

BMAA in brains and the environment

Conclusions from an analytical perspective

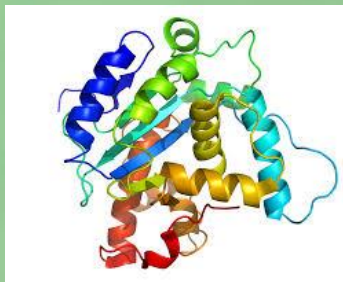
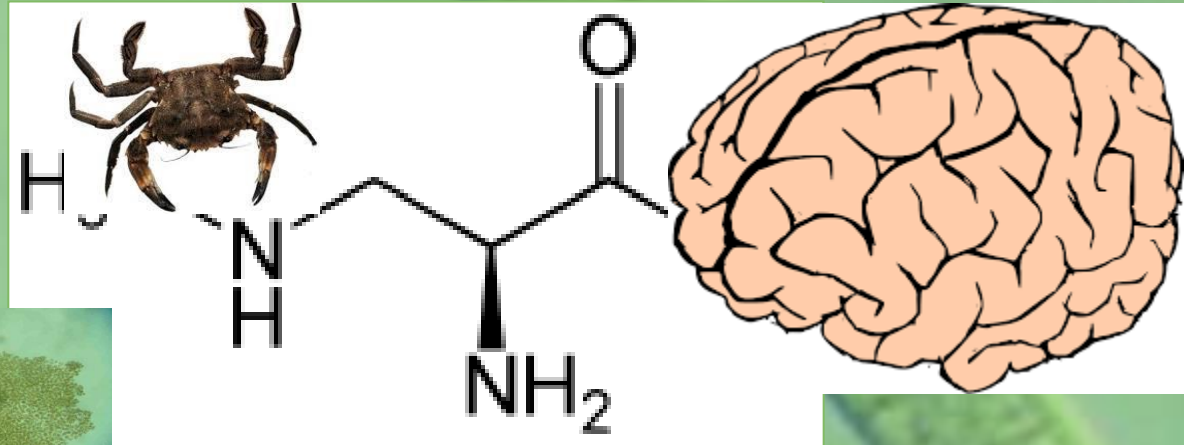
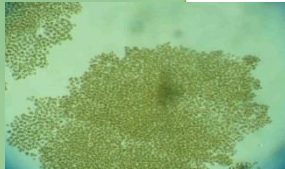


WAGENINGEN **UR**
For quality of life

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Miquel Lürling



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13 Octobre 1859



BMAA in cyanobacteria

Publication year	Quantification method	% positive samples	[BMAA] pos. samples $\mu\text{g/g DW}$
2005	LC-FLD	97	968
2008	LC-FLD	100	103
2008	LC-FLD	100	10
2008	GC-MS	96	130
2008	LC-MS/MS	0	-
2009	LC-MS/MS	43	13
2010	LC-MS/MS	0	-
2010	LC-MS/MS	100	0.01
2011	LC-MS	80	1.4
2011	CE-UV	100	402
2012	LC-FLD	100	14
2012	LC-FLD	100	0.29
2012	LC-MS/MS	0	-
2012	LC-MS/MS	0	-
2012	LC-FLD	38	28
2014	LC-MS/MS	100	4.4

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Detection methods of BMAA

- Optical detection methods (e.g. UV, FLD)
 - risk misidentification and overestimation ^{1,2}
- Commercial ELISA kit
 - Not suitable for all matrices^{3,4,5}
- Mass spectrometry methods
 - either with underivatised separation and detection, or with pre-column derivatisation (e.g. AQC, EZ-Faast, dansyl chloride)

