Biography

Dr. Laurent Picot

OMICS International

- Dr. Picot currently is an assistant professor of biochemistry and pharmacology in the University of La Rochelle, France.
- His qualification includes
- PhD Post-doctoral position, University of La Rochelle, France: 2002-2005: Marine bioprospecting for anticancer peptides and pigments.
- PhD, June 2003, University of Rouen, France: Neuroscience and cellular microbiology of infectious diseases in the human central nervous system.
- Master 2 degree in Cellular and molecular Pharmacology, University Paris VI, France: Pharmacology of the NMDA receptor in the cortex of a genetic absence epilepsy rat model (neuroscience).
- Licence and Master 1 degree in Cell biology and physiology, university of Rouen, France.
- Training period in the Sanofi Winthrop pharmaceutical company.

Research Interests

- Marine and terrestrial Biochemistry and Pharmacology
- Biotechnology of marine resources
- Anticancer molecules
- Marine microalgae, pigments

Major achievements

2014	**Demonstrated the possibility to extract phycobiliproteins from marine microalgae using Microwaves-assisted extraction.**
2014	**Developed and optimized an extraction process to purify carotenoids from marine microalgae.**
2013	**Identified zeaxanthin and b-cryptoxanthin from *Cyanophoara paradoxa* as potent inhibitors of human invasive melanoma cells growth**
2012	**Developed and optimized an extraction process to purify metabolites from marine microalgae**
2012	**Reviewed the potential of microalgae for the production of bioactive molecules of pharmaceutical interest**
2012	**Reviewed all the data demonstrating the anticancer activity of microalgal epoxycarotenoids**
2011	**Identified Violaxanthin from *Dunaliella tertiolecta* as a potent inhibitor of human breast cancer cells growth**
2011	**Performed the first Microwaves-assisted extraction of phytoplankton pigments in the world**
2011	**Demonstrated that microalgae pigments have a high potential as tumor photosensitizers (ANR Project Photomer)**

Selected papers from our research group

- Juin C., Chérouvrier J.R., Thiéry V., Gagez A.L., Bérard J.B., Joguet N., Kaas R., Cadoret J.P. & **Picot L**. Microwave-assisted extraction of phycobiliproteins from *Porphyridium purpureum*. Accepted in *Applied Biochemistry and Biotechnology* 2014 (http://www.ncbi.nlm.nih.gov/pubmed/25231233).
- Juin C., Thiéry V., Cadoret J.P. & **Picot L.** Towards the clinical use of Phytoplankton carotenoid pigments to cure cancer. *Oceanography open access 1*(3), 2013.
- Baudelet P.H., Gagez A.L., Bérard J.N., Juin C., Bridiau N., Kaas R., Thiéry V., Cadoret J.P. & Picot L. Antiproliferative activity of *Cyanophora paradoxa* pigments in melanoma, breast and lung cancer cells. *Marine Drugs 11*(11), 4390-4406, 2013.
- Serive B., Kaas R., Bérard J.B., Pasquet V., Picot L. & Cadoret J.P. Selection and optimisation of a method for efficient metabolites extraction from microalgae. *Bioresource technology 124*, 311-320, 2012.
- Mimouni V., Ulmann L., Pasquet V., Mathieu M., **Picot L**., Cadoret J.P., Morant-Manceau A. & Schoefs B. The potential of microalgae for the production of bioactive molecules of pharmaceutical interest (review). *Current Pharmaceutical Biotechnology 13*(15), 2733-2750, 2012.
- Gagez A.L, Thiery V., Pasquet V., Cadoret J.P. & **Picot L**. Epoxycarotenoids and cancer (review). *Current Bioactive compounds 8*(2), *109-141,* 2012.
- Pasquet V., Morrisset P., Ihammouine S., Chepied A., Aumailley L., Berard J.B., Serive B., Kaas R., Lanneluc I., Thiery V., Lafferiere M., Piot J.M., Patrice T., Cadoret J.P. & **Picot L**. Antiproliferative activity of violaxanthin isolated from bioguided fractionation of *Dunaliella tertiolecta* extracts. *Marine Drugs 9*(5), 819-831, 2011
- Pasquet V., Chérouvrier J.R., Farhat F., Thiéry V., Piot J.M., Bérard J.B.,Kaas R., Serive B., Patrice T., Cadoret J.P. & **Picot L**. Study on the microalgal pigments extraction process: Performance of microwave assisted extraction. *Process Biochemistry* 46(1), 59-67, 2011.

- **Oceanography** is the science of oceans and seas including marine environment, coastal zone management, fishery economics, and marine pollution.
- Oceanography increases the scope of marine pollution impact and possible effects of the exploitation of marine resources, together with the role of the ocean in possible global warming and climate change.

