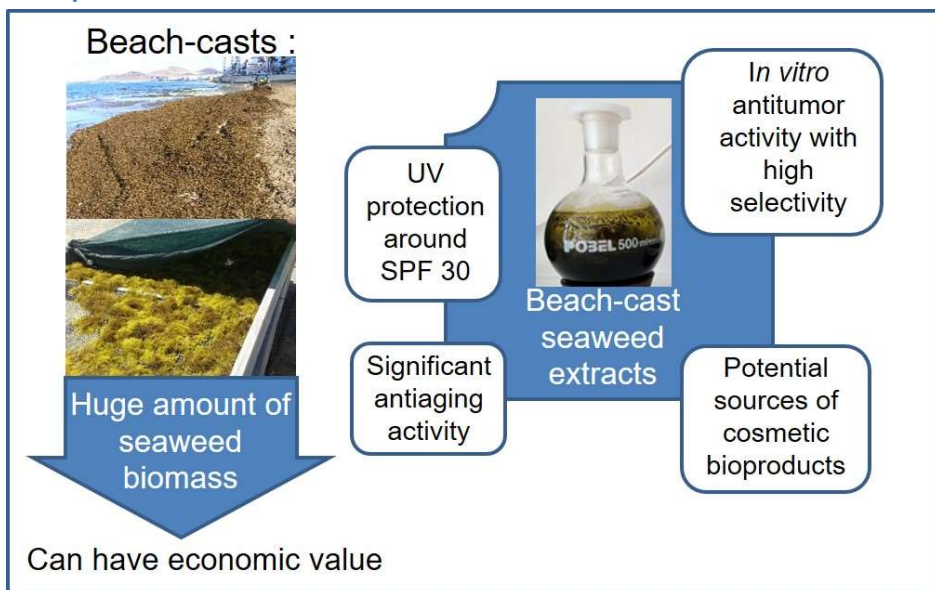


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Zarate et al, 2020. Pharmacological and Cosmeceutical Potential of Seaweed Beach-Casts of Macaronesia. doi:10.3390/app10175831

Graphical abstract:



Most significant skin antiaging activities:

- Antioxidant
- UV Protection
- Tyrosinase inhibition
- Collagenase inhibition

UV protection

Sample	SPF	Sample	SPF
3.E	32.95 ± 0.49	8.M	32.88 ± 1.30
3.M	33.93 ± 1.83	9.E	33.37 ± 1.25
4.E	31.27 ± 0.52	9.M	33.54 ± 2.23
4.M	33.15 ± 1.95	10.E	31.34 ± 0.48
5.E	34.03 ± 1.03	10.M	30.48 ± 0.59
5.M	33.38 ± 1.68	11.E	33.19 ± 0.52
6.E	32.41 ± 1.34	11.M	34.37 ± 3.32
6.M	34.37 ± 0.95	12.E	31.31 ± 0.88
7.E	31.12 ± 0.78	12.M	32.48 ± 1.51
7.M	32.82 ± 0.34		
8.E	33.62 ± 1.67	Standard	32.86 ± 1.46

Standard—Standard Darphin Soleil SPF30 sunblock.



MACBIOBLUE
Novos Produtos e Processos no Âmbito da Biotecnologia Azul da Macaronésia

<https://macbioblue.com/>

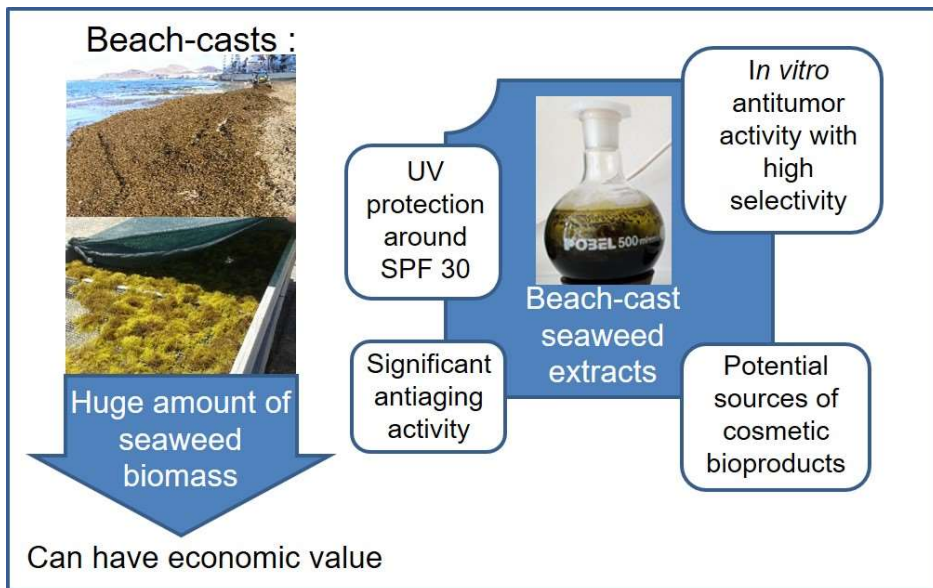


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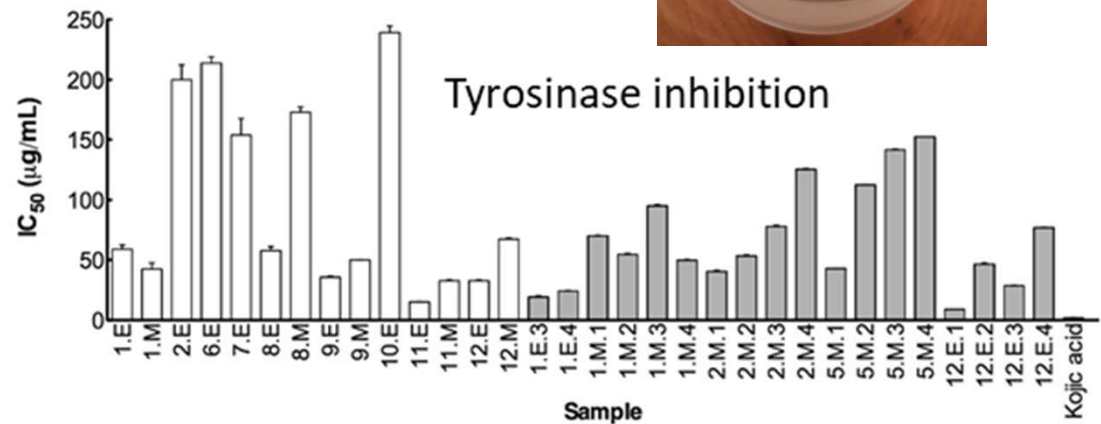
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grupo da
biodiversidade
dos açores
AFB

Ongoing work: bioassay-guided fractionation and phytochemical characterization of extracts from (1) highly active beach casts, (2) native seaweed species and (3) invasive seaweed species



Bioassay-guided fractionation

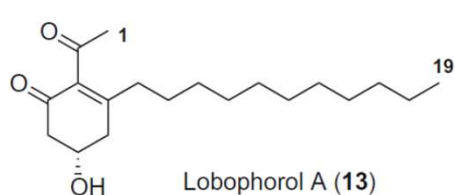
+



+ GC-MS,
LC-MS, NMR

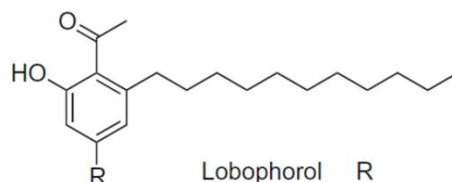
Bioactive
compound
characterization

2 pure compounds (derived from Lobophorol and Lobophopyranone) isolated from extract MBB-1 (100% *Lobophora* sp).

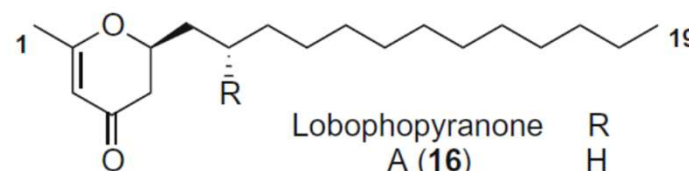


Lobophorol A (13)

Lobophorol – antibacterial activity



Lobophorol
B (14) R
C (15) H
OH



Lobophopyranone
A (16) R
B (17) H
OH

26 compounds identified by GC-MS: alkanes (13%), saturated and unsaturated carboxylic acids (48%), long-chain alcohols (4 %) and sterols (35%).

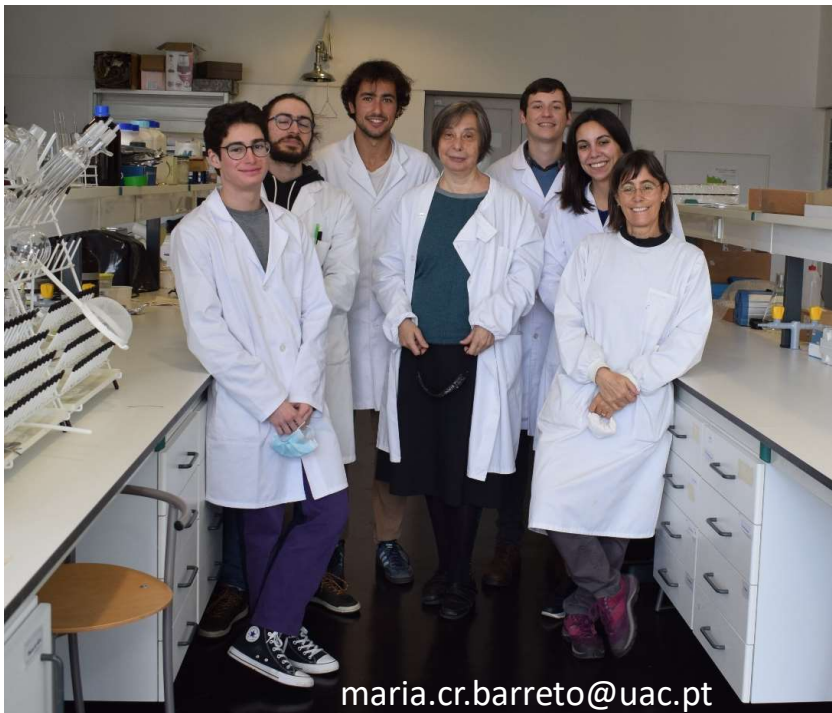


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Can we be young forever?

No, but we can delay many effects of the aging process, especially extrinsic aging, and seaweed can give an excellent contribution.



Thank you for your attention!

Thanks also due to:

- Our recently departed seaweed expert, Ana Neto
- The funding agencies



MACBIBLUE
Novos Produtos e Processos no Âmbito da Biotecnologia Azul da Macaronésia



MAC 2014-2020
Cooperación Territorial

Interreg
Fundo Europeo de Desenvolvimento Regional



FCT
Fundação para a Ciência e a Tecnologia



QR EN
QUADRO DE REFERÊNCIA ESTRATÉGICO NACIONAL PORTUGAL 2007-2013

POPH
PROGRAMA OPERACIONAL POTENCIAL HUMANO