ColiMinder®
ONLINE BACTERIAL MONITORING
by Vienna Water Monitoring Solutions

References Awards & Scientific Publications

This document covers information about VWMS customers in different application fields and awards won for the technology as well as a list of peer-reviewed scientific publications. The reference list serves as an excerpt and is under continuous updating.

Date of publishing: 19 May 2023

BOTTLED WATER

Customer:	Romaqua – Mineral Water Production Romania, 2 units in 2 different plants
Application:	Online monitoring of microbiological water quality of two mineral water wells and quality control throughout bottling process.
Task:	Safeguarding product quality, enable evidence-based decision-making to CIP (Clean in Place), testing final product prior to delivery, increase safety and efficiency of the bottling process.
Target organism:	Total Microbiological Activity (ALP)
Contact:	Mr Radu Lazaroiu, General Manager Romaqua, radu.borsec@romaqua.ro

ROMAQUA GROUP
BORSEC

Customer:	**Refresco**
Application:	Monitoring of microbial water quality in the production process and as a lab device to replace parts of manual tests
Task:	Safeguarding process and product quality, testing of final product prior to dispatch.
Target organism:	Total Microbiological Activity and E.coli in some cases.
Contact:	Via our distribution partner Reinhold Keller, Sagamo AG.

Refresco
Our drinks on every table

Customer:	**Major international soft drink company,** plant in South Africa
Application:	Pilot and technology validation project for monitoring of microbiological water quality of raw water from municipal sources, quality control throughout the production process.
Task:	Safeguarding product quality and increase safety and efficiency of the soft drink production process. Targeted reduction of chlorine dosage for disinfection.
Target organism:	Total Microbiological Activity (ALP)
Contact:	no disclosure of information possible due to an NDA.

Customer:	**Rauch Fruchtsaft AG, Austria**
Application:	Using the ColiMinder for continuous monitoring of microbial water quality at different steps in bottling process.
Task:	Safeguarding product quality, increase safety and efficiency of bottling process.
Target organism:	Total Microbiological Activity (ALP)
Contact:	through our partner **Sagamo AG** Mr. Reinhold Keller, rk@sagamo.ch, mobile: +41 77 983 5164

RAUCH

DRINKING WATER

Customer:	**WSD** – public **W**ater **S**upply **D**epartment, Hong Kong
Application:	ColiMinder has been successfully validated in a technology evaluation project, and WSD will continue using the ColiMinder for monitoring final drinking water and equip further drinking water plants with the instrument. Next scheduled investment will be a ColiMinder Emergency Response Unit for scanning the drinking water network.
Task:	Ensuring microbial safety in drinking water supply.
Target organism:	Total Microbiological Activity (ALP)
Contact:	through our partner **Guyline Asia Ltd.** Ms Wendy Lai, General Manager Wendy@guyline.com.hk or GM@guyline.com.hk

Water Supplies Department
The Government of the Hong Kong Special Administrative Region

Customer:	**DEWA** – Dubai Electricity and Water Authority, UAE
Application:	Pilot project for monitoring microbial water quality in a drinking water network
Task:	Ensuring drinking water safety, planned roll-out to more deployments within DEWA
Target organism:	Total Microbiological Activity (ALP)
Contact:	through our partner **AIWAEN**: Mr Craysac Fx, CEO E-Mail: craysacfx@waen.ai

Customer:	**NEOM** –Smart City Project, Saudi Arabia
Application:	Pilot project for monitoring microbial water quality in drinking water production
Task:	Ensuring drinking water safety, planned roll-out to more deployments within NEOM
Target organism:	Total Microbiological Activity (ALP) and E. coli
Contact:	through our partner **AIWAEN**: Mr Craysac Fx, CEO E-Mail: craysacfx@waen.ai

Customer:	**KWR** Water Research Institute, The Netherlands
Application:	Technology evaluation and validation for Dutch drinking water utilities, comparison with other techniques.
Task:	Identifying most suitable deployments and use cases of ColiMinder for Dutch Water Utilities.
Target organism:	Total Microbiological Activity (ALP)
Contact:	Marcelle van der Waals, Scientific researcher - Microbial Water Quality and Health phone +31 30 606 9566 | E-Mail: Marcelle.van.der.Waals@kwrwater.nl