1 Cohen Analyst 2012

2 Faassen *et al.* PLoS ONE 2012

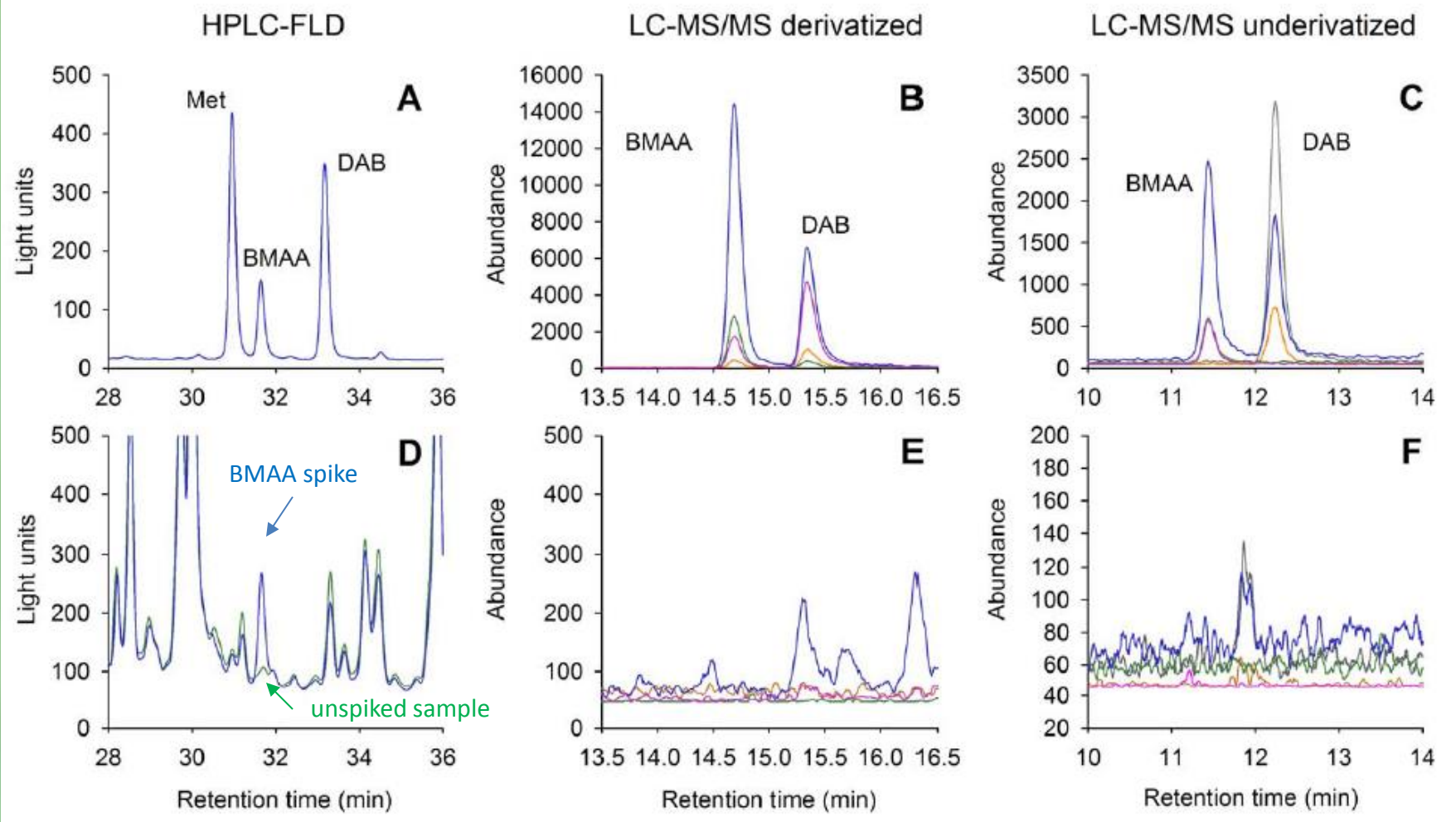
3 Faassen *et al.* PLoS ONE 2013

4 Blahova *et al.* Toxicon 2017

5 Clausi *et al.* IJEAC 2016

6 Faassen 2014

Method comparison experiment



Search for the most reliable data

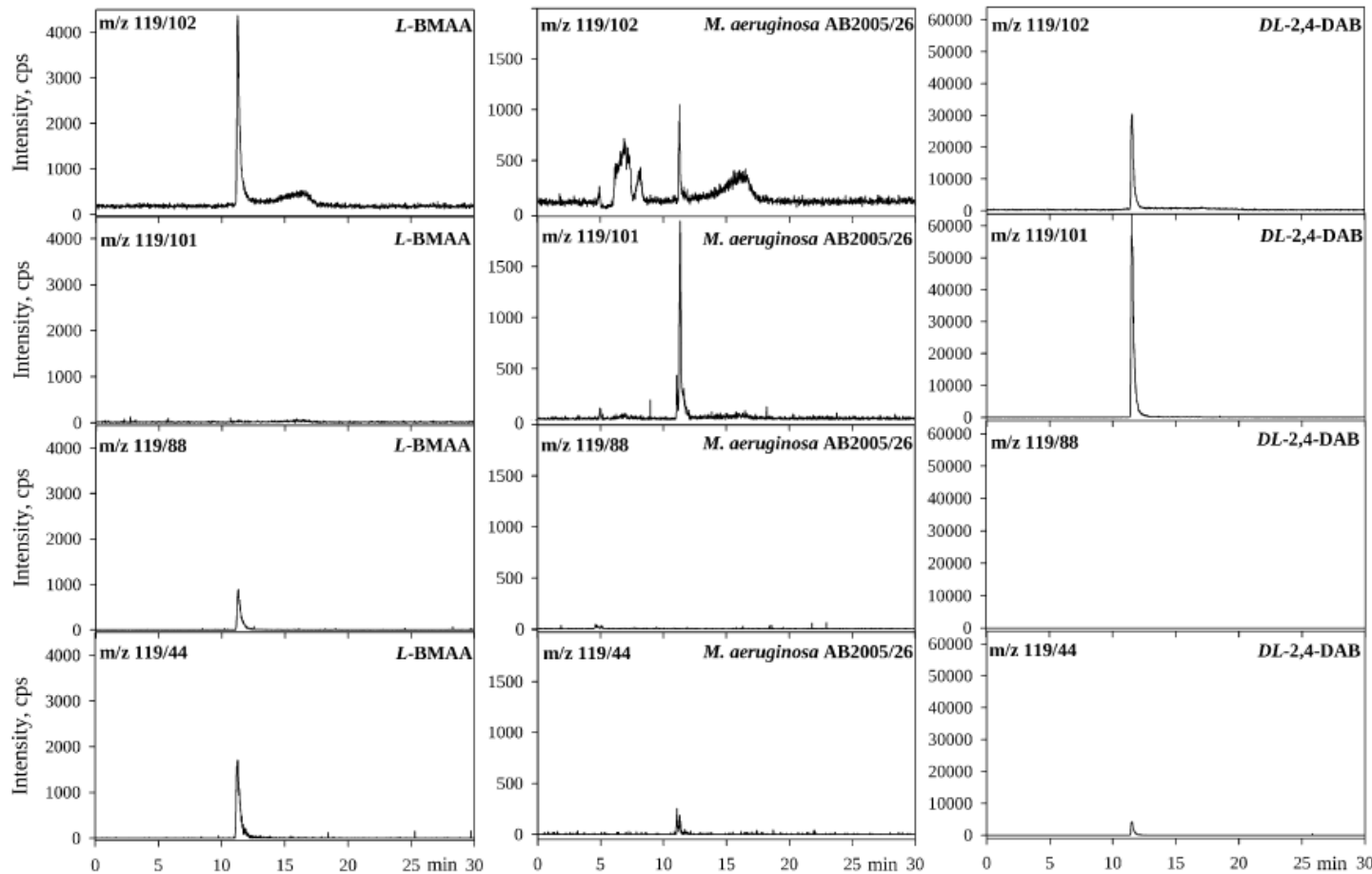
- Studies that used mass spectrometry ^{1,2,3}
- Studies that have shown to use correct chromatograms:
 - Retention times standard and sample similar
 - Peaks above noise level
 - Ratio of qualifier and quantifier(s) similar between standard and sample

1 Cohen Analyst 2012

2 Faassen *et al.* PLoS ONE 2012

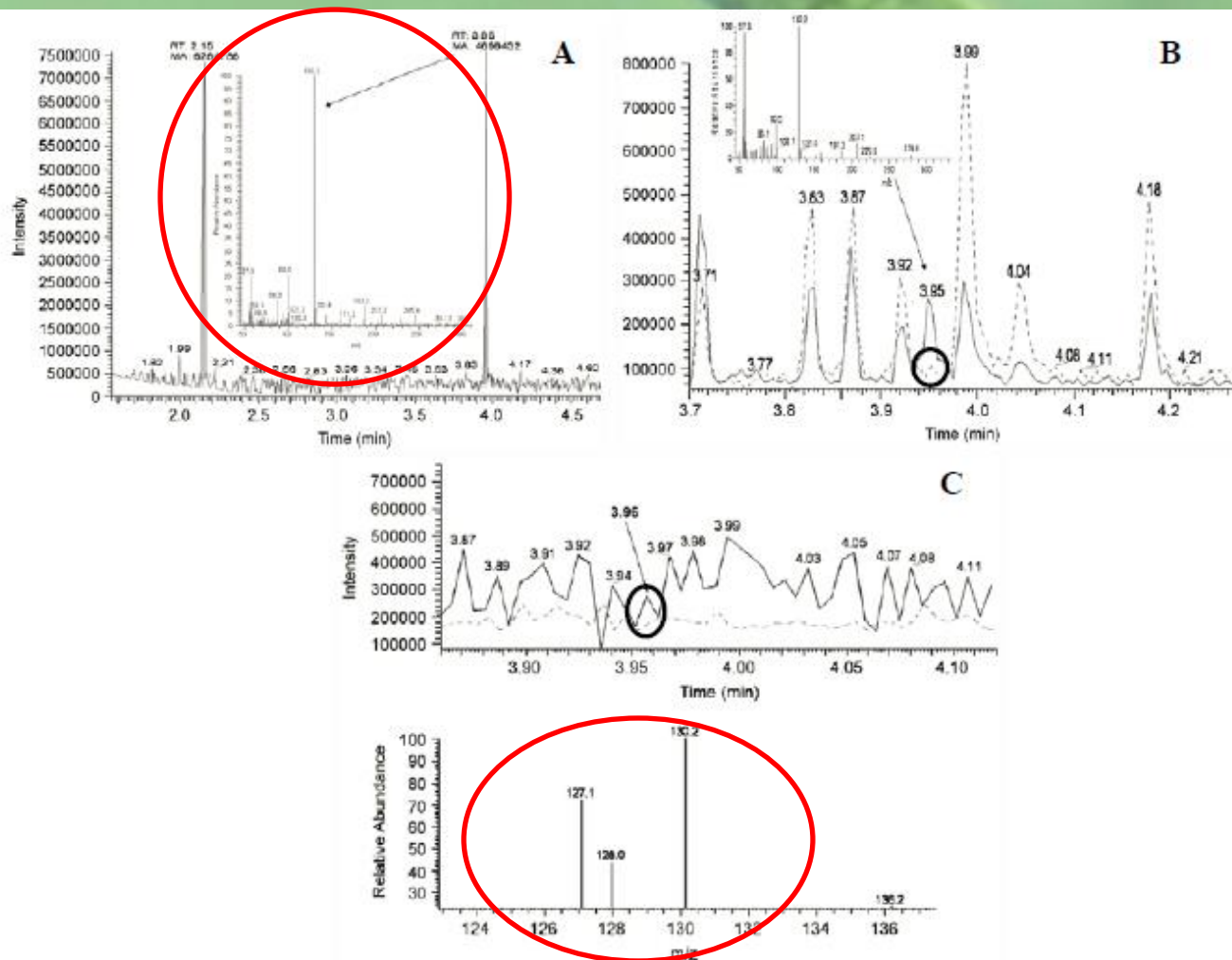
3 Faassen *et al.* PLoS ONE 2013

Informative chromatograms: LC-MS/MS



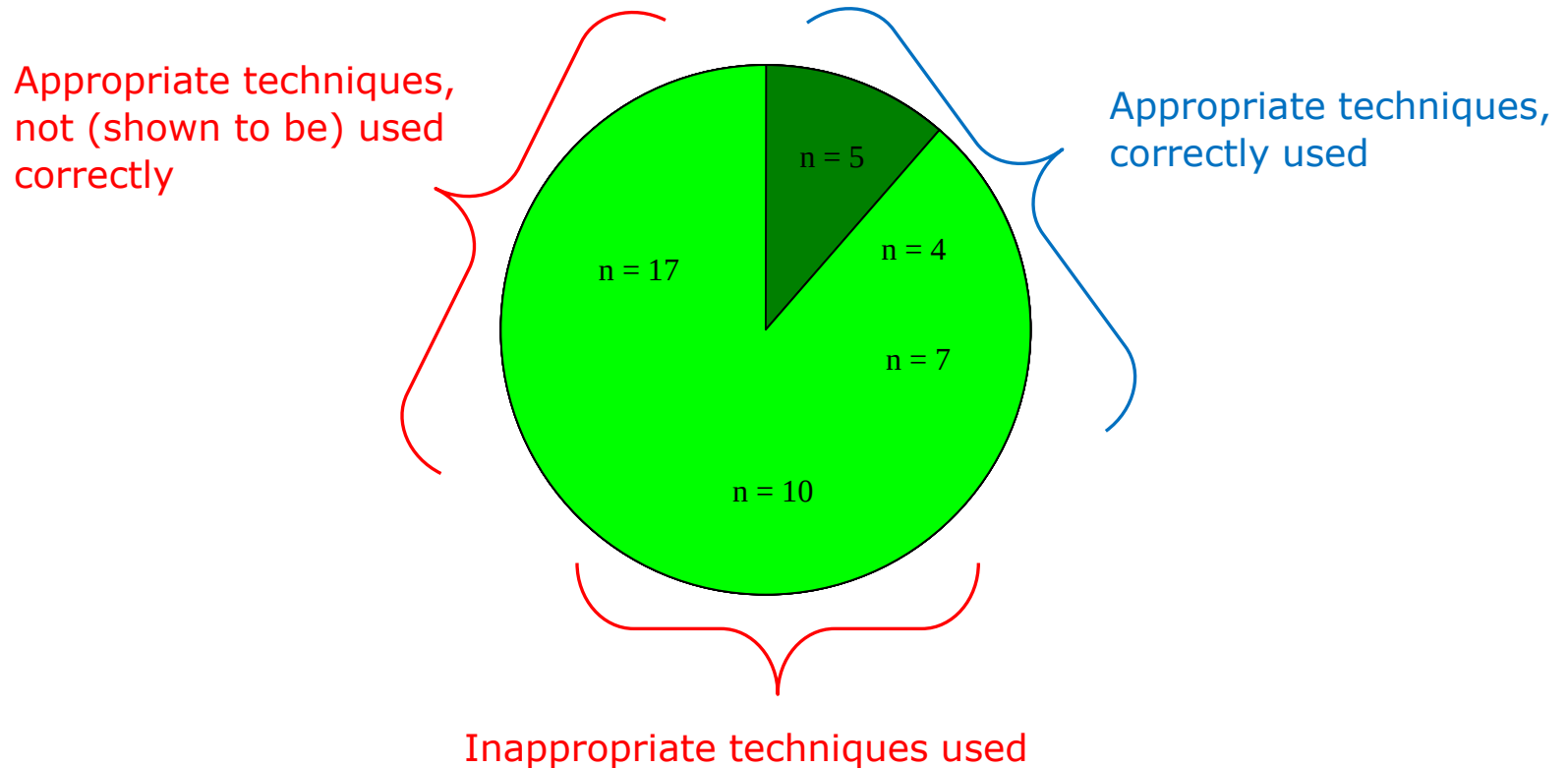
Krüger *et al.*
2010 Toxicon

Incorrect chromatograms: GC-MS



Esterhuizen and
Downing 2008
Ecotoxicology and
Environmental Safety

BMAA in aquatic organisms



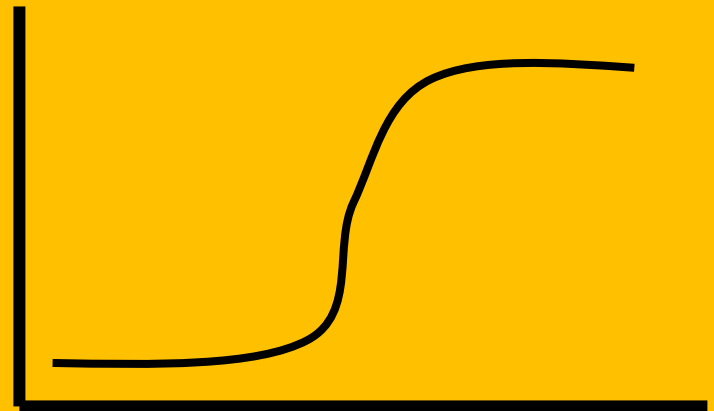
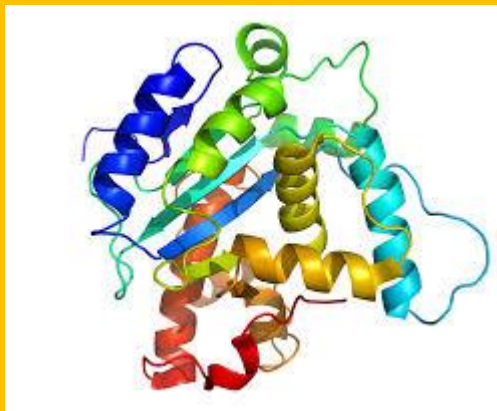
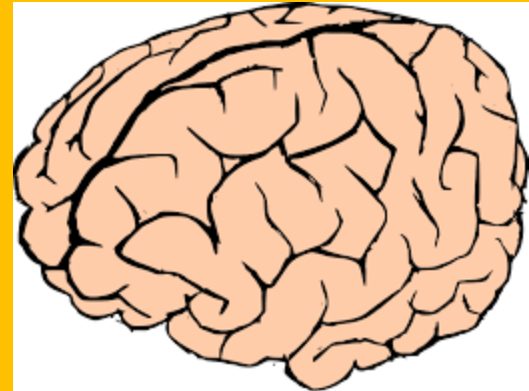
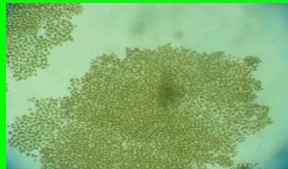
BMAA in aquatic organisms

- BMAA can be present in cyanobacteria, diatoms and higher aquatic organisms
- Concentration range: up to low $\mu\text{g/g}$

BMAA in brain

Publication year	Quantification method	BMAA in patients	BMAA in control
2003	HPLC-FLD	Yes	No
2004	HPLC-FLD	Yes	No
2004	HPLC-FLD	Yes	No
2005	HPLC-FLD	No	No
2009	HPLC-FLD	Yes	Incidental
2009	GC-MS/MS	No	No
2010	GCxGC-TOFMS	No	No
2014	LC-MS/MS	No	n.a.
2016	LC-MS/MS	No	No

BMAA rarely detected in tissue of neurodegenerative disease patients



Time for an interlab study?

- Analyse set of blank, spiked and natural positive samples
- Include seafood and cyanobacteria
- Include different analytical approaches
- Full analysis disclosure in scientific publication

- Interested? Contact me!
 - Els.Faassen@wur.nl

