Water Microbiology 2017

International Symposium on Health-Related Water Microbiology

May 15-19
Monday–Friday

the international water association

UNC Water Microbiology Conference

May 15-17
Monday–Wednesday

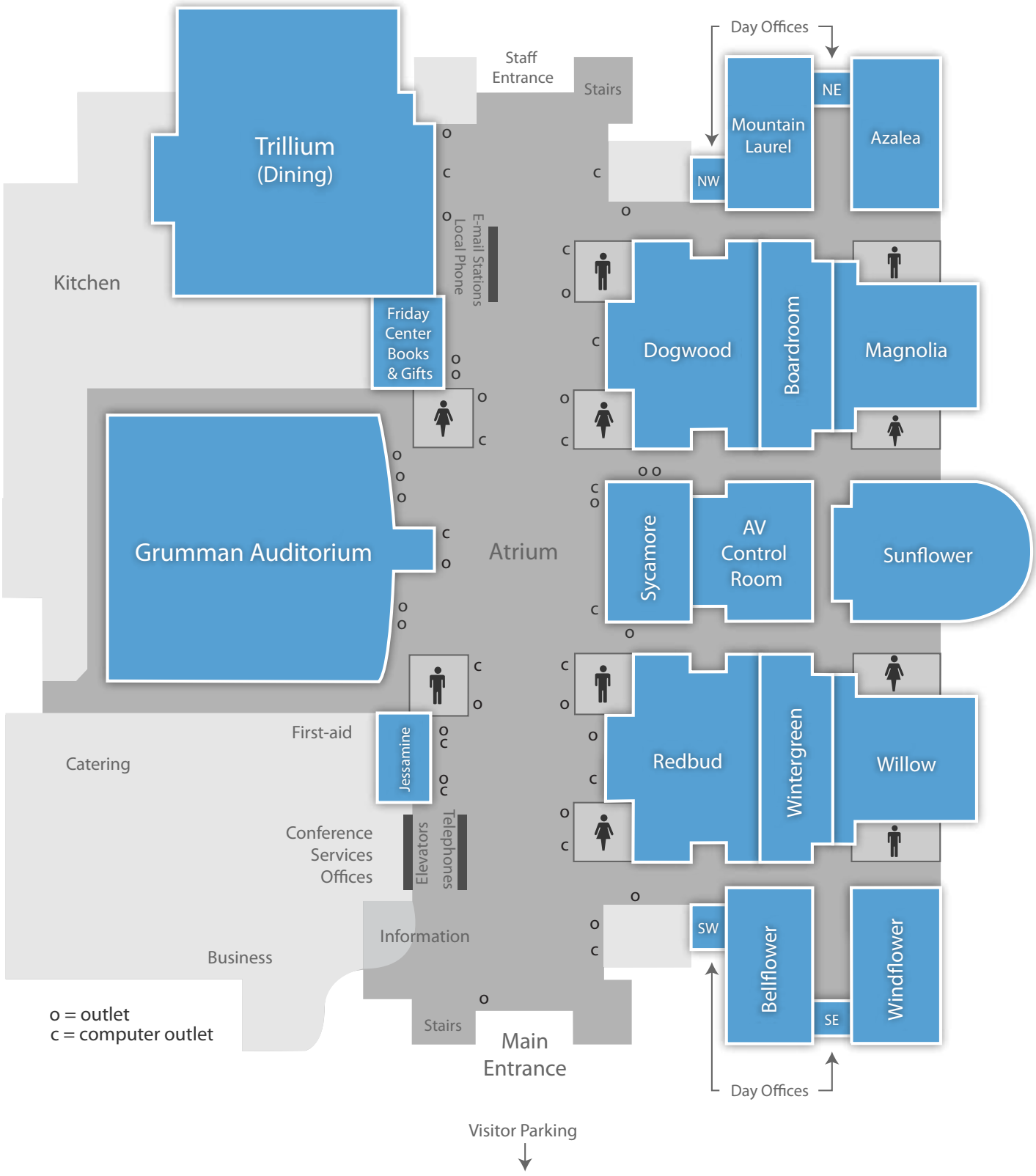
UNC WATER INSTITUTE

University of North Carolina, Chapel Hill

UNC WATER INSTITUTE

Friday Center

#UNCwatermicro



Water Microbiology 2017

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Local Information

UNC Water Microbiology Conference 2017

International Symposium on
Health-Related Water Microbiology

May 15 – 19, 2017
University of North Carolina at Chapel Hill

Conference Location: The Friday Center - 100 Friday Center Drive, Chapel Hill, NC 27517 (919) 962-3000

Conference Schedule/Information: See website for details: *http://waterinstitute.unc.edu/conferences/watermicro/*

Internet: Wireless Network is "UNC Guest". Click "Connect", then "Agree to Terms" in order to connect.

