UNIVERSITÀ DEGLI STUDI DI PADOVA

Targeted and non-targeted analysis of organic compounds by high resolution mass spectrometry.

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Mass Spectrometry LAB
DISC- University of Padova

UNIVERSITÀ DEGLI STUDI DI PADOVA

UHPLC-HRMS/MS
(ESI-Orbitrap RP 140,000 FWHM)

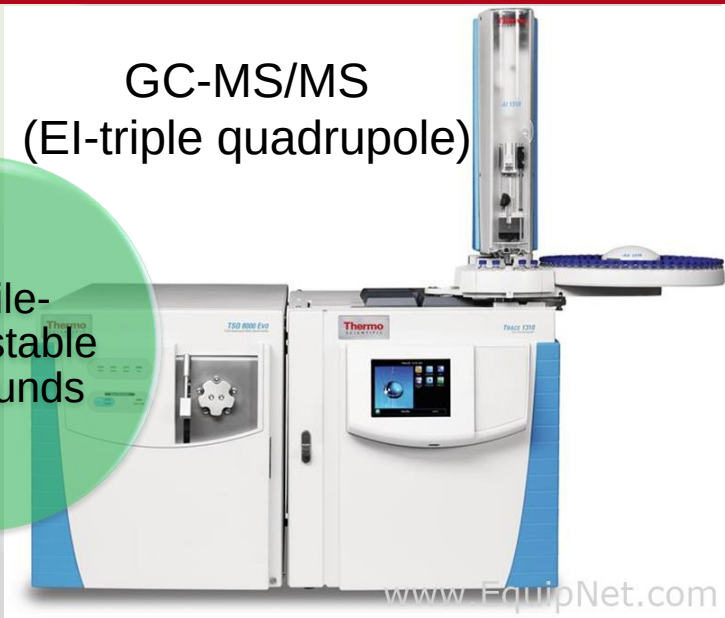
Medium polar- non volatile- thermolabile compounds

Chemical characterization

Elements analysis- speciations
HPLC-ICP-MS

Volatile- thermostable compounds

GC-MS/MS
(EI-triple quadrupole)



Electrochimica Acta 277 (2018) 287–300

ELSEVIER

Regular Article

Nanoaggregates in aqueous solu

Giulio Fracasso[a], Pac
Elena Nicolato[c], Pas
Vincenzo Amendola

[a] Department of Medicine, Immuno
[b] Department of Chemistry, Univer
[c] CNR – ICMATE, Padova, Italy

ELSEVIER

Probing the co reduction react with Pt-N activ

Riccardo Brandiele,
Denis Badocco, Pao

Department of Chemical Sciences, University of Padova, Via Marzolo 1, 35131, Padova, Italy

Contents lists available at ScienceDirect

Nanoparticle Synthesis

Room-Temperature Crystallization of CuS Nanostructures for Photothermal Applications through a Nanoreactor Approach

Giulia Morgese,[a] Paolo Dolcet,*[a,b] Alessandro Feis,[c] Cristina Gellini,[c] Stefano Gialanella,[d] Adolfo Speghini,[e] Denis Badocco,[a] Paolo Pastore,[a] Maurizio Casarin,[a] and Silvia Gross*[a,b]

Metallomics

ROYAL SOCIETY OF CHEMISTRY

PAPER

View Article Online
View Journal | View Issue

CrossMark

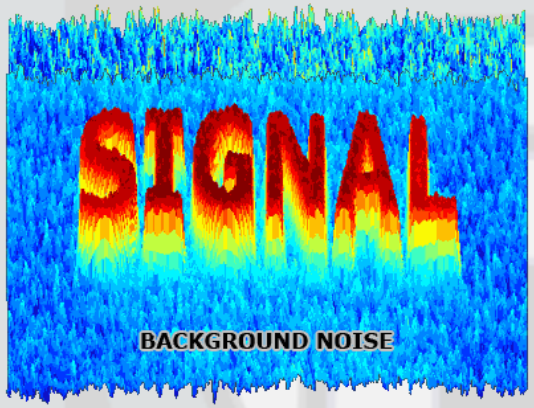
Cite this: *Metallomics*, 2015, 7, 1146

The metallome of the human placenta in gestational diabetes mellitus†

Marco Roverso,[ab] Chiara Bertè,[a] Valerio Di Marco,*[a] Annunziata Lapolla,[b] Denis Badocco,[a] Paolo Pastore,[a] Silvia Visentin[c] and Erich Cosmi[c]

Identification of «markers»

Ancient proverb:
On a Dark night you can see more stars



"Mass spectrometry is the art of measuring atoms and molecules to determine their molecular weight. Such mass or weight information is sometimes sufficient, frequently necessary, and always useful in determining the identity of a species"

John B. Fenn, Nobel_2002

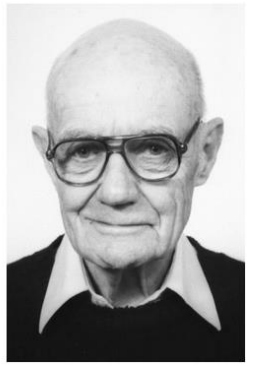


Photo from the Nobel Foundation archive.
John B. Fenn
Prize share: 1/4

Photo from the Nobel Foundation archive.
Koichi Tanaka
Prize share: 1/4

Photo from the Nobel Foundation archive.
Kurt Wüthrich
Prize share: 1/2

What We Do....

Development of new qualitative and quantitative analytical method based on chromatography coupled with mass spectrometry

Chromatography- High resolution Mass Spectrometry

Resolution and accuracy

Resolving power (R) = m/Δm

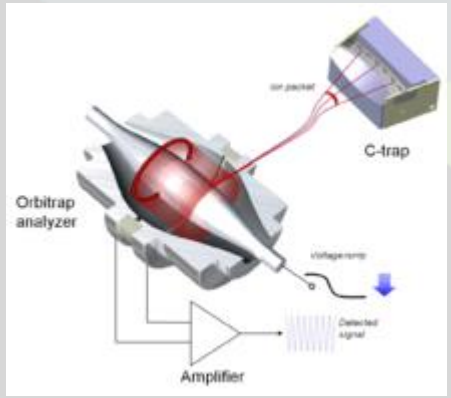
Compound with MW=200 , Δm=0.014 > R=14000

How many compounds?

resolution

correct identification?