- **Oceanography: Open Access** is an Open Access journal and aims to publish most complete and reliable source of information on the discoveries and current developments in the mode of original articles, review articles, case reports, short communications, etc. in all areas of the field and making them freely available through online without any restrictions or any other subscriptions to researchers worldwide

Dr. Laurent Picot, Associate editor of Oceanography Open access

Littoral Environment Society Environmental molecules and human health (UMRi CNRS 7266 LIENSs La Rochelle)

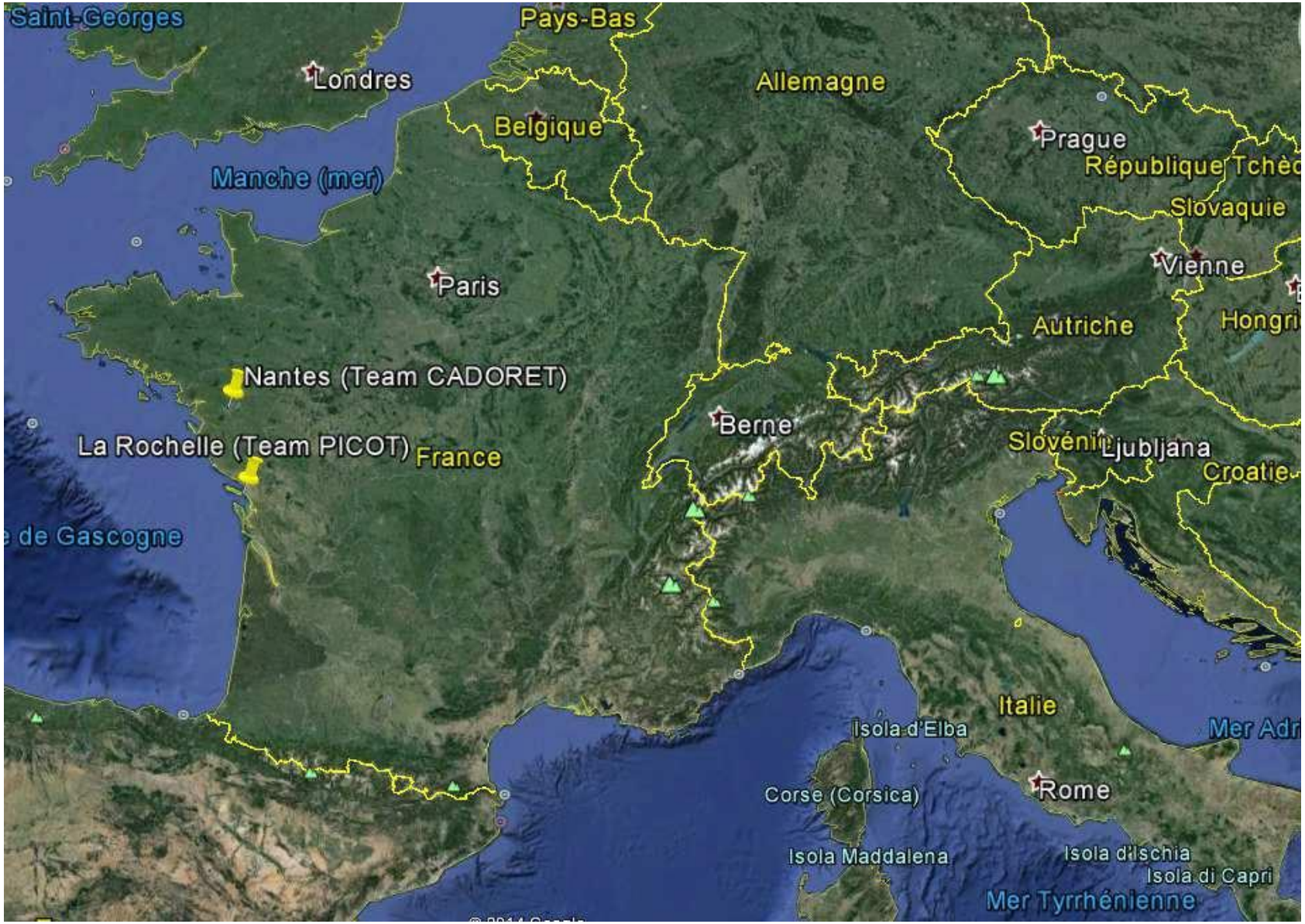
Pigment extraction, purification, chemistry and pharmacology

Our team has been working for years with IFREMER PBA Nantes lead by Dr Jean-Paul CADORET

JPC

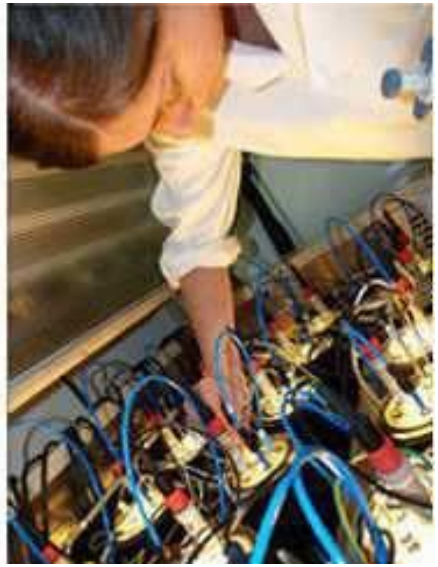
Algae Physiology and Biotechnology (PBA Nantes)

