Assessing the feasibility of total virus detection with flow cytometry in drinking water

Introduction

The feasibility of total virus detection with flow cytometry in drinking water has been assessed. The staining and detection was based on a published protocol. The bacteriophage T4 has been used as a model organism. The staining procedure has been evaluated by epifluorescence microscopy and the suspensions have been subsequently analyzed by flow cytometry. Three different types of instruments have been compared for their ability to detect the stained bacteriophages.

Result

T4 bacteriophages could be detected using flow cytometry. A separated peak was visible on two of the instruments that were tested, and enumeration down to a concentration of about 5 x 10^4 viral particles/mL was possible. However, even though the conditions for detection were optimal using a model organism suspended in a matrix characterized by low amount of interfering signals, the fluorescence peak, resembling the bacteriophages, was very near to the background and thus on the limit of detection. In our opinion, the application of this method for the rapid and quantitative detection of total viral counts for drinking water analysis is therefore not yet feasible using the tested instruments and protocol. Results would be very vague and could therefore easily lead to false interpretations and reactions of drinking water facilities.

More information

Full details on this deliverable can be found under D3.3.5. Further information can be requested from:

Marius Vital
EAWAG
Überlandstrasse 133, 8600 Dübendorf
marius.vital@eawag.ch

TECHNEAU Knowledge Integrator (TKI) categorisation

Categorisation of Knowledge Packages

Categorisation (i.e. classification, contains and constraints) of knowledge packages (KPs) can be carried out by 'checking' the appropriate boxes in the attached tables. For example, for a KP investigating point-of-use treatment suitable for a developing world country, the following might be checked:

Classification: Process chain – Tap (Customer) – Point-of-use (POU).
Contains: Report; Literature review.
Constraints: Low cost; Simple technology; No/low skill requirement; No/low energy requirement; No/low chemical requirement; No/low sludge production; Developing world location.

Note that only the lowest level classification needs to be checked, e.g. Point-of-use (POU) in the above example.

Meta data can be included under the 'More Information' section of the Executive Summary Report, i.e. Author(s), Organisation(s), Contact details (name and email), Quality controller (name and organisation) and Date prepared. (The TKI administrator can enter Source (= TECHNEAU), Date submitted (TKI) and Date revised (TKI)).

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		- Settlement		- Raw water (source)		- Recycle	
- Groundwater		- Bankside storage		- Thickening		- Treated water			
- Surface water		**Pretreatment**		- Dewatering		**Chemical**			
- Spring water		- Screening		- Disposal		- Organic compounds			
- Storm water		- Microstraining		**Chemical dosing**		- Inorganic compounds			
- Brackish/seawater		**Primary treatment**		- pH adjustment		- Disinfection by-products			
- Wastewater		- Sedimentation		- Coagulant		- Corrosion			
Raw water storage		- Rapid filtration		- Polyelectrolyte		- Scaling			
- Supply reservoir		- Slow sand filtration		- Disinfectant		- Chlorine decay			
- Bankside storage		- Bank filtration		- Lead/plumbosolvency		**Microbiological**			
Water treatment		- Dune infiltration		**Control/instrumentation**		- Viruses		**Consumers / Risk**	
- Pretreatment		**Secondary treatment**		- Flow		- Parasites			
- Primary treatment		- Coagulation/flocculation		- Pressure		- Bacteria		**Trust**	
- Secondary treatment		- Sedimentation		- pH		- Fungi		- In water safety/quality	
- Sludge treatment		- Filtration		- Chlorine		**Aesthetic**		- In security of supply	
Treated water storage		- Dissolved air flotation(DAF)		- Dosing		- Hardness / alkalinity		- In suppliers	
- Service reservoir		- Ion exchange		- Telemetry		- pH		- In regulations and regulators	
Distribution		- Membrane treatment		**Analysis**		- Turbidity		**Willingness-to-pay/acceptance**	
- Pumps		- Adsorption		- Chemical		- Colour		- For safety	
- Supply pipe / main		- Disinfection		- Microbiological		- Taste		- For improved taste/odour	
Tap (Customer)		- Dechlorination		- Physical		- Odour		- 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	x	Low cost		*Author(s)*		Marius Vital			
Database		Simple technology		*Organisation(s)*		EAWAG			
Spreadsheet		No/low skill requirement		*Contact name*		Marius Vital			
Model		No/low energy requirement		*Contact email*		marius.vital@eawag.ch			
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*		26-06-2007			
Financial / organisational				Date submitted (TKI)		28-06-2007			
Methodology	x			Date revised (TKI)					
Legislation / regulation									
Benchmarking									