accuracy



Resolution and accuracy

Resolving power (R) = m/Δm

Compound with MW=200 , Δm=0.014 > R=14000

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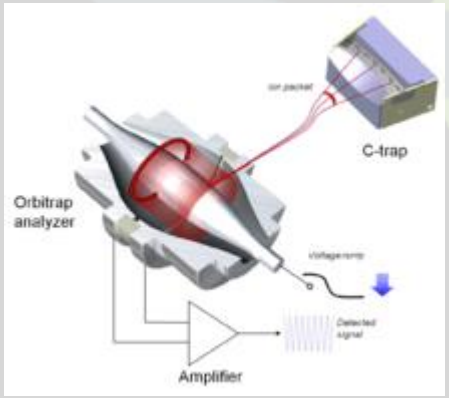
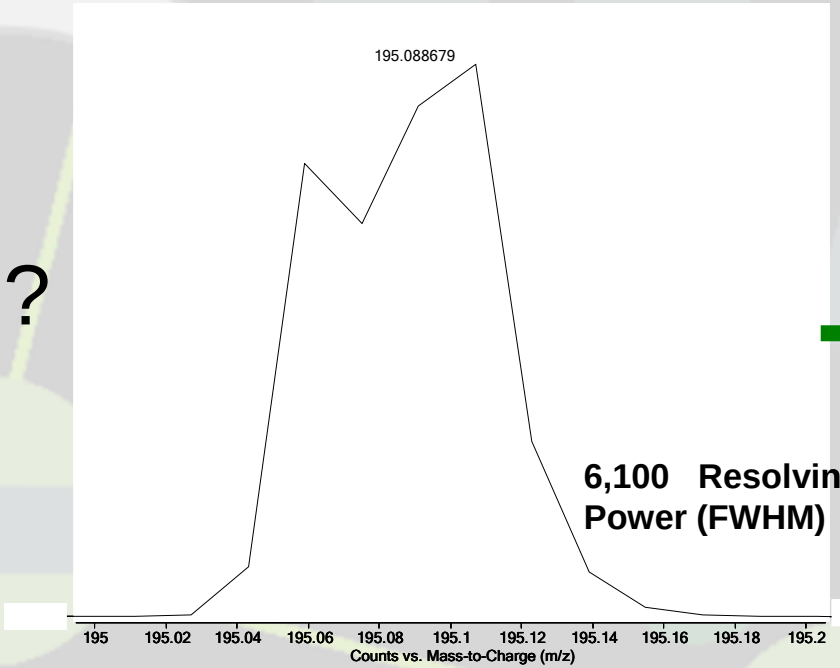
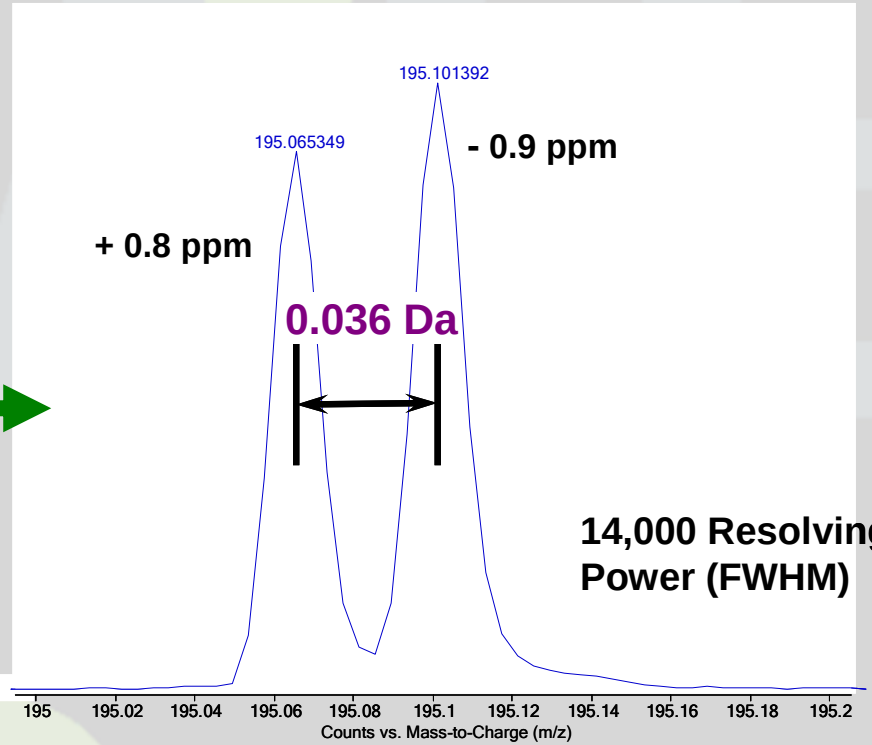
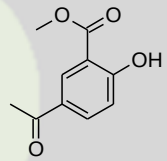
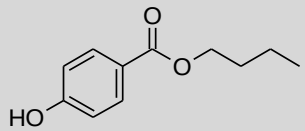








Methyl 5-acetylsalicylate
[M+H]+ = *m/z* 195.06519



Butyl paraben
[M+H]+ = *m/z* 195.10157

Who and what Have we to face out?

*"There are **known knowns** These are things we know that we know*

*"There are **known unknowns**. That is to say, there are things that we know we don't know.*

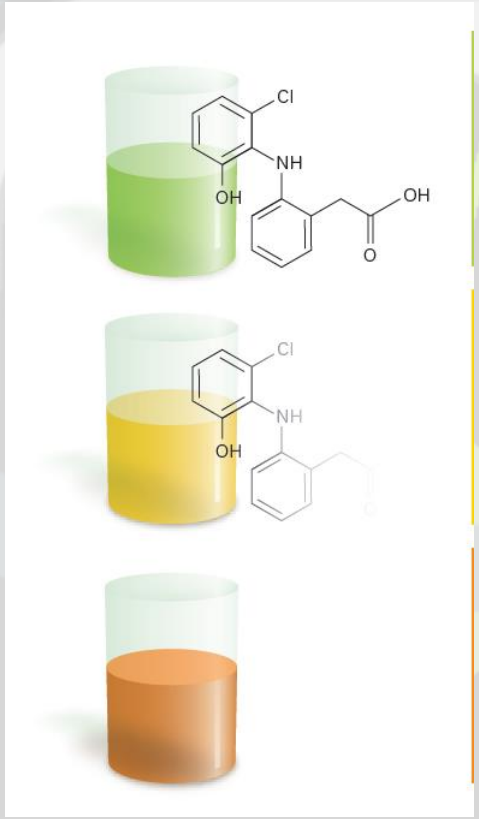
*But there are also **unknown unknowns**. There are things we don't know we don't know."*

Donald Rumsfeld, Ex Secretary of Defense, USA

- Ci sono «informazioni» conosciute che sappiamo di sapere. **"Target"**
- Ci sono «informazioni» sconosciute che sappiamo di non sapere. **"UnTargeted"**
- Ma ci sono anche «informazioni» a noi sconosciute che non sappiamo di non sapere.**"UnKnown"**

The language of the HRMS methods Harmonization

All analyses without a pure standard start as non-target and could remain unknown



target

- **Comparison with the reference standard** of Retention time (t_R)+ Molecular formula (MS) + fragmentation pattern (MSMS)

suspect

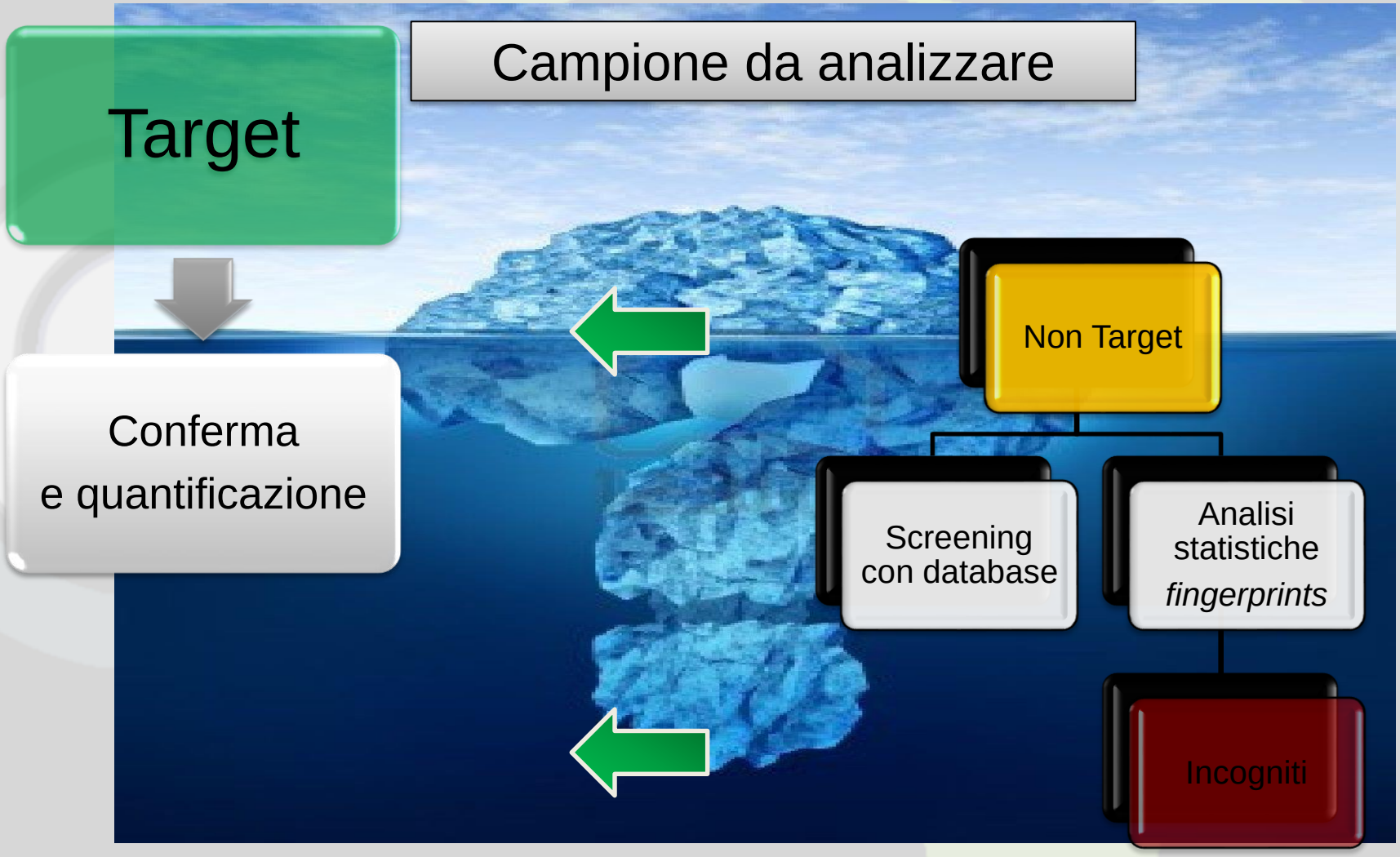
- **Comparison with database**+ Molecular formula (MS) + fragmentation pattern (MSMS)