Microalgae culture, selection, molecular biology, biotechnology



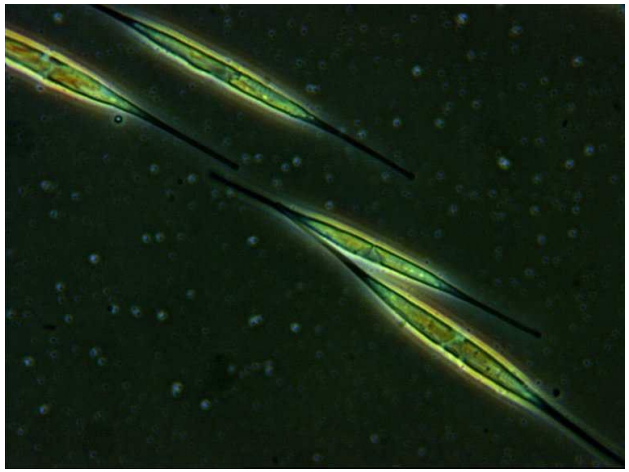
Location of the Labs : Nantes and La Rochelle, France

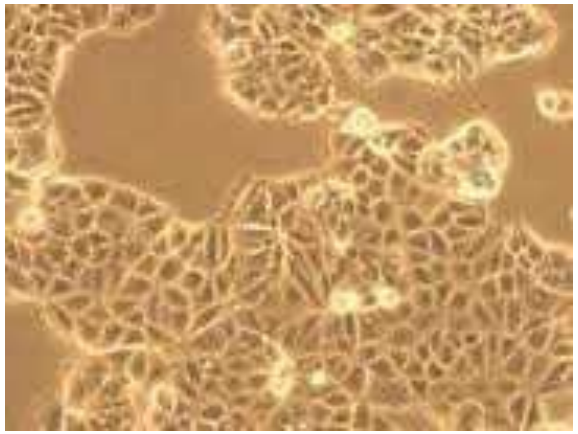


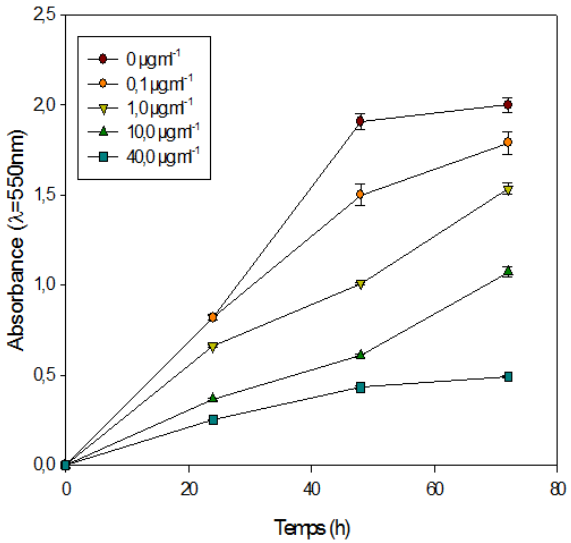




The Labs : PBA IFREMER Nantes and UMRi CNRS 7266 La Rochelle, France

Research and Methodology





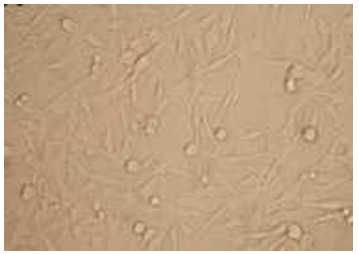


Our Research

Isolate bioactive pigments from marine microalgae, develop innovative extraction and purification processes.

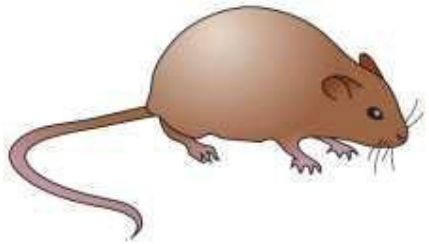
Clean and innovative pigments extraction processes

Understand the biological and pharmacological activity of microalgae pigments in cancer cells



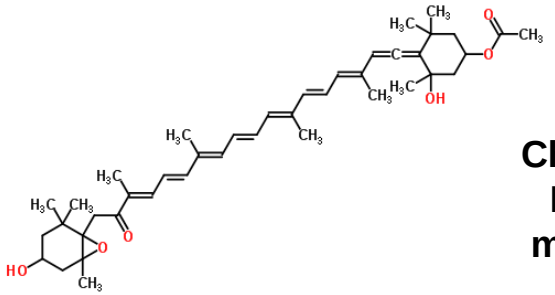
Proliferation studies, apoptosis, videomicroscopy

Confirm the anticancer activity *in vivo* in animal models and validate the clinical interest of microalgae pigments



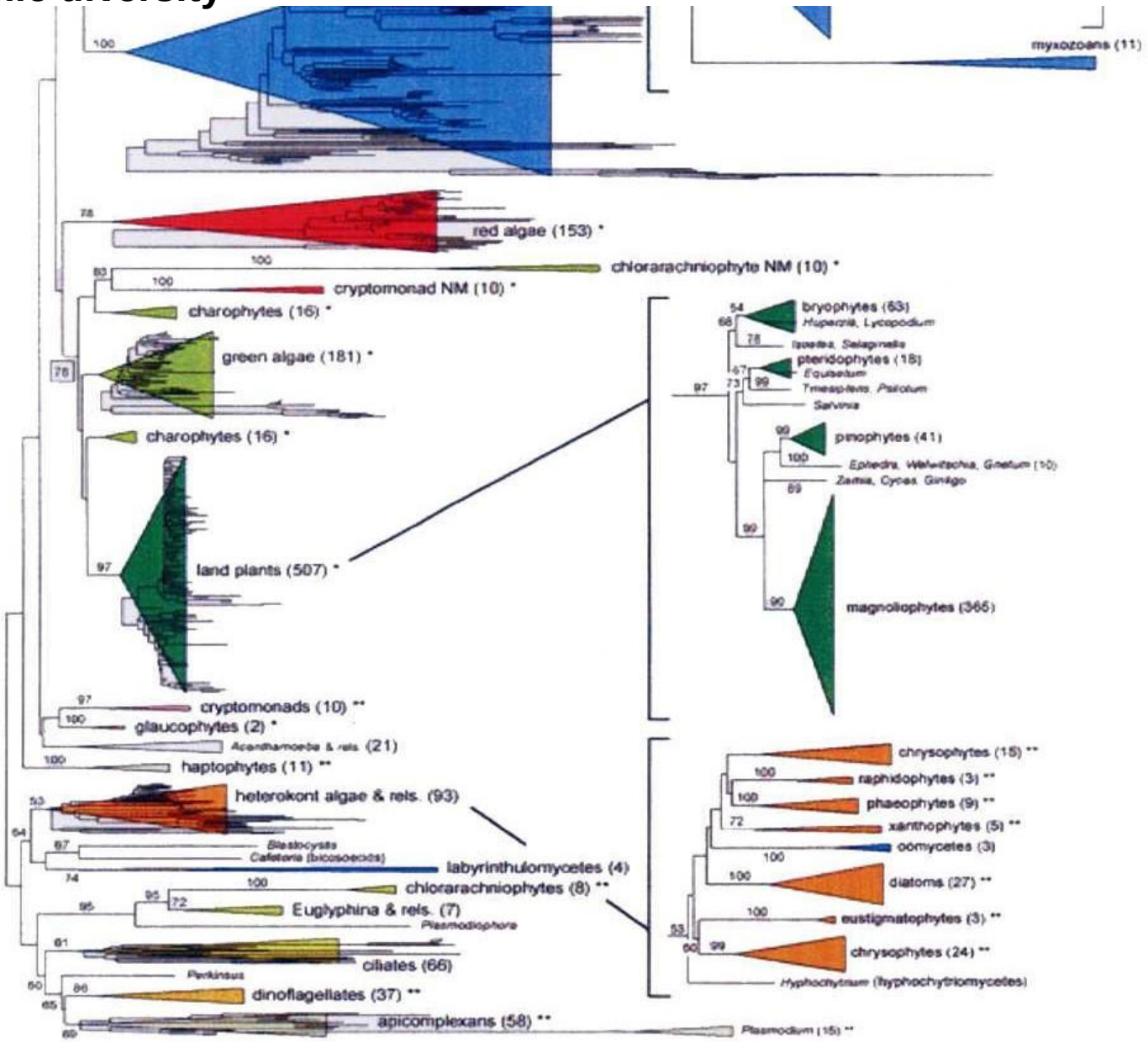
Murine models for melanoma and other tumors

Pharmacomodulate the bioactive molecules to optimize their activity and biodisponibility



Chemical and Enzymatic modification

Microalgae taxonomic diversity



An example of one of our research projects : Isolation of an antiproliferative pigment from Dunaliella tertiolecta

Selection of the species for this study

- unstudied for the purification of anticancer pigments
- available in banks and easy to grow in photobioreactors
- Possible extraction of pigments

Dunaliella tertiolecta

- **green**
- **Chlorophyceae**

The purpose

- get most pigments in a wide polarity range, work in non denaturating conditions for pigments extraction, check the reproducibility of extracts and define the pigment composition, optimize the pigments extraction yields
- Assess the anticancer activity of DT pigments

IC50 of Dunaliella tertiolecta pigments extracts

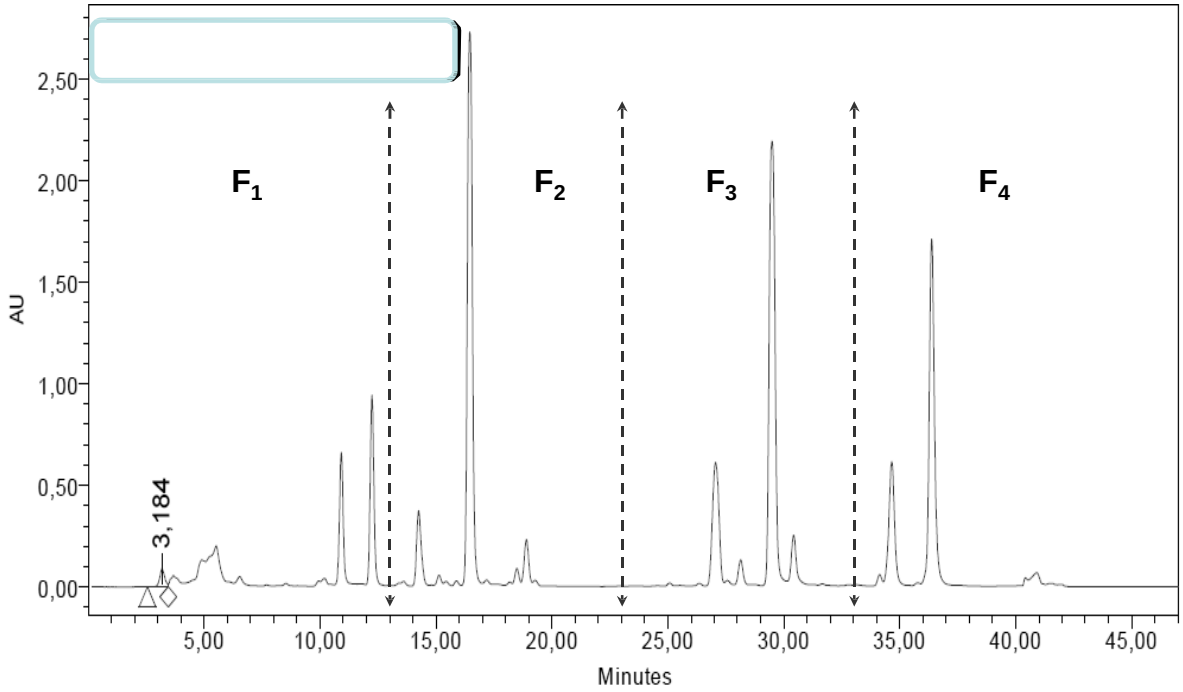
Cancer cell line	Extract	*Dunaliella tertiolecta*
A549 (lung)	Water	>
	EtOH	>
	DCM	>
MCF-7 (breast)	Water	>
	EtOH	61,5 µg.ml^{-1}
	DCM	56,1 µg.ml^{-1}
MDA-MB-231 (breast)	Water	>
	EtOH	>
	DCM	>
LNCap (prostate)	Water	>
	EtOH	>
	DCM	60,9 µg.ml^{-1}

> means IC_{50} > 100 µg.mL^{-1}

Dunaliella tertiolecta
Dichloromethane extract

MCF-7

RP-HPLC fractionation of Dunaliella tertiolecta DCM extract



Chromatogram at 435 nm

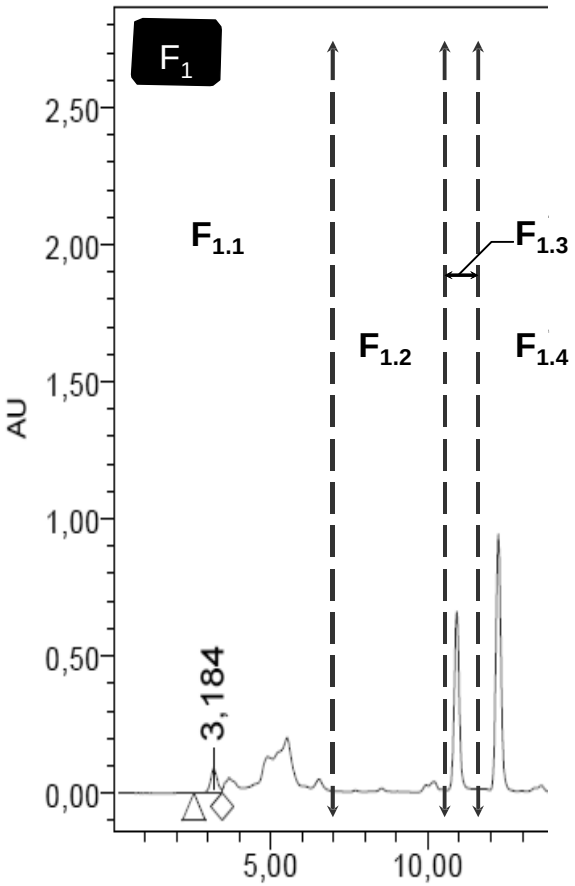
***Dunalliela tertiolecta* Dichloromethane extract**

Fraction		F_1	F_2	F_3	F_4
MCF-7	IC_{50} (µg.ml^{-1})	14,3	>	>	>

F_1

> IC_{50} > 100 µg.ml^{-1}

RP-HPLC sub-fractionation of Dunaliella tertiolecta Fraction 1



Fraction		$F_{1.1}$	$F_{1.2}$	$F_{1.3}$	$F_{1.4}$
MCF-7	CI_{50} (µg.ml^{-1})	>	20,5	18,9	11,7
sem	+ /-		2,2	8,85	0,2

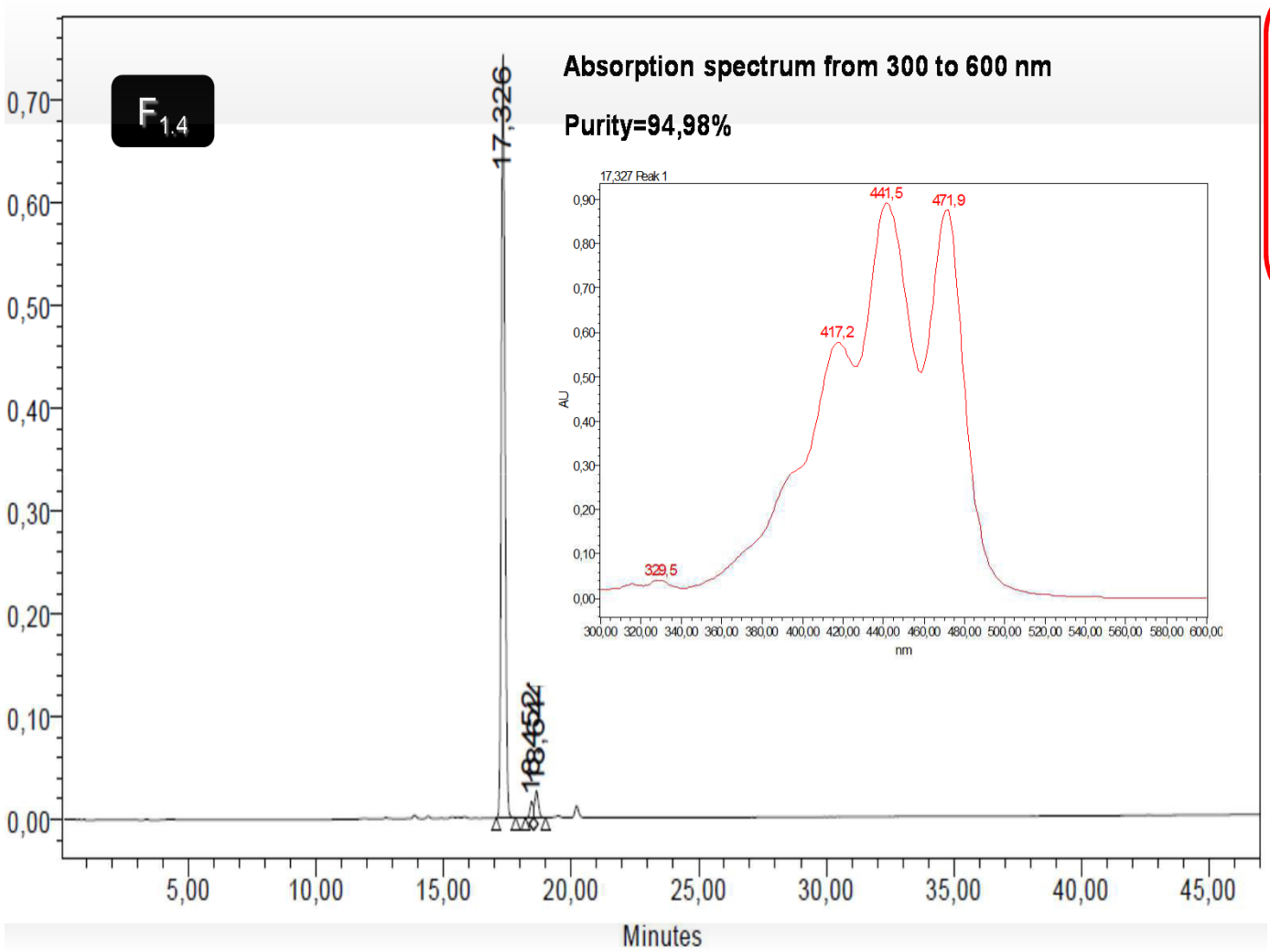
> IC_{50} > 50 µg.ml^{-1}

Chromatogram at 435 nm

Dunalliela tertiolecta **Dichloromethane extract Fraction 1**

$F_{1.4}$

Molecular characterization of F1.4.



Carotenoid pigment
Band III/II ratio 96%
One major peak in F1.4 corresponding to 95% of the fraction peak surface

Molecular characterization of F1.4.

High Resolution Mass Spectroscopy ESI Bruker MicrO-Tof-Q 2 Solvent : CH_2Cl_2 /CH_3OH : 90/10	
Molecular formula	[M+Na]+ (C40 H56 O4 Na)
Theorical MW	623.40763
Experimental m/z	623.4068 (0 ppm)

Formula $C_{40}H_{56}0_4$

violaxanthin

neoxanthin

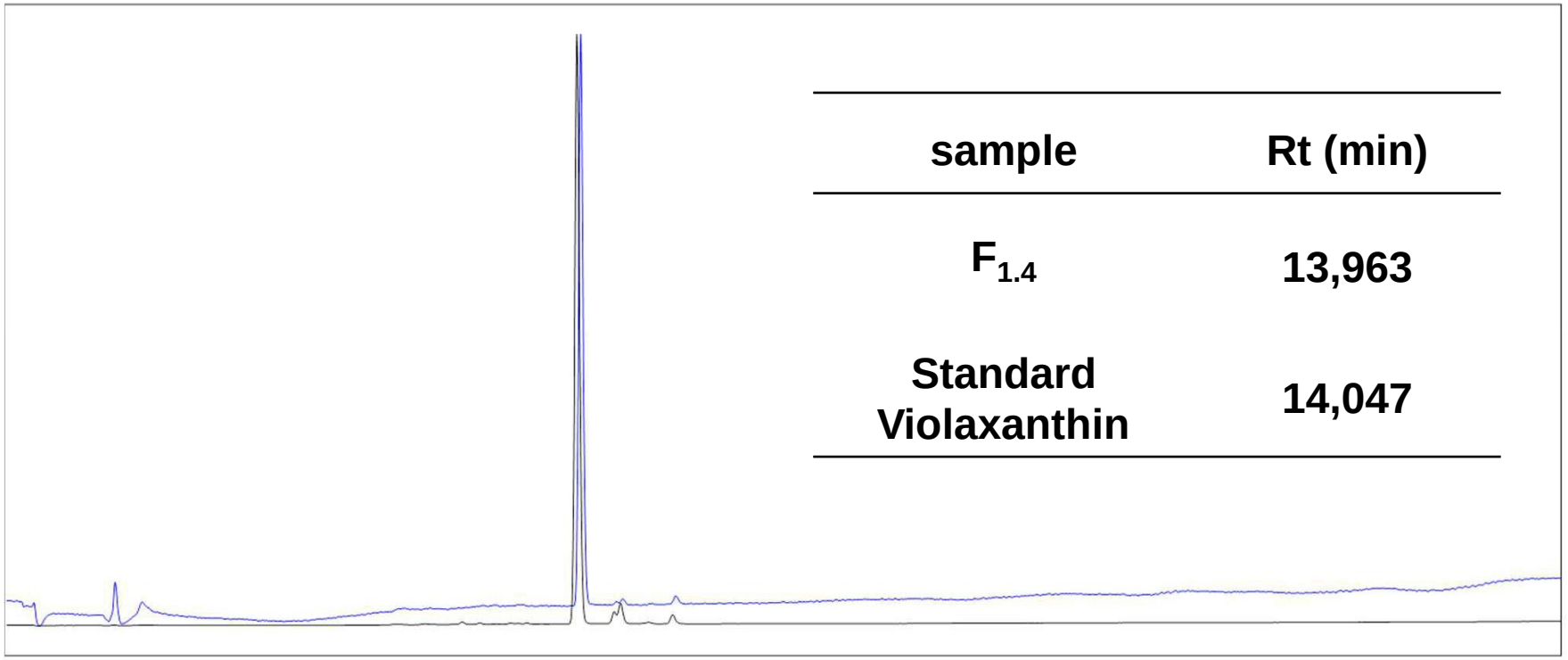
prasinoxanthin

siphonaxanthin

Molecular characterization of F1.4.

Comparison with standard carotenoids

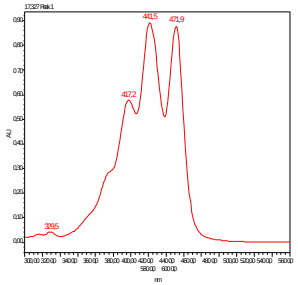
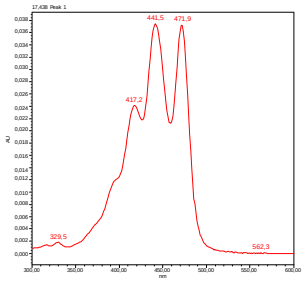
- The retention time of F1.4 is the same as standard violaxanthin and different from the 3 other pigments



sample	Rt (min)
$F_{1.4}$	13,963
Standard Violaxanthin	14,047

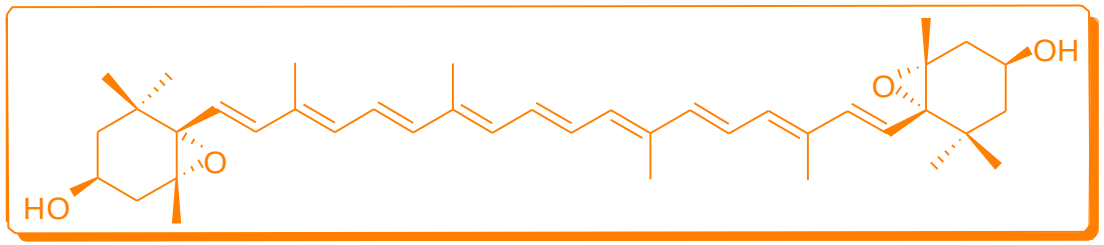
Molecular characterization of F1.4.