Customer:	**Sweden Water Research**
Application:	Various projects for evaluation of ColiMinder for online monitoring of microbiological water quality, in drinking water and surface & bathing water.
Task:	Identifying most suitable deployments and use cases of ColiMinder for Swedish Water Utilities.
Target organism:	Total Microbiological Activity (ALP), E. coli and Enterococci
Contact:	Markus Fröjd, Head of Projects at Sweden Water Research Markus.Frojd@swrab.se, mobile : + 46 722 25 96 56

Customer:	**LIST** – Luxembourg Institute of Science & Technology
Application:	Online monitoring of microbiological water quality in drinking water production and distribution at different Luxembourg drinking water utilities. Next project SMARTWATER including 4 ColiMinder devices in finalizing for 2023/2024.
Task:	Ensuring safety of drinking water supply
Target organism:	Total Microbiological Activity (ALP)
Contact:	**Mr Jean-Baptiste Burnet** jeanbaptiste.burnet@list.lu Mobile: +352 691 682 273

Customer:	**Unitywater** - drinking water utility, Australia
Application:	Online monitoring of microbiological water quality of final drinking water in Unitywater's network, installed at BliBli reservoir.
Task:	Ensuring safety of drinking water supply.
Target organism:	Total Microbiological Activity (ALP)
Contact:	through **Optimos Solutions**, distribution partner for Australia & NZL Mr. Phil Krasnostein, Director phil@optimosgroup.com.au, Mobile: +61 409359155

Customer:	**WLVNB – Wasserleitungsverband Nördliches Burgenland,** one of Austria's Top Ten Water supplier
Application:	During pilot project 500+ samples were measured in parallel with the culture-based method. Correlation was approved. Using an ERU (Emergency Response Unit) to monitor microbial drinking water quality during construction works in drinking water network.
Task:	Ensuring safety of drinking water supply. Quick decision-making during construction works increases efficiency significantly.
Target organism:	Total Microbiological Activity (ALP)
Contact:	via VWMs GmbH

Customer:	**Bathurst Regional Council,** municipal drinking water supply, Australia
Application:	Online monitoring of raw water quality for drinking water production – installed at pumping station located in a 21 km long pipeline between reservoir and drinking water production facility
Task:	Ensuring safety of drinking water supply
Target organism:	E. coli
Contact:	**through Optimosgroup, ColiMinder distributor for Australia** Mr. Phil Krasnostein, Director, phil@optimosgroup.com.au, Mobile: +61 409359155

Customer:	**MEKOROT**, Israel's public water supplier
Application:	Online monitoring of raw water network for drinking water supply with ColiMinder ERU
Task:	Ensuring safety of drinking water supply
Target organism:	E. coli and Total Activity (ALP)
Contact:	Dalit Vaizel-Ohayon, PhD Chief Bacteriologist Mekorot National Water Company Jordan District, Central Laboratory P.O.Box 610 Nazareth Illit 17105, Israel Mobile phone: +972 50 7126839 Email: dvaizel@mekorot.co.il

Customer:	**Ville de Laval, municipal drinking water supply, Canada**
Application:	The ColiMinder is installed at raw water intake from river "Rivière des Mille Îles" to a drinking water plant
Task:	Monitoring of microbiological quality of raw water
Target organism:	E. coli
Contact:	via VWMS

SURFACE & BATHING WATER

Customer: **Sydney Water** – Sydney's public Water Company

Application: using 2 ColiMinder devices for monitoring urban bathing water site at Paramatta River to safeguard bathing water quality

Task: Enabling quick reaction on contamination events

Target organism: Enterococcus

Contact : **Through VWMS' distribution partner for Australia**
Optimos Group
Mr. Phil Krasnostein
phil@optimos.com.au

Customer: **Eau de Paris -** public water utility for Paris

Application: using 2 ColiMinder devices for
1. bathing water monitoring in different public recreation areas, especially during **Olympic Games 2024**
2. deployment in raw water monitoring for **drinking water production**
3. monitoring combined sewer overflows in rivers and recreational waters
4. monitoring drinking water production in drinking water production

Task: ensuring safety in bathing waters / enabling quick reaction on contamination events / monitoring drinking water safety

Target organism: E. coli, Enterococcus and Total Activity

Contact : **Dr Sophie Haenn,** Microbiologiste R&D
75214 PARIS Cedex 13 I France I sophie.haenn@eaudeparis.fr

Customer: **Ville de Paris – Government of the City of Paris**

Application: bathing water monitoring of a sites at Seine River, **dedicated for swimming competition at Olympic Games 2024.** Paris' Olympic Organization Committee together with International triathlon Union have decided to use ColiMinder results for final decision-making whether to use the Seine for official swimming competition.