Non target

- **Data on Retention times** + Molecular formula (MS) + eventually fragmentation pattern (MSMS)

Non-target screening with high-resolution mass spectrometry: critical review using a collaborative trial on water analysis
Schymanski EL, .., **Bogialli S,** et al. *Anal Bioanal Chem,* **2015,** *407,* 6237-6255

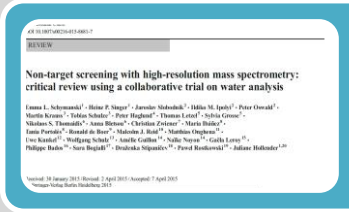
Analisi Target e Non-Target



LC-HRMS_research

Emerging contaminants

- ❑Endocrine disruptors (EDs)
- ❑Illicit drugs
- ❑Pharmaceuticals
- ❑Flame retardants
- ❑Plasticisers
- ❑Food additives
- ❑Personal Care Products
- ❑Perfluorinated compounds
- ❑Disinfection by-products
- ❑Transformation products
- ❑Algal toxins
- ❑etc…

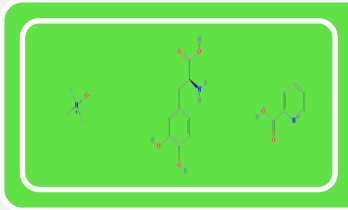

Non-target screening with high-resolution mass spectrometry: critical review using a collaborative trial on water analysis

Target & non-target analysis


FULL PAPER

Degradation Products from Naturally Aged Paper Leaves of a 16th-Century-Printed Book: A Spectrochemical Study

Characterization of organic compounds (organometallic, cultural heritage)



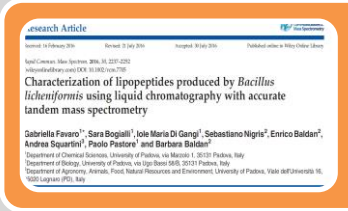
Metabolomic

Clinical markers (Alzheimer, Parkinson, Diabetes)


Talanta

Identification of wine aroma precursors in *Moscato Giallo* grape juice: A nuclear magnetic resonance and liquid chromatography–mass spectrometry tandem study

Biomarkers in food


Research Article

Characterization of lipopeptides produced by *Bacillus licheniformis* using liquid chromatography with accurate tandem mass spectrometry

Contaminants (Biomarkers) in environment

HR-MS/MS - An example …

Chemical contaminants in envinroment:

- Pesticides, Erbicides
- Industrial residues
- Endocrine disruptors (e.g plastificant)
- Pharmaceuticals
- Personal care products
- Cleaning products
- ….
- Metabolites

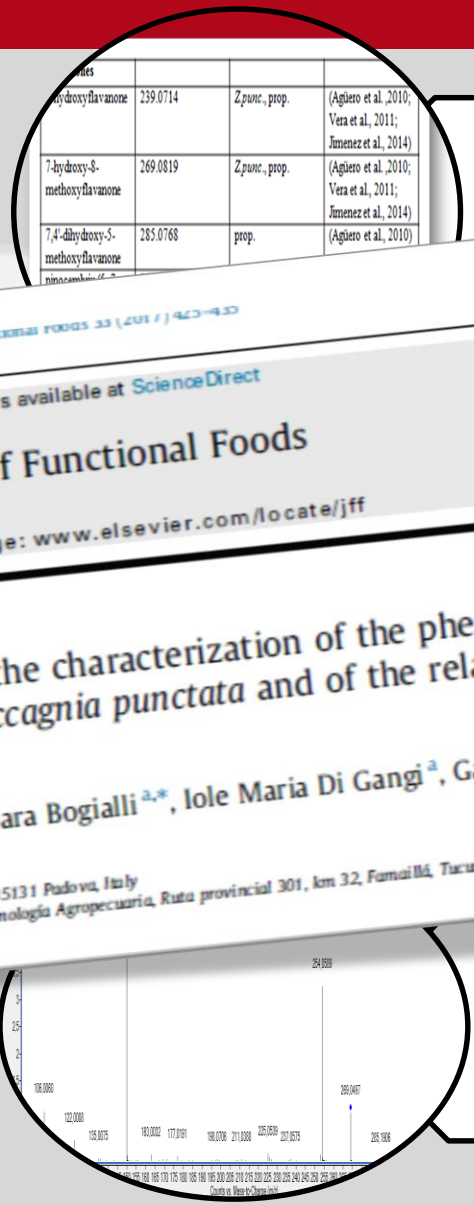
EXPOSOME

LC-DAD-HRMS workflow: plant biomarkers

Bioactive compounds produced by extremophiles plants

Multi-step workflow:

1. (pseu
2. diagr
3. chara
4. molec



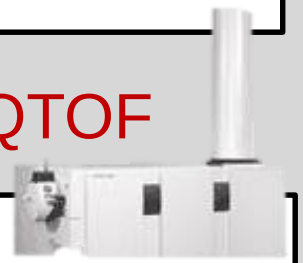
1.From literature

•MS sig n full scan analysis of suspect or *Z. punctata*.

-DAD

tion of the largest peaks with c UV spectra.

LC-ESI-QTOF



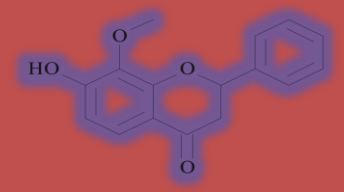
3. LC-HR- tandem MS

- AutoMS fragmentation scan of the previously selected MS precursor ions

Bioactive polyphenols: identification scheme

Bioactive compounds produced by extremophiles plants

1.Raw formula



Accurate mass

DBE

$$C - \frac{H}{2} - \frac{X}{2} + \frac{N}{2} + 1$$

2.Structural formula

DBE

Fragmentation pattern

3.Isomeric variant

UV spectra (if present)

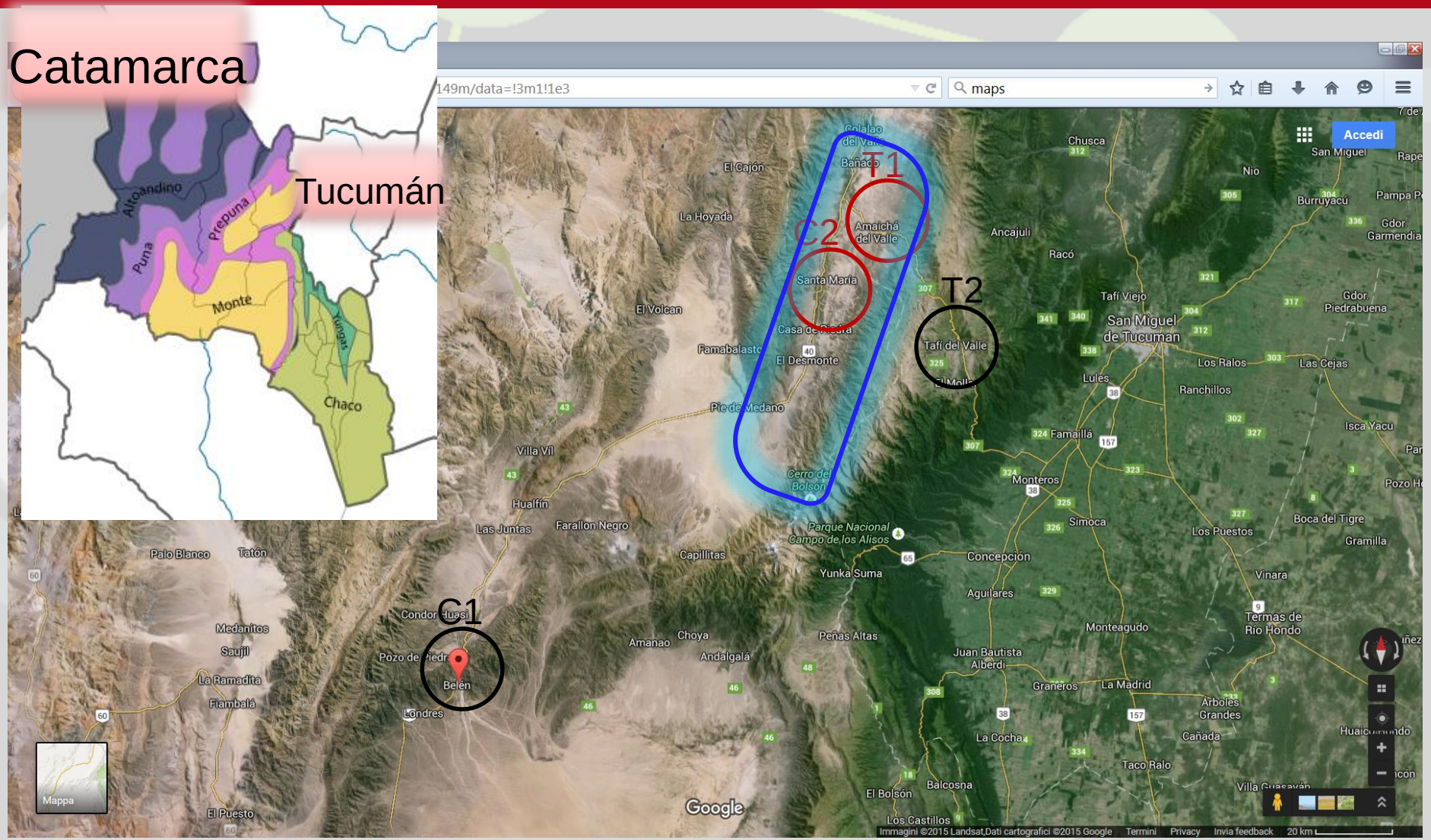
Chromatographic behaviour

Biological mechamism

Propolis analysis_results

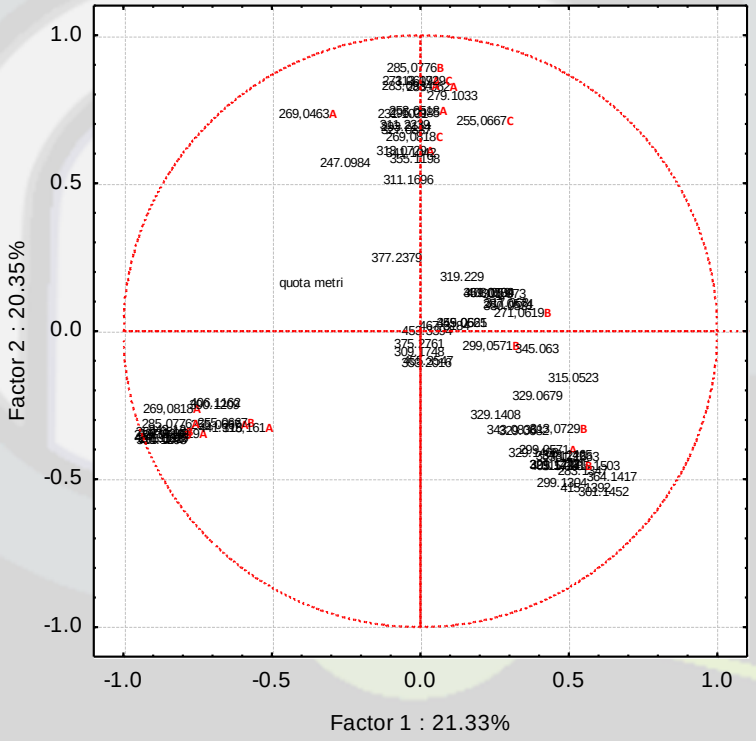
		Compounds	Reports	% relative area				
				Z.p-E	T1-E	T2-E	C1-E	C2-E
		Chalcones and Dihydrochalcones						
1	**s**	**2',4'-dihydroxychalcone**	**Z.punc., prop.**	**95.3**	**104.3**			**59.7**
2	**t**	**2',4'-dihydroxy-3'-methoxychalcone**	**Z.punc., prop.**	**34.5**	**13.4**			**2.0**
3	**s**	**2',4',4-trihydroxy-6'-methoxychalcone**	**prop.**	**10.0**	**2.1**			**9.1**
		Flavanones						
1*	**t**	**7-hydroxyflavanone**	**Z.punc., prop.**	**57.9**	**24.9**			**24.8**
2*	**s**	**7-hydroxy-8-methoxyflavanone**	**Z.punc., prop.**	**22.3**	**34.1**			**8.9**
3*	**s**	**7,4'-dihydroxy-5-methoxyflavanone**	**prop.**	**2.0**	**15.7**			**1.3**
10	**s**	**pinocembrin (5, 7-dihydroxyflavanone)**	**Z.punc., prop.**	**2.3**	**13.9**			**7.1**
		Flavones						
14	s	3,7-dihydroxy-8-methoxyflavone	Z.punc., prop.	6.3	4.2			4.5
15	s	rhamnocitrin (3,5,4'-trihydroxy-7-methoxyflavone)	Z.punc., prop.	2.3	3.7	5.1		2.3
20	t	galangin (3,5,7-trihydroxyflavone)	Z.punc., prop.	22.5	36.7	61.4	5.4	12.7
25	t	chrysin (5,7- dihydroxyflavone)	prop.	3.7	77.7	34.8	19.5	7.0
26	s	3,7-dihydroxyflavone	Z.punc.	5.3	5.6			5.3
		Acids and esters						
28	s	1,1-dimethylallyl caffec acid	prop.		11.9	36.9	6.8	8.4
32	**s**	**1-methyl-3-(4'-hydroxyphenyl)-propyl caffeic acid ester**	**Z.punc.**	**21.9**	**35.0**	**0.4**		**24.2**
33	**s**	**1-methyl-3-(3',4'-dihydroxyphenyl)-propyl caffeic acid ester**	**Z.punc.**	**36.8**	**76.0**			**51.1**
		Proposed non target compounds						
34	nt	7,8-dihydroxyflavanone		8.6	10.3			7.4
35	nt	3,7-dihydroxyflavanone		5.2	5.0			3.5
36	nt	pinobanksin-5-methyl eter (3,7-dihydroxy-5-methoxyflavanone)		3.6	20.4	14.7	2.6	5.9
37	nt	3,7,8-trihydroxydihydroflavanone		6.3	27.7	96.3	7.8	3.8
38	**nt**	**4'-hydroxy-2'-methoxydihydrochalcone**		**100.0**	**68.5**			**53.3**
39	**nt**	**2',4'-dihydroxydihydrochalcone**		**23.6**	**23.3**			**14.5**
40	nt	4'-terbutyloxyphenyl p-coumaric acid ester		0.9	0.6			0.5
41	**nt**	**1-methyl-3-(4'-hydroxyphenyl)-propyl p-coumaric acid ester**		**22.8**	**25.3**			**18.2**
42	**nt**	**geranyl caffeate**		**9.4**	**25.8**	**1.3**	**1.6**	**20.7**
43	nt	1-methyl-3-(3',4'-di hydroxyphenyl)-propyl ferulic acid ester		3.4	8.9			4.8
44	nt	2-methyl-3-(3'-hydroxy-4'-methoxyphenyl)-propyl caffeic acid ester		4.9	3.8			2.3

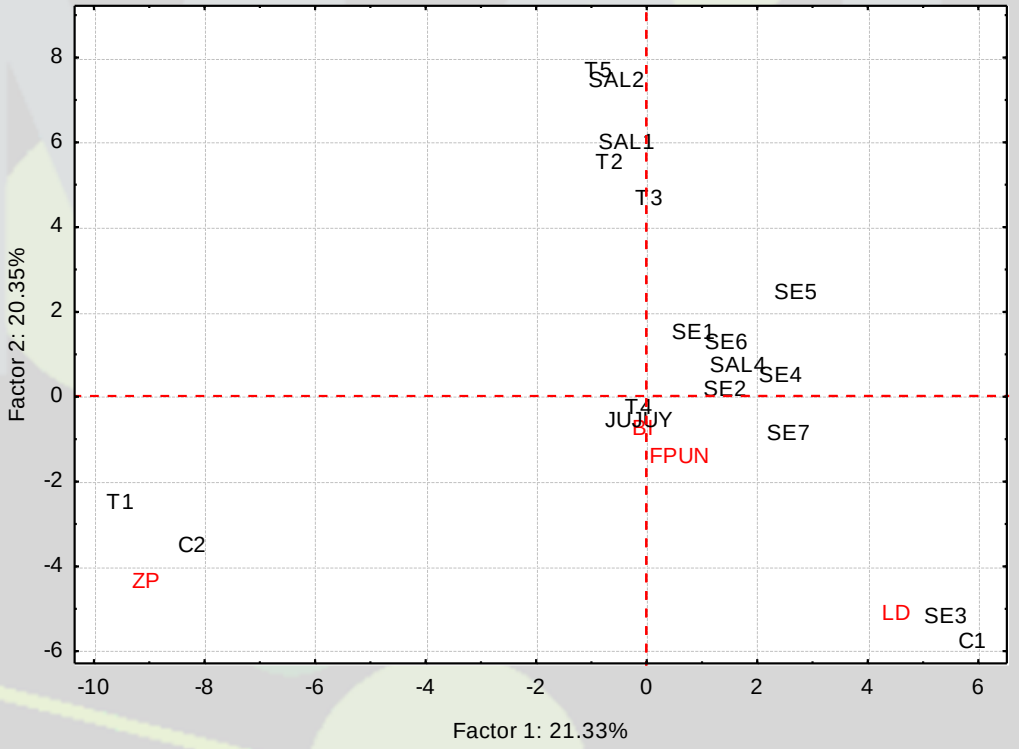
Z.p. phytogeografical region



PCA analysis

An alternative bottom-up approach based on PCA analysis





A preliminary elaboration gives a clear indication of some sources and drives the MS data analysis

Toward “bottom-up” metabolomic

XCMS: online platform for data analysis

featureid	mzmed	rtmed	maxint	isotopes	adducts	peakgrc	mzmin	mzmax	rtmin	rtmax	usernote
							.0818	194.0830	15.56	15.81	
						22	197.9624	197.9634	0.92	1.20	

Home | Highlights | Databases | Create Job | View Results | XCMS Public | XCMS Institute | Stored Datasets | Account | Toolbox | Help | Logout [sara.bogia...]

Download Results

hash: 8726fcfb61e0610bae781cf0452c8d7c

Single Results Summary: Eliana analisi piante_2017-03-29 (#1152286)

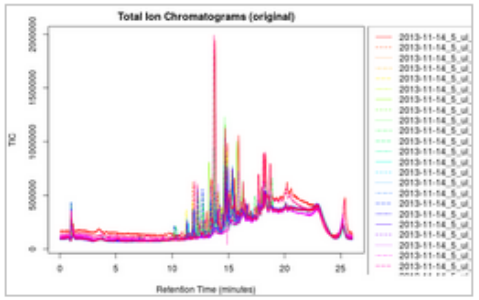
Submit Date	Finish Date	Total Detected Features	Parameter ID#	Log	Shared
2017-03-29 01:59:04	2017-03-29 03:12:09	363	Eliana_OK-2017-03-29 (28910)	View Log	Shared with User(s) | [Stop sharing]

Citation Links

Results Table

Dataset Used

- Eliana_analisi_ (240546)



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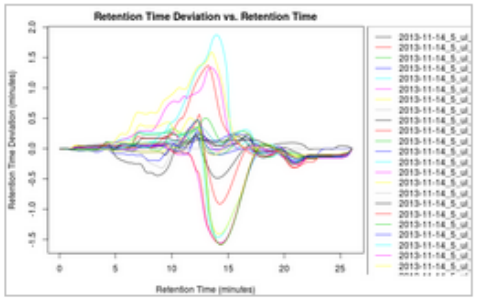

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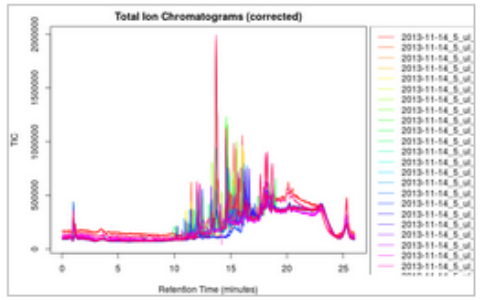

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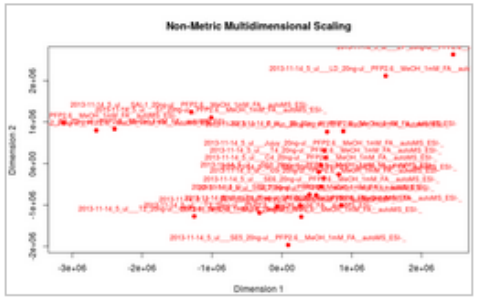

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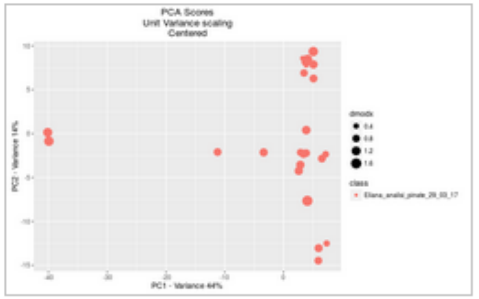
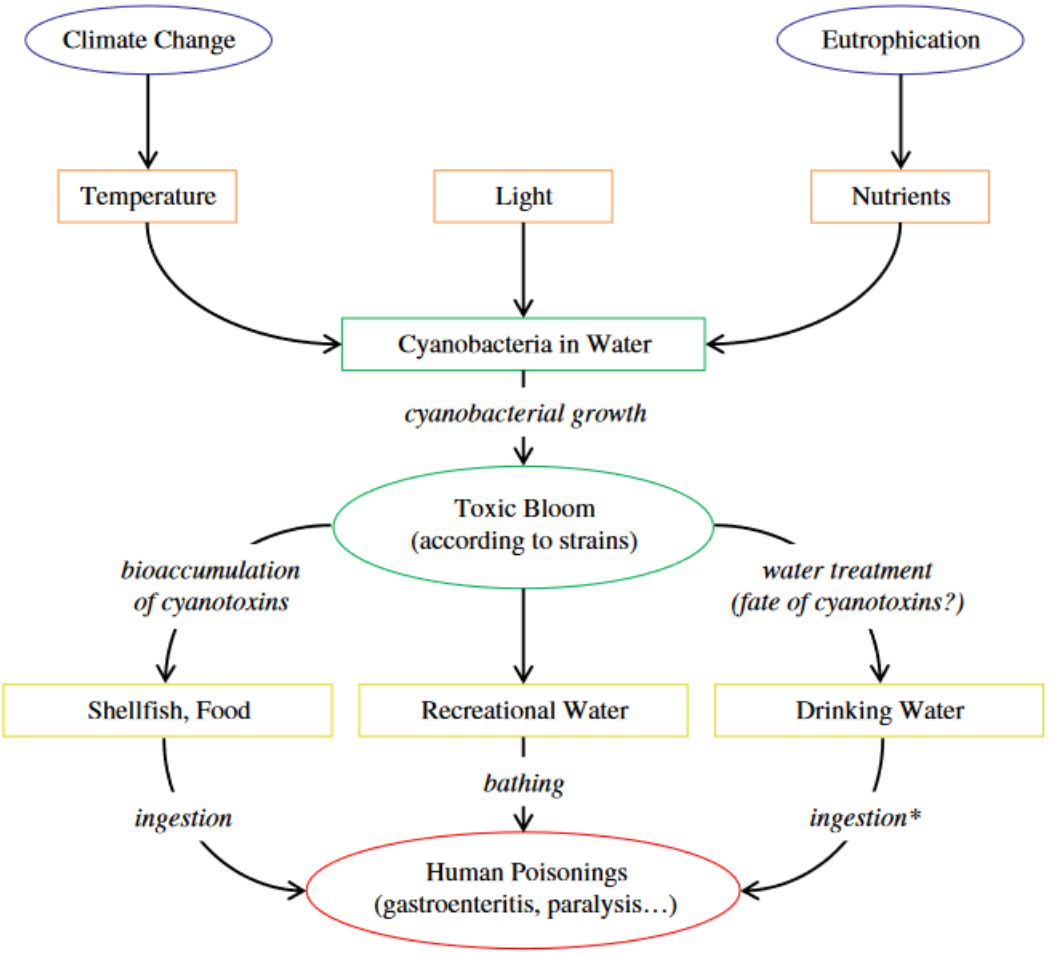


PNG PDF

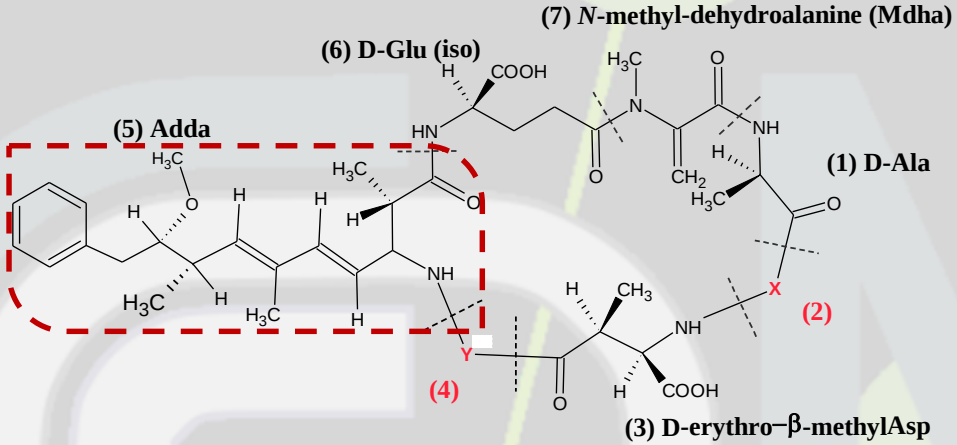
Cyanotoxins in water



* 80% of human exposure to cyanotoxins (WHO, 1998)

Fig. 1. Origin of toxic cyanobacterial blooms and human exposure.

Cyanotoxins_cyclic peptides
Microcystins (MCs)



Adda:

(2*S*,3*S*,8*S*,9*S*)-
3-amino-9-methoxy-2,6,8-trimethyl-10-phenyldeca-4,6-dienoic acid

WHO provisional limit for drinking water

1 µg/L expressed as MC-LR equivalents

Uncertainty factor 1000

Intended with ELISA assay

TABLE 2. Primary Microcystin Analogues With Variations in Amino Acids 2 (X) and 4 (Y)

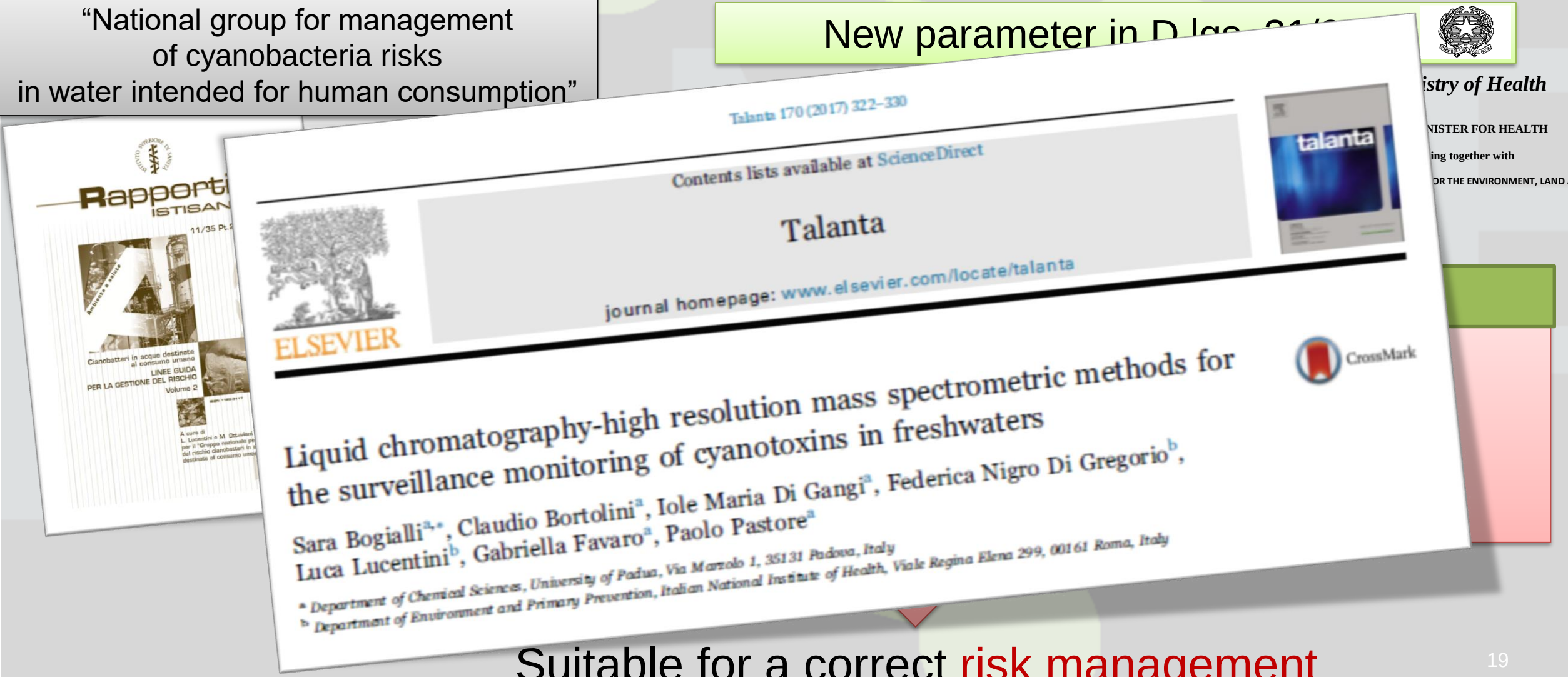
Analogue	Structure
Microcystin-AR	cyclo (-D-Ala-L-**Ala**-D-MeAsp-L-**Arg**-Adda-D-Glu-Mdha-)
Microcystin-FR	cyclo (-D-Ala-L-**Phe**-D-MeAsp-L-**Arg**-Adda-D-Glu-Mdha-)
Microcystin-HilR	cyclo (-D-Ala-L-**Hil**-D-MeAsp-L-**Arg**-Adda-D-Glu-Mdha-)
Microcystin-HtyR	cyclo (-D-Ala-L-**Hty**-D-MeAsp-L-**Arg**-Adda-D-Glu-Mdha-)
Microcystin-LA	cyclo (-D Ala-L-**Leu**-D-MeAsp-L-**Ala**-Adda-D-Glu-Mdha-)
Microcystin-LAba	cyclo (-D Ala-L-**Leu**-D-MeAsp-L-**Aba**-Adda-D-Glu-Mdha-)
Microcystin-LF	cyclo (-D-Ala-L-**Leu**-D-MeAsp-L-**Phe**-Adda-D-Glu-Mdha-)
Microcystin-LL	cyclo (-D-Ala-L-**Leu**-D-MeAsp-L-**Leu**-Adda-D-Glu-Mdha-)
Microcystin-LM	cyclo (-D-Ala-L-**Leu**-D-MeAsp-L-**Met**-Adda-D-Glu-Mdha-)
Microcystin-LR	cyclo (-D-Ala-L-**Leu**-D-MeAsp-L-**Arg**-Adda-D-Glu-Mdha-)
Microcystin-LV	cyclo (-D-Ala-L-**Leu**-D-MeAsp-L-**Val**-Adda-D-Glu-Mdha-)
Microcystin-LW	cyclo (-D-Ala-L-**Leu**-D-MeAsp-L-**Trp**-Adda-D-Glu-Mdha-)
Microcystin-LY	cyclo (-D-Ala-L-**Leu**-D-MeAsp-L-**Tyr**-Adda-D-Glu-Mdha-)
Microcystin-M(O)R	cyclo (-D-Ala-L-**Met(O)**-D-MeAsp-L-**Arg**-Adda-D-Glu-Mdha-)
Microcystin-RA	cyclo (-D-Ala-L-**Arg**-D-MeAsp-L-**Ala**-Adda-D-Glu-Mdha-)
Microcystin-RR	cyclo (-D-Ala-L-**Arg**-D-MeAsp-L-**Arg**-Adda-D-Glu-Mdha-)
Microcystin-WR	cyclo (-D-Ala-L-**Try**-D-MeAsp-L-**Arg**-Adda-D-Glu-Mdha-)
Microcystin-YA	cyclo (-D-Ala-L-**Tyr**-D-MeAsp-L-**Ala**-Adda-D-Glu-Mdha-)
Microcystin-YM(O)	cyclo (-D-Ala-L-**Tyr**-D-MeAsp-L-**Met(O)**-Adda-D-Glu-Mdha-)
Microcystin-YR	cyclo (-D-Ala-L-**Tyr**-D-MeAsp-L-**Arg**-Adda-D-Glu-Mdha-)
Microcystin-(H4)YR	cyclo (-D-Ala-L-**(H4)Tyr**-D-MeAsp-L-**Arg**-Adda-D-Glu-Mdha-)