Absorption maxima and Band III/II ratio are equivalent to that of standard Violaxanthin

Sample	Absorption spectrum 300 à 600 nm	Absorption maxima (nm)	% III/II
$F_{1.4}$		417,2 441,5 471,9	96
Standard violaxanthin		417,2 441,5 471,9	98

Conclusion

F1.4 = violaxanthin



Biological activity of Violaxanthin in MCF-7 breast cancer cells

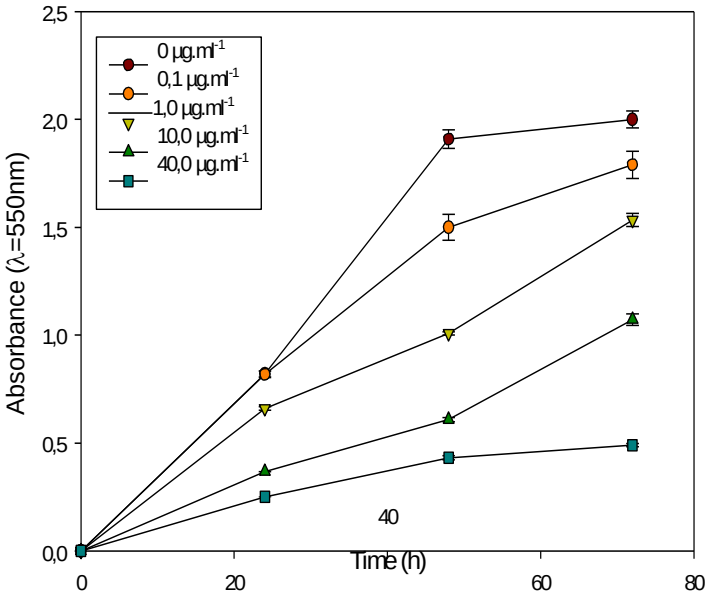
Antiproliferative

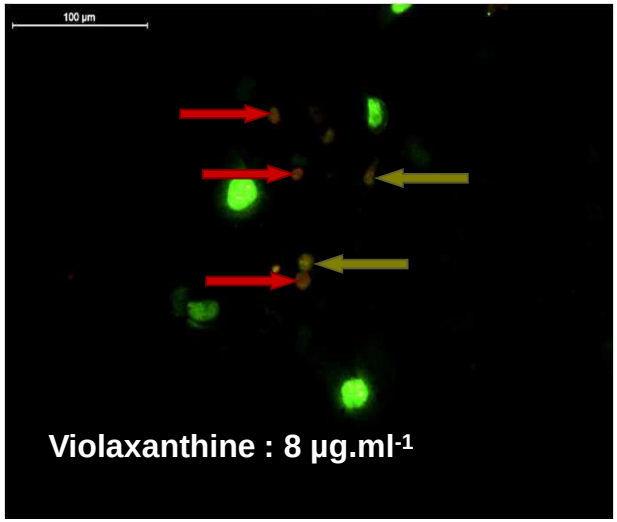
IC_{50}= 11,7 ± 0,2 µg.ml^{-1}
= 18,5 ± 0,3 µM

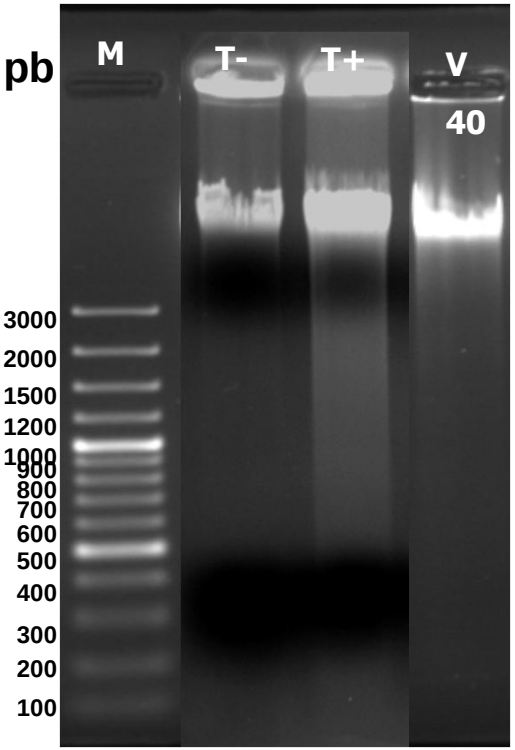
cytostatic
at 40,0 µg.ml^{-1}
= 63 µM

Induction of early apoptosis (translocation of Phosphatidyl Serines) and necrosis at 8 µg.ml^{-1}

No internucleosomal fragmentation at 40 µg .ml^{-1}







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