Task: Ensuring safety in bathing waters, enabling quick reaction on contamination events (closing/opening beaches)

Target organism: E. coli, Enterococcus

Contact : **Marion Delarbre**
Bureau de Miguel GILLON-RITZ, Responsable du pôle d'expertise grand cycle et qualité de l'eau Direction de la Propreté et de l'Eau, 75014 PARIS, France,
marion.delarbre@paris.fr

Customer:	**EKEO, Energizing Kowloon East Office, Smart City Project, together with CEDD (Civil Engineering Development Department), Hong Kong**
Application:	Monitoring E. coli levels at Kwun Tung Typhoon Shelter at the former airport in Hong Kong, an urban development site
Task:	Monitoring fecal contamination in surface & recreational water
Target organism:	E. coli saline
Contact :	Ms Wendy Lai, General Manager, Guyline Asia Ltd. (Distribution partner for Hong Kong) Wendy@guyline.com.hk or GM@guyline.com.hk

Customer:	**Sweden Water Research – Urbana Bad Sweden**
Application:	The Urbana Bad project is a large scientific project to make bathing safer through application of innovative monitoring techniques. Using 3 unit in summer 2023 for monitoring bathing water quality in Helsingborg and Malmö, Sweden
Task:	Monitoring fecal contamination levels in bathing waters, enabling quick reaction on contamination events.
Target organism:	E. coli and Enterococci
Contact:	Markus Fröjd, Head of Projects at Sweden Water Research Markus.Frojd@swrab.se, mobile : + 46 722 25 96 56

Customer:	**Ville de L'Assomption**, municipal bathing water and drinking water, Canada
Application:	The ColiMinder is installed at raw water intake from a river to a drinking water production, at the same time monitoring a bathing site nearby.
Task:	Monitoring of microbiological quality of surface and raw water
Target organism:	E. coli
Contact:	via VWMS

Customer:	**University of Tokyo**
Application:	surface water monitoring in different public recreation areas, also the ones **dedicated for swimming competition at upcoming Olympic Games**
Task:	ensuring bathing water safety, enabling quick reaction on contamination events
Target organism:	E. coli
Contact:	**Prof. Hiroyuki Katayama** University of Tokyo, Department of Urban Engineering, Graduate School of Engineering Bunkyo-ku, Tokyo, 113-8656 I Japan

Customer: **NIWA - National Institute of Water and Atmospheric Research**

Application: Surface water monitoring using ColiMinder ERU in different applications and both fresh and saline waters.

Task: scientific studies, validations, research projects

Target organism: E. coli, Enterococcus in Fresh-/Saline-Waters

Contact:

Dr Rebecca Stott
Environmental Health I Microbiology Scientist
Hamilton | New Zealand
www.niwa.co.nz
Rebecca.Stott@niwa.co.nz

Customer: **KIT – Karlsruhe Institute of Technology**

Application: Surface water monitoring in different applications using ColiMinder Mobile. Current project: karstic spring monitoring throughout Europe

Task: scientific studies, validations, research projects in real world setting

Target organism: E. coli

Contact:

Prof. Nico Goldscheider
Karlsruhe Institute of Technology
Institute of Applied Geosciences
Nico.goldscheider@kit.edu
76131 Karlsruhe I Germany

Customer: **Université Polytechnique de Montréal**

Application: monitoring of surface water and raw water in drinking water production, bathing water and sewage plant discharge using 6 ColiMinder devices

Task: scientific validation of the technology; helping municipalities and other institutions to ensure water safety

Target organism: E. coli

Contact:

Sarah Dorner, PhD
Canada Research Chair in Source Water Protection
Department of Civil, Geological and Mining Engineering
Polytechnique Montréal
Tel: 514-340-4711 ext. 3711
sarah.dorner@polymtl.ca

Customer: **AgResearch, New Zealand**

Application: monitoring of surface water in agricultural production and land use

Task: Monitoring at different sites / of different streams and effluents in agricultural land use and production

Target organism: E. coli

Contact:

AgResearch
Mr. Richard Muirhead, richard.muirhead@agresearch.co.nz

WASTEWATER

Customer: **MWR Denver – MetroWaterRecovery Denver / Colorado**

Application: Pilot project for using the ColiMinder to control disinfection

Task: Monitoring of E. coli levels prior to disinfection for adjusting disinfection intensity to actual microbiological load.

Target organism: E.coli

Contact: **MWR Denver**
Mr Dan Freedman
Dfreedman@MetroWaterRecovery.com

METRO WATER RECOVERY℠

Customer: **LZWW – Life Zero Waste Water –** EU funded project with several stakeholders: FCC Aqualia, Canal de Isabel II, Simbiente Ingenería and scientific partners, deployed at Valdebebas WWTP (Madrid, Spain)

Application: Project "Combined treatment of urban waste water and the organic fraction of municipal solid waste in WWTPs with positive energy balance for populations of less than 50,000 IE.

Target organism: E.coli

Task: Providing reliable sensor data for a development of the smart system for the control and monitoring of water quality in effluent.

ZERO WASTE WATER

Contact: via VWMS GmbH I www.lifezerowastewater.com

Customer: **DSD - Drainage Service Department**, public wastewater institution Hong Kong, with **ARUP** International Consultancy

ARUP

Application: Sewage treatment monitoring and controlled disinfection at Stonecutters Island Sewage Treatment Works (SCISTW), one of the world's largest wastewater treatment plants.

渠務署
Drainage Services Department

Target organism: E. coli (saline water)

Task: <u>official statement from DSD dated 2018:</u>

DSD and ARUP present an innovative project at Hong Kong´s Stonecutters Island Treatment Works (SCISTW).
As an attempt to adopt new technology in order to improve efficiency and efficacy of sewage treatment, DSD and ARUP are trialing VWMs' ColiMinder technology at HK Stonecutters Island.
The treatment works at Stonecutters Island consists of Chemically Enhanced Primary Treatment (CEPT) and disinfection with Sodium Hypochlorite. The SCISTW services a

population of more than 5 Million and with a design ADWF of 2,450,000 m^3/d is it one of the world's largest CEPT wastewater treatment plants.
Sodium Hypochlorite for disinfection consists as one of the significant operating costs. A number of inherent technical issues, including variable wastewater chlorine demand and fluctuating environmental conditions provide a challenge for the operators to optimize the chemical consumption while meeting disinfection objectives.
The goal of DSD and ARUP is to:

- *Improve process efficiency*
- *Safeguard water quality*

The trial has been under way since December 2017 and so far over 5,000 measurements have been recorded without failure or need for re-calibration of the unit. While the trial period is planned for 12 months in order to cover all expected process conditions, initial performance indicates that the equipment is reliable and the relationship between ColiMinder and Laboratory results is positive.

Contact: **via VWMS GmbH**

Customer: **MSD** Cincinnati, Ohio, US

Application: Controlled disinfection in sewage treatment discharge, monitoring before and after disinfection

Task: Monitoring sewage treatment process performance

Target organism: E. coli

Contact: via VWMS **GmbH**

MEMBRANE INTEGRITY

Customer: **Herlev Hospital in cooperation with DHI Group, Denmark**

Application: DHI acted as engineering company for a hospital sewage plant discharge quality monitoring, using the ColiMinder to monitor membrane integrity in a public hospital's MBR plant. **Project has been awarded by Danish EPA as "BAT" (Best Available Technology).**

Task: Fully automated contamination monitoring of sewage plant discharge before drained into a recreational area. Automatic warnings in case of increased contamination due to broken UF membranes.

Target organism: E. coli

Contact: **Ulf Nielsen (formerly DHI)**
Ultraaqua, Denmark
uni@ultraaqua.com

Customer:	**Bipso Bracco, Pharma production, Germany**
Application:	Monitoring of microbiological quality levels in pharma production, from RO water to ultra-pure water.
Task:	Ensuring safety and efficiency of production process.
Target organism:	Total Activity (ALP)
Contact:	via Sagamo AG, Reinhold Keller I rk@sagamo.ch

Customer:	**Producer of metal working fluids, Europe** **(**Must not be named due to an existing NDA.
Application:	Monitoring of microbiological contamination in metal working fluids in industrial production process.
Task:	Automated quality monitoring to enable adjustment of disinfection intensity.
Target organism:	Total Activity (ALP)
Contact:	via VWMS

AWARDS won by ColiMinder

2021:

December 2021:

Winner of the TechChallenge by The Water Council, Milwaukee, US

"Microbial Control in Distribution systems and in buildings"