More than 120 known variants,
12 certified standards available

LC-MS for «early warning system»

"National group for management
of cyanobacteria risks
in water intended for human consumption"

New parameter in D.lgs. 31/



Suitable for a correct risk management

… much still unknown

DISC-UNIPD: Characterization of species-dependent toxicity

Sampling of blooms or in-lab cells growths

Extraction of toxins:
intra and extarcellular content

TARGETED analysis

UNTARGETED analysis

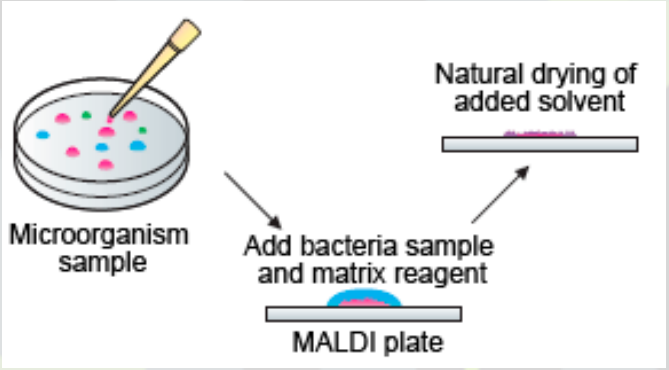
Quantification of KNOWN toxins

Characterization of UNKNOWN toxins

DATABASE

… much still unknown

ICMATE-CNR: Characterization of cyanobacteria species



DATABASE

Protein profile
(hopefully species-dependent)

Analytical method and protocols for Data analysis

Talanta 194 (2019) 233–242

Contents lists available at ScienceDirect

Talanta

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

A new method for the determination of primary and secondary terrestrial and marine biomarkers in ice cores using liquid chromatography high-resolution mass spectrometry

Amy C.F. King[a,b,*], Chiara Giorio[b,**], Eric Wolff[c], Elizabeth Thomas[a], Ornela Karroca[b,d], Marco Roverso[e], Margit Schwikowski[f], Andrea Tapparo[e], Andrea Gambaro[d], Markus Kalberer[b]

analytical chemistry — Article

Cite This: Anal. Chem. 2019, 91, 5051–5057 — pubs.acs.org/ac

Direct Injection Liquid Chromatography High-Resolution Mass Spectrometry for Determination of Primary and Secondary Terrestrial and Marine Biomarkers in Ice Cores

Amy C. F. King,[*,†,‡] Chiara Giorio,[*,‡,§] Eric Wolff,[∥] Elizabeth Thomas,[†] Marco Roverso,[§] Margit Schwikowski,[⊥] Andrea Tapparo,[§] Sara Bogialli,[§] and Markus Kalberer[‡,#]

ACS SENSORS — Article

Cite This: ACS Sens. 2018, 3, 1291–1298 — pubs.acs.org/acssensors

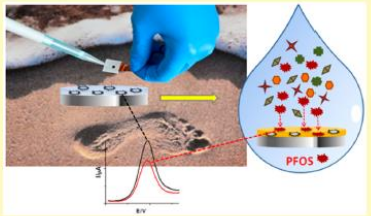
Electrochemosensor for Trace Analysis of Perfluorooctanesulfonate in Water Based on a Molecularly Imprinted Poly(*o*-phenylenediamine) Polymer

Najmeh Karimian,[†] Angela M. Stortini,[†] Ligia M. Moretto,[†] Claudio Costantino,[†] Sara Bogialli,[‡] and Paolo Ugo[*,†]

[†]Department of Molecular Sciences and Nanosystems, University Ca' Foscari of Venice, via Torino 155, 30172 Venezia Mestre, Italy
[‡]Department of Chemical Sciences, University of Padova, via F. Marzolo 1, 35131 Padova, Italy

Supporting Information

ABSTRACT: This work is aimed at developing an electrochemical sensor for the sensitive and selective detection of trace levels of perfluorooctanesulfonate (PFOS) in water. Contamination of waters by perfluorinated alkyl substances (PFAS) is a problem of global concern due to their suspected toxicity and ability to bioaccumulate. PFOS is the perfluorinated compound of major concern, as it has the lowest suggested control concentrations. The sensor reported here is based on a gold electrode modified with a thin coating of a molecularly imprinted polymer (MIP), prepared by anodic electropolymerization of *o*-phenylenediamine (o-PD) in the presence of PFOS as the template. Activation of the sensor is achieved by template removal with suitable a solvent mixture. Voltammetry, a quartz



Chemosphere 224 (2019) 786–795

Contents lists available at ScienceDirect

Chemosphere

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

Direct target and non-target analysis of urban aerosol sample extracts using atmospheric pressure photoionisation high-resolution mass spectrometry

Chiara Giorio [a, b, *], Claudio Bortolini [b], Ivan Kourtchev [a], Andrea Tapparo [b], Sara Bogialli [b], Markus Kalberer [a, c]

Atmospheric Environment 178 (2018) 129–139

Contents lists available at ScienceDirect

Atmospheric Environment

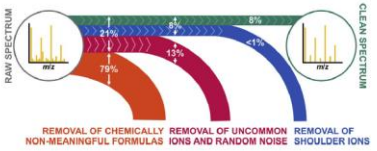
journal homepage: www.elsevier.com/locate/atmosenv

A new processing scheme for ultra-high resolution direct infusion mass spectrometry data

Arthur T. Zielinski[a], Ivan Kourtchev[a], Claudio Bortolini[b], Stephen J. Fuller[a], Chiara Giorio[a], Olalekan A.M. Popoola[a], Sara Bogialli[b], Andrea Tapparo[b], Roderic L. Jones[a], Markus Kalberer[a,*]

[a] Department of Chemistry, University of Cambridge, Lensfield Road, Cambridge CB2 1EW, United Kingdom
[b] Dipartimento di Scienze Chimiche, Università degli Studi di Padova, via Marzolo 1, 35131 Padova, Italy

GRAPHICAL ABSTRACT



Identification of binders in paintings

GUM ARABIC
(natural polymers)
polysaccharides

ANIMAL GLUE
(proteins)

ACRYLIC
(synthetic polymer)

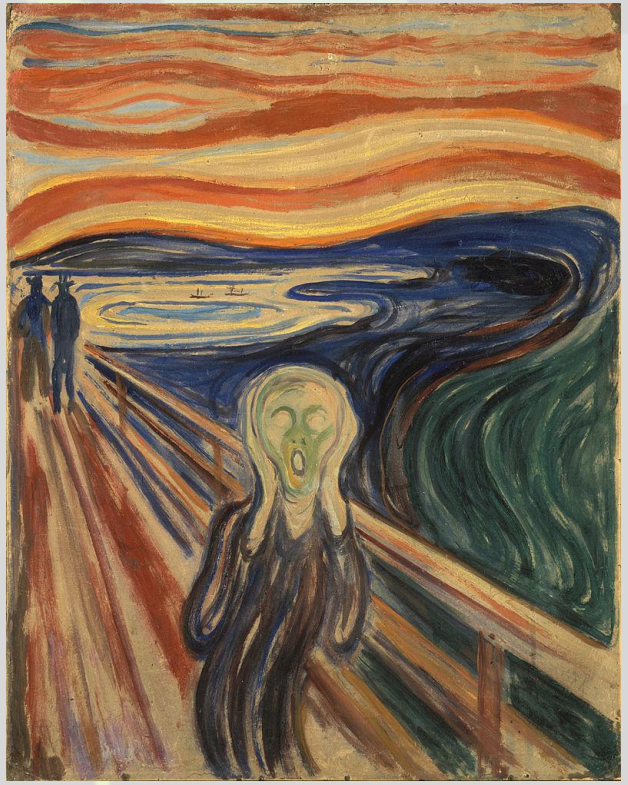
EGG YOLK
(proteins)

LINSEED OIL
(lipids)

MILK (caseins)
(proteins)

BEESWAX
(lipids and waxes)

Identification of binders in paintings



BINDERS:

- Usually BIG molecules
- Very different (chemically)
- Usually present in mixture
- Pigments might chemically modify the binder (?)
- Low amount of sample

Sigle MS-based analytical method for binders characterization

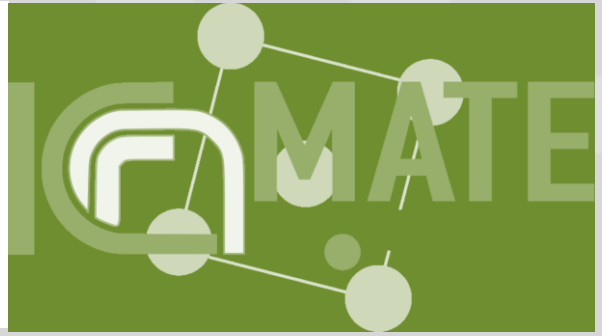
Untargeted Analysis of known binders and pigments

Binder (or mixture)

Extraction (derivatization)

Binder (or mixture)

Matrix addiction (enzymatic digestion)



Statistical Analysis

DATABASE
(and analytical method)

MS for Cultural Heritage

Analysis of unknown samples

Sampling
(< 1 mg)

MS analsysis

BINDER ID
(1-2 hours)

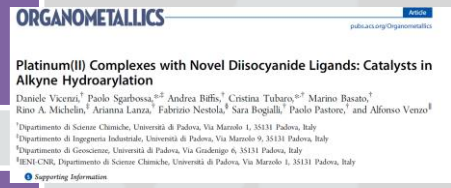
DATABASE

Collaboration_Padua_DISC
Characterization of materials; food adulterants

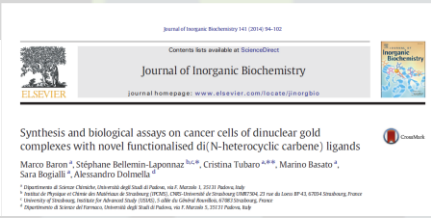
LC-HRMS

- Synthesis of organometals for catalysis and medical applications
- Cultural Heritage
- Food analysis
- Nanomaterials

Sugars analysis
With NMR & LC-MS


ORGANOMETALLICS

Platinum(II) Complexes with Novel Diisocyanide Ligands: Catalysts in Alkyne Hydroarylation

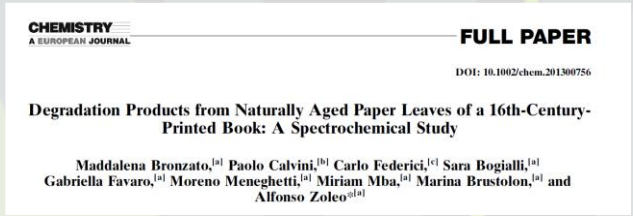

Journal of Inorganic Biochemistry

Synthesis and biological assays on cancer cells of dinuclear gold complexes with novel functionalised di(N-heterocyclic carbene) ligands


Dalton Transactions

PAPER

A square planar gold(III) bis-(1,1′-dimethyl-3,3′-methylene-diimidazol-2,2′-diylidene) trication as an efficient and selective receptor towards halogen anions: the cooperative effect of Au···X and X···HC interactions†


CHEMISTRY
A EUROPEAN JOURNAL

FULL PAPER

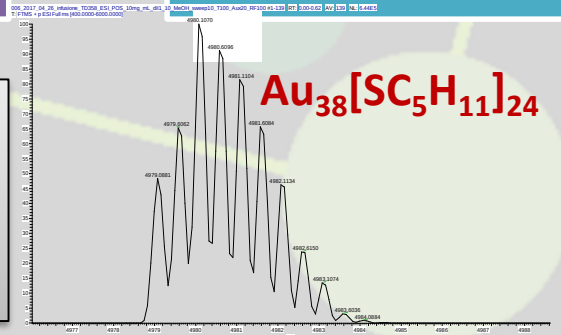
DOI: 10.1002/chem.201300756

Degradation Products from Naturally Aged Paper Leaves of a 16th-Century-Printed Book: A Spectrochemical Study


Research article

RAMAN SPECTROSCOPY

Composition and spectroscopic properties of historic Cr logwood inks




ACSNANO

ARTICLE

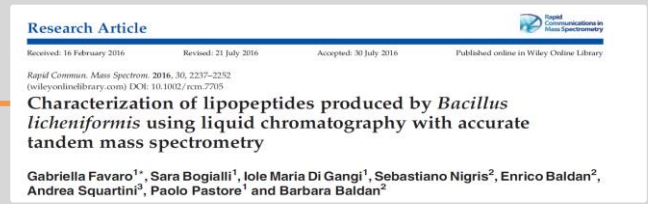
Gold Fusion: From $Au_{25}(SR)_{18}$ to $Au_{38}(SR)_{24}$, the Most Unexpected Transformation of a Very Stable Nanocluster

Collaboration_Padua_University
«Top-down» Metabolomic; biomarkers; environment

UNIVERSITÀ DEGLI STUDI DI PADOVA

DiSC

LC-HRMS

Dpt. of Medicine	Metabolomic on microbioma of diabetes	 THE FASEB JOURNAL • RESEARCH • www.fasebj.org **Interplay between gut microbiota and *p66Shc* affects obesity-associated insulin resistance** Stefano Ciciliot,[*,1] Mattia Albiero,[*,1] Stefano Campanaro,[†] Nicol Poncina,[*] Serena Tedesco,[*] Valentina Scattolini,[*,‡] Francesca Dalla Costa,[*] Andrea Cignarella,[§] Monica Vettore,[‖] Iole Maria Di Gangi,[§] Sara Bogialli,[§] Angelo Avogaro,[‖] and Gian Paolo Fadini[*,‡,2] [*]Venetian Institute of Molecular Medicine, Padua, Italy; and [†]Department of Biology, [‡]Department of Medicine, and [§]Department of Chemistry, University of Padova, Padua, Italy
Dpt. Pharmaceutical Sciences	-Metabolomic on Microbioma Gastrointestinal disorder, Hepatite B -Pharmacokinetic	 BJP British Journal of Pharmacology **RESEARCH PAPER** **Antibiotic-induced dysbiosis of the microbiota impairs gut neuromuscular function in juvenile mice** Correspondence Maria Cecilia Giron, Department of Pharmaceutical and Pharmacological Sciences, Pharmacology Building, Gastrointestinal Pharmacology Unit, University of Padova, Largo Meneghetti, 2–35121 Padova, Italy. E-mail: cecilia.giron@unipd.it Received 1 February 2017; Revised 18 July 2017; Accepted 19 July 2017 Valentina Caputi[1], Ilaria Marsilio[1], Viviana Filpa[2], Silvia Cerantola[1,3], Genny Orso[4], Michela Bistoletti[2], Nicola Paccagnella[1], Sara De Martin[1], Monica Montopoli[1], Stefano Dall'Acqua[5], Francesca Crema[6], Iole Maria Di Gangi[6], Francesca Gallopin[7], Isabella Lante[4], Sara Bogialli[6], Massimo Rugge[7], Patrizia Debetto[1], Cristina Giaroni[2] and Maria Cecilia Giron[1]
Dpt. of Biology	-Risk assessment on emerging contaminants (glyphosate, PFAs) -Marine Biology, Algal metabolites	 Environmental Pollution 233 (2018) 623–632 Contents lists available at ScienceDirect Environmental Pollution journal homepage: www.elsevier.com/locate/envpol **Ecotoxicological risk assessment for the herbicide glyphosate to non-target aquatic species: A case study with the mussel *Mytilus galloprovincialis*** Valerio Matozzo[a,*], Jacopo Fabrello[a], Luciano Masiero[a], Federico Ferraccioli[b], Livio Finos[c], Paolo Pastore[d], Iole Maria Di Gangi[d], Sara Bogialli[d]
Dpt. of Land, Environment, Agriculture And Forestry	Pharmacokinetic of biocides	Regional project «INFUSE» Research activities for Spin-off Two patents
Dept. of Agronomy, Animals, Food, Natural Resources and Environment	Food contaminants (mycotoxins) Bacteria bioactive metabolites	 Research Article Received: 16 February 2016 Revised: 21 July 2016 Accepted: 30 July 2016 Published online in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/rcm.7705 **Characterization of lipopeptides produced by *Bacillus licheniformis* using liquid chromatography with accurate tandem mass spectrometry** Gabriella Favaro[1]*, Sara Bogialli[1], Iole Maria Di Gangi[1], Sebastiano Nigris[2], Enrico Baldan[2], Andrea Squartini[3], Paolo Pastore[1] and Barbara Baldan[2]

The analytical group

… thanks for the attention.