Approach of SOP-development for HPLC based analysis of "new" algal toxins (dissolved state) in natural waters

Importance

Besides the microcystins which are the most common cyanotoxins world wide, a new group of toxins, the so called *saxitoxins* became more relevant in aqueous medium in recent years. Up to now about eighteen (18) different structures are known. Saxitoxins are neurotoxins and can be formed by marine dinoflagellates and fresh water blue green algae. The importance of saxitoxins is in relation to red tide in shellfish and causes the paralytic shellfish poisoning (PSP). In general the saxitoxins occur cell bound. On the other hand, they can be released in to the water by algal cell destruction. The molecular weight of saxitoxins lies between 300 and 400 a.u.. Their structures are characterized by amino and sulfonic acid groups. This is the reason of a very high polarity which makes their extraction from the water phase quite difficult.

Approach

The approach for trace analysis of dissolved saxitoxins is subdivided into the following steps:

- Preparation of aqueous standard solutions of saxitoxins and for HPLC calibration,
- Online Solid phase extraction of saxitoxins in water samples using a combination of pre-concentration columns,
- Conditions for analysis saxitoxins by high-performance liquid chromatography and mass detection.

Result

Interim SOP for trace analysis (till a limit of determination from 0.1 till 0.3 µg/L) of saxitoxin, neosaxitoxin, gonyautoxin-I, gonyautooxin-II, gonyautoxin-III and gonyautoxin-IV in natural fresh and sea waters are available and will be tested in further work

More information

The overview and results of the first selection round have been published in the report Interim SOP for HPLC based analysis of new algal toxins (dissolved state) in natural waters.

Dr. Wido Schmidt
TZW Karlsruhe, Brach Dresden
Tel.: +493518521143
e-mail: schmidt@tzw-dresden.de

TKI Categorisation

Classification									
Supply Chain		**Process Chain**		**Process Chain (cont'd)**		**Water Quality**		**Water Quantity (cont'd)**	
Source		**Raw water storage**		**Sludge treatment**		**Legislation/regulation**		- Leakage	
- Catchment		- Supply reservoir	x	- Settlement		- Raw water (source)	x	- Recycle	
- Groundwater		- Bankside storage		- Thickening		- Treated water	x		
- Surface water	x	**Pretreatment**		- Dewatering		**Chemical**			
- Spring water		- Screening	x	- Disposal		- Organic compounds	x		
- Storm water		- Microstraining		**Chemical dosing**		- Inorganic compounds			
- Brackish/seawater	x	**Primary treatment**		- pH adjustment		- Disinfection by-products			
- Wastewater	x	- Sedimentation		- Coagulant		- Corrosion			
Raw water storage		- Rapid filtration	x	- Polyelectrolyte		- Scaling			
- Supply reservoir	x	- Slow sand filtration		- Disinfectant		- Chlorine decay			
- Bankside storage		- Bank filtration		- Lead/plumbosolvency		**Microbiological**			
Water treatment		- Dune infiltration	x	**Control/instrumentation**		- Viruses		**Consumers / Risk**	
- Pretreatment	x	**Secondary treatment**		- Flow		- Parasites			
- Primary treatment	x	- Coagulation/flocculation	x	- Pressure		- Bacteria	x	**Trust**	
- Secondary treatment	x	- Sedimentation	x	- pH		- Fungi		- In water safety/quality	x
- Sludge treatment		- Filtration	x	- Chlorine		**Aesthetic**		- In security of supply	
Treated water storage		- Dissolved air flotation(DAF)	x	- Dosing		- Hardness / alkalinity		- In suppliers	
- Service reservoir	x	- Ion exchange		- Telemetry		- pH		- In regulations and regulators	
Distribution		- Membrane treatment	x	**Analysis**		- Turbidity		**Willingness-to-pay/acceptance**	
- Pumps		- Adsorption	x	- Chemical	x	- Colour		- For safety	x
- Supply pipe / main		- Disinfection	x	- Microbiological		- Taste	x	- For improved taste/odour	
Tap (Customer)		- Dechlorination		- Physical		- Odour	x	- For infrastructure	
- Supply (service) pipe		**Treated water storage**						- For security of supply	

- Internal plumbing		- Service reservoir				**Water Quantity**		**Risk Communication**	
- Internal storage		**Distribution**						- Communication strategies	
		- Disinfection				**Source**		- Potential pitfalls	
		- Lead/plumbosolvency				- Source management		- Proven techniques	
		- Manganese control				- Alternative source(s)			
		- Biofilm control				**Management**			
		Tap (Customer)				- Water balance			
		- Point-of-entry (POE)				- Demand/supply trend(s)			
		- Point-of-use (POU)				- Demand reduction			

TKI Categorisation (continued)

Contains		**Constraints**		**Meta data**					
Report		Low cost		*Author(s)*		Wido Schmidt		Lutz Imhof	
Database	x	Simple technology		*Organisation(s)*		TZW Branch Dresden			
Spreadsheet		No/low skill requirement		*Contact name*		Wido Schmidt			
Model		No/low energy requirement		*Contact email*		schmidt@tzw-dresden.de			
Research	x	No/low chemical requirement		*Quality controller name*					
Literature review		No/low sludge production		*Quality controlerl organisation*					
Trend analysis		Rural location		Source					
Case study / demonstration		Developing world location		*Date prepared*					
Financial / organisational				Date submitted (TKI)					
Methodology				Date revised (TKI)					
Legislation / regulation									
Benchmarking									