2019:

September 2019:

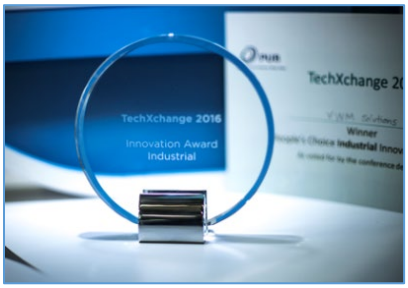
Winner of the MEKOROT -Bacterial Detection Challenge

2016:

October 2016 **WaterSmart Innovations Conference**

LAS VEGAS Channels for Innovation Summit:

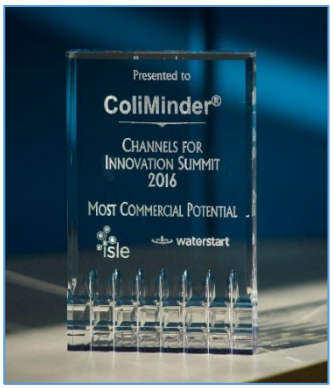
- **MOST INNOVATIVE NEW TECHNOLOGY**

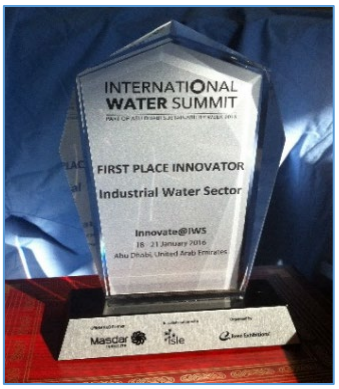


July 2016 **Singapore Water Week**

TechXchange: WINNER OF INNOVATION AWARD

- **1st Place voted by the Jury**
- **1st Place voted by TechXchange Participants**





Jan 2016 **International Water Summit ABU DHABI**

Innovate@IWS: FIRST PLACE INNOVATOR

- **WINNER OF INDUSTRIAL WATER SECTOR**

2015:

- 3/2015 - Neptun Water- Award
- 3/2015 - Science2business Award 2015

2014 :

- 12/2014 - STEP AWARD – Germany – TOP 20
- 11/2014 - Austrian Young Entrepreneurs Competition – Winner Category Environment
- 11/2014 - Austrian Young Entrepreneurs Competition - 9. Rank
- 10/2014 - NÖ Future Award – 2. Rank
- 10/2014 - Green Business Award 2014 – 1. Rank
- 10/2014 - Cisco + Pioneers – Innovation Challenge – Top 50
- 10/2014 - Innovationspreis 2014 – outstanding Innovation
- 09/2014 - DAPHNE Environment Award – awarded Excellent Project

List of scientific publications

List of peer-reviewed publications

Goeppert, N., Frank, S., Fahrmeier, N., Goldscheider, N. (2022). High-Resolution multiparameter monitoring of microbial water quality and particles at two alpine karst springs as a basis for an early-warning system. Hydrogeology Journal *2022.* https://doi.org/10.1007/s10040-022-02556-8

Favere, J., Waegenaar, F., Boon, N., & De Gusseme, B. (2021). Online microbial monitoring of drinking water: How do different techniques respond to contaminations in practice? *Water Research*, 117387. https://doi.org/10.1016/j.watres.2021.117387.

Burnet, J.-B.; Habash, M.; Hachad, M.; Khanafer, Z.; Prévost, M.; Servais, P.; Sylvestre, E.; Dorner, S. (2021). Automated Targeted Sampling of Waterborne Pathogens and Microbial Source Tracking Markers Using Near-Real Time Monitoring of Microbiological Water Quality. Water, 13, 2069. https://doi.org/ 10.3390/w13152069

Sylvestre, É., Prévost, M., Burnet, J.-B., Smeets, P., Medema, G., Hachad, M., & Dorner, S. (2021). Using surrogate data to assess risks associated with microbial peak events in source water at drinking water treatment plants. *Water Research*, *200*, 117296. https://doi.org/10.1016/j.watres.2021.117296. *In press*

Sylvestre, É., Prévost, M., Burnet, J.-B., Pang, X., Qiu, Y., Smeets, P., Medema, G., Hachad, M., & Dorner, S. (2021). Demonstrating the reduction of enteric viruses by drinking water treatment during snowmelt episodes in urban areas. *Water Research X*, *11*, 100091. https://doi.org/10.1016/j.wroa.2021.100091

Cazals, M., Stott, R., Fleury, C., Proulx, F., Prévost, M., Servais, P., Dorner, S., & Burnet, J.-B. (2020). Near real-time notification of water quality impairments in recreational freshwaters using rapid online detection of β-D-glucuronidase activity as a surrogate for *Escherichia coli* monitoring. *Science of The Total Environment*, *720*, 137303. https://doi.org/10.1016/j.scitotenv.2020.137303

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Demeter, K., Burnet, J.-B., Stadler, P., Kirschner, A., Zessner, M., & Farnleitner, A. H. (2020). Automated online monitoring of fecal pollution in water by enzymatic methods. *Current Opinion in Environmental Science & Health*, *16*, 82–91. https://doi.org/10.1016/j.coesh.2020.03.002

Burnet, J.-B., Sylvestre, É., Jalbert, J., Imbeault, S., Servais, P., Prévost, M., & Dorner, S. (2019). Tracking the contribution of multiple raw and treated wastewater discharges at an urban drinking water supply using near real-time monitoring of β-d-glucuronidase activity. *Water Research*, *164*, 114869. https://doi.org/10.1016/j.watres.2019.114869

Burnet, J.-B., Dinh, Q. T., Imbeault, S., Servais, P., Dorner, S., & Prévost, M. (2019). Autonomous online measurement of β-D-glucuronidase activity in surface water: Is it suitable for rapid *E. coli* monitoring? *Water Research*, *152*, 241–250. https://doi.org/10.1016/j.watres.2018.12.060

Stadler, P., Loken, L. C., Crawford, J. T., Schramm, P. J., Sorsa, K., Kuhn, C., Savio, D., Striegl, R. G., Butman, D., Stanley, E. H., Farnleitner, A. H., & Zessner, M. (2019). Spatial patterns of enzymatic activity in large water bodies: Ship-borne measurements of beta-D-glucuronidase activity as a rapid indicator of microbial water quality. *Science of The Total Environment*, *651*, 1742–1752. https://doi.org/10.1016/j.scitotenv.2018.10.084

Ender, A., Goeppert, N., Grimmeisen, F., & Goldscheider, N. (2017). Evaluation of β-d-glucuronidase and particle-size distribution for microbiological water quality monitoring in Northern Vietnam. *Science of The Total Environment*, *580*, 996–1006. https://doi.org/10.1016/j.scitotenv.2016.12.054

Stadler, P., Blöschl, G., Vogl, W., Koschelnik, J., Epp, M., Lackner, M., Oismüller, M., Kumpan, M., Nemeth, L., Strauss, P., Sommer, R., Ryzinska-Paier, G., Farnleitner, A. H., & Zessner, M. (2016). Real-time monitoring of beta-d-glucuronidase activity in sediment laden streams: A comparison of prototypes. *Water Research*, *101*, 252–261. https://doi.org/10.1016/j.watres.2016.05.072

Further references (articles, oral presentations, poster presentations)

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Burnet, J.-B. (2017b). *Automated high frequency monitoring of β-D-glucuronidase activity in drinking water supplies in Québec, Canada*. UNC Water Microbiology Conference 2017 & 19th International Symposium on Health-Related Water Microbiology, Chapel Hill, NC, USA.

Lackner, M., Stadler, P., & Grabow, W. (Eds.). (2017). *Handbook of Online and Near-real-time Methods in Microbiology*. CRC Press.

Milne, J., Madarasz-Smith, A., & Davie, T. (2017). *Recreational water quality monitoring and reporting in New Zealand*.

Stott, R. (2017). *Moving to real-time measurement of microbial health risks in rivers* [Presentation]. 5th Biennial Symposium of the International Society for River Science, Hamilton, New Zealand.

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Vogl, W. (2013a). *Quantitative Real-Time Fluorescence Spectrometer for Automated Analysis of Microbial Contamination in Surface/Sanitary Water*. Tradeshow Wasser Berlin, Berlin, Germany.

Vogl, W. (2013b). *Rapid Analysis of Microbial Contamination in Water*. Acquea 2013, Brussels, Belgium.

Vogl, W. (2013c). *Rapid Detection of E. coli in Surface Waters for Quality and Health Monitoring Using Fluorescence-Based ColiMinder V*. WaterMicro2013 - 17th International Symposium on Health-Related Water Microbiology, Florianópolis, Brazil.