Lost & Found: Please see The Friday Center Information desk

Conference Hotels

- **Marriott Courtyard** *(across from The Friday Center)*
  100 Marriott Way Chapel Hill, NC 27517 (919) 883-0700 or (800) 321-2211
- **Hampton Inn & Suites Chapel Hill** *(east of The Friday Center)*
  6121 Farrington Rd. Chapel Hill, NC 27517 (919) 403-8700 or (800) 426-7866
- **Holiday Inn Express Chapel Hill** *(east of The Friday Center)*
  6119 Farrington Rd. Chapel Hill, NC 27517 (919) 489-7555 or (800) 465-4329
- **Aloft** *(1 mile west of The Friday Center)*
  1001 S. Hamilton Rd. Chapel Hill NC 27517 (919) 932-7772 or (866) 716-8143
- **University Inn** *(west of The Friday Center)*
  1301 Fordham Blvd, Chapel Hill NC 27514 (919)929-2171 or (888) 452-5765

Conference Shuttle Schedule
(Please contact your individual hotel to inquire about alternative shuttle service).

MORNING SCHEDULE (From Select Hotels to Conference Center)

Shuttle pick-up location: Parking lot outside front of listed hotels. SHUTTLES DO NOT WAIT!!!

HOTEL	Departure Times from Hotels								
Hampton Inn	7:00am	7:45am	8:30am	----	----	----	----	----	----
Holiday Inn Express	7:00am	7:45am	8:30am	----	----	----	----	----	----
Aloft	7:15am	8:00am	8:45am	----	----	----	----	----	----
Courtyard Marriott	----	----	----	----	----	----	----	----	----
The University Inn	----	----	----	----	----	----	----	----	----

AFTERNOON & EVENING SCHEDULE (From Conference Center to Select Hotels):

Shuttle pick-up location: "Back" of Friday Center (Under Portico). SHUTTLES DO NOT WAIT!!!

DAY OF WEEK	Departure Times from Conference Center								
Monday	5:15pm	5:45pm	6:15pm	6:45pm	7:15pm	7:45pm	----	----	----
Tuesday	5:15pm	5:45pm	6:15pm	6:45pm	7:15pm	7:45pm	8:15pm	----	----
Wednesday	5:15pm	5:45pm	6:15pm	6:45pm	7:15pm	7:45pm	8:15pm	8:45pm	9:15pm
Thursday	5:15pm	5:45pm	6:15pm	6:45pm	7:15pm	----	----	----	----
Friday	1:15pm	1:45pm	2:15pm	2:45pm	3:15pm	----	----	----	----

Transportation

- Taxi Service (*before entering the taxi, confirm you are the intended passenger by providing your name)*
  - **Chapel Hill Taxi Service** (919) 407-9747 or www.chapelHillTaxiService.com
    20% senior citizens discount and student ID discounts
  - **GoodFellas** (919) 537-2078 or http://goodfellastaxinc.com
  - **RDU Airport Taxi** (919) 840-7277
  - **RDU Express Taxi** (919) 771-8222 or (800) 840-8098 or www.RDUExpressTaxi.com
    with student/faculty ID, receive a lower rate to the airport
  - **Tar Heel Taxi** (919) 933-1255
  - **Uber** - sign up for UBER at get.uber.com

- Bus Service
  - **Chapel Hill Transit**- chtransit.org (919)969-4900
    http://www.townofchapelhill.org/town-hall/departments-services/transit
    - The routes that serve the Friday Center directly are the S and the HU
    - The FCX runs throughout the day from the park and ride lot on the north side of the building
    - There is also the V route, which runs from Meadowmont, across the street
  - **Triangle Transit**- www.gotriangle.org (919)485-7433

Shops & Restaurants

- Meadowmont Village (straight across Rt. 54
  - UPS store (mailing & copy services), Wells Fargo Bank, Maupin Travel, Great Clips Haircuts, Elegance Dry Cleaners, Starbucks Coffee Shop, Harris Teeter Grocery Store, and various restaurants
  - **Transportation**: ~ 5-minute walk, Taxi or Uber
- Downtown Chapel Hill and UNC Campus: 135 East Franklin Street, Chapel Hill, NC 27514
  - UNC campus, Student Stores, Walgreens, CVS, Fex Ex/Kinkos, shops, bars, restaurants
  - Shopping and Dining information: (http://www.downtownchapelhill.com/)
  - Parking information: http://www.parkonthehill.com/
  - **Transportation**: FCX, HU, S, or V Chapel Hill Transit bus to Student Stores; walk or take U/RU to Franklin St.
- Downtown Carrboro: 101 East Weaver Street, Carrboro, NC 27510
  - Weaver Street Market, cafes, shops, bars, restaurants
  - Information: http://www.townofcarrboro.org/9/For-Visitors
  - **Transportation**: 800 Bus (GoTriangle) to CW (Chapel Hill Transit)
- New Hope Commons (5428New Hope Commons Drive, Durham, NC 27707)
  - Walmart, Best Buy, FedEx Office Print/Ship Center, Marshalls, Barnes &Noble
  - **Transportation**: Taxi or Uber
- Printing and Shipping - FedEx Office Print/Ship Centers
  - 114 West Franklin Street, Chapel Hill, NC 27516 (Hours: M-F 7a-11p; Phone: 919-967-0790)
  - 5319 New Hope Commons Drive, Durham, NC 27707 (Hours: M-F 7:30a – 9p; Phone 919-402-8160)
  - **Transportation**: see above
- Streets at Southpoint Mall (6910 Fayetteville Road, Durham, NC 2771)
  - Nordstrom, Macys, Belk's department stores, other shops and restaurants
  - Hours: 10am - 9pm. www.streetsatsouthpoint.com
  - **Transportation**: Triangle Transit Bus 800
- Target in South Durham (8210 Renaissance Pkwy, Durham, NC 27713)
  - Hours: Mon-Fri 8am – 11pm, Sat 8am – 12pm, Sun 8am – 11pm
  - **Transportation**: Triangle Transit Bus 800

Special Services: Please check with the Friday Center main desk to make arrangements for special services such as a private location for nursing moms or a private room to pray.

Special Notifications

In the case of any situation requiring the delay or cancellation of any conference sessions or events, attendees will receive an email* by 6:30am the day of the event. Notifications will be posted on the conference website.

*NOTE: email is based on registration information. If someone else registered you and listed their email instead of yours, you will need to contact them or check the conference website: http://waterinstitute.unc.edu/conferences/watermicro/

Schedule at a Glance

	Monday, May 15		Tuesday, May 16	
7:30 a.m.	*REGISTRATION OPENS*		*REGISTRATION OPENS*	
8:30–10:00	QMRA **Grumman**	Side Events **Windflower** **Dogwood** **Redbud**	Wastewater **Grumman**	Side Events **Windflower** **Dogwood** **Redbud**
10:00–10:30	*BREAK*		*BREAK*	
10:30–12:00	Novel Methods **Grumman**	Side Events **Windflower** **Dogwood**	Waterborne Pathogens **Grumman**	Side Events **Windflower** **Dogwood** **Redbud**
12:00-1:00	*LUNCH*		*LUNCH*	
1:00–2:15	*PLENARY KEYNOTE:* Stephen A. Morse **Grumman**		*PLENARY KEYNOTE:* Ana Maria de Roda Husman **Grumman**	
2:15–2:30	*BREAK*		*BREAK*	
2:30–3:30	Recreational Water **Grumman**	Verbal Presentations **Windflower** **Bellflower** **Redbud**	Agriculture **Grumman**	Verbal Presentations **Dogwood** **Bellflower** **Windflower**
3:30–4:00	*BREAK*		*BREAK*	
4:00–5:00	Systems and Treatment **Grumman**	Verbal Presentations **Dogwood** **Bellflower** **Windflower**	Virus in Sewage **Grumman**	Verbal Presentations **Dogwood** **Bellflower** **Windflower**
5:00–6:30	*POSTER RECEPTION* **Atrium**		*POSTER RECEPTION* **Atrium**	

Wednesday, May 17

REGISTRATION OPENS

IWA	UNC
Outbreaks **Grumman**	Side Events **Windflower** **Dogwood** **Redbud**

BREAK

Drinking Water **Grumman**	Side Events **Windflower** **Redbud**

LUNCH

PLENARY KEYNOTE: Rosina Girones **Grumman**

BREAK

Reuse **Grumman**	Verbal Presentations **Dogwood** **Bellflower** **Windflower**

BREAK

Sediment, Sand and Pathogen Reduction **Grumman**	Verbal Presentations **Dogwood** **Bellflower** **Windflower**

POSTER RECEPTION

Atrium

CONFERENCES DINNER AND DANCE

Trillium, 6:30–9 p.m.

Thursday, May 18

REGISTRATION OPENS

IWA
Viral Inactivation **Grumman**

BREAK

Virus Dynamics **Grumman**

LUNCH

Panel Discussion **Grumman**

BREAK

Bacterial Pathogens **Grumman**

BREAK

Recreational Water **Grumman**

POSTER RECEPTION

Atrium

AWARDS CEREMONY

Grumman, 6:30–7 p.m.

Friday, May 18

REGISTRATION OPENS

IWA
WHO Workshop **Grumman, 8–10:30 a.m.**

BREAK, 10:30–11 a.m.

WHO Workshop (continued) **Grumman, 11 a.m.–12:30 p.m.**

LUNCH, 12:30–1:30 p.m. Fri.

Daily Food Service

(included with registration)

Continental Breakfast
7:30–11 a.m., Mon.–Fri.
Atrium

Lunch Buffet
12-1 p.m., Mon.–Thurs.
12:30-1:30 p.m., Fri.
Trillium

Afternoon Snacks
2-4 p.m., Mon.–Thurs.
Atrium

Beer, Wine & Snacks
5–6:30 p.m., Mon.–Thurs.
Poster Reception, Atrium

Dinner
6:30-8 p.m., Wed. only
Trillium

Detailed Schedule
Monday, May 15

QMRA (Quantitative Microbial Risk Assessment)

8:30–10 a.m.

Grumman Auditorium

Chairperson: Jill Stewart

A Microsimulation Approach to Estimating Annual Risk in QMRA: Coping with Non-Random Variation in Risk Amongst Populations

Paul Hunter

The QMRAcatch Modeling Approach: Using Best Available Pathogen, Indicator and Source Tracking Data to Support Catchment Protection and Water Safety Management

Andres Farnleitner

QMRA of a Wastewater System Undergoing a Novel Treatment Process for Rural Environments in a Developing Country

Bettina Genthe

Separating Uncertainty from Variability in QMRA to Support Management Decisions

Patrick Smeets

Side Events

8:30–10 a.m.

Windflower, Dogwood and Redbud

Automated and Rapid Methods for Protecting Public Health by Improving Methods for the Sampling, Filtration and Detection of Pathogens in Drinking Water

University of East Anglia, The AQUAVALENS Consortium

Windflower

Evolution of QMRA: How to Fully Realize its Contribution to Water Policy and Human Health Risk Reduction

RTI International, Georgia Institute of Technology, Ohio State University

Dogwood

How to Test and Teach About Water in Developing Countries to Eliminate Waterborne Diseases

International Water and Health Alliance

Redbud

Break

10–10:30 a.m.

Novel Methods

10:30 a.m.–12 p.m.

Grumman Auditorium

Chairperson: Rosina Girones

Evaluation of Digital Droplet PCR (ddPCR) for Improved Microbial Source Tracking

Jean Pierre Nshimyimana

Rapid In Situ Physico-Chemical Disinfection of Hospital Sewage and Human Fecal Waste Contaminated with Ebola Virus Surrogates and Other Highly Infectious Viruses

Emanuele Sozzi

Electrochemical and Colorimetric DNA Aptasensor Technologies for Rapid Norovirus Detection

Masaaki Kitajima

Side Events (continued)

10:30 a.m.–12 p.m.

Windflower and Dogwood

Lunch

12–1 p.m.

Trillium Dining Room

Plenary Keynote: Stephen A. Morse, PhD

Emerging Pathogens and Water Safety Implications for National Security

1–2:15 p.m.

Grumman Auditorium

Detailed Schedule
Monday (continued)

Break
2:15–2:30 p.m.

Recreational Water
2:30–3:30 p.m.
Grumman Auditorium
Chairperson: Bursary Winners

A Decision Support System (DSS) for Recreational Water Use — Revision of the South African Water Quality Guidelines
Bettina Genthe

Use of Somatic Coliphages Measured in Real Time (4 Hours) in the Prediction of Fecal Contamination in Recreational Mediterranean Waters
Anicet Blanch

A Fast Method for the Detection of Somatic Coliphages Used as Indicators of Viral Fecal Pollution in Water
Maite Muniesa

Verbal Presentations
2:30–3:30 p.m.
Windflower, Bellflower and Redbud

Shellfish
Windflower
Moderator: Denene Blackwood

Bacterial Community Profiling of Shellfish and Waters in a Shellfish-Harvesting Area and its Catchment in France
Mohamed Amine Boukerb

Diversity of *Campylobacter lari*, the Most Frequent *Campylobacter* Species in Shellfish and Marine Waters, in a Shellfish-Harvesting Area and its Catchment in France
Michele Gourmelon

Fecal Pollution and Microbial Source Tracking in Shellfish Harvesting Waters in the Gulf of Nicoya, Costa Rica
Erin Symonds

Pathogen Dynamics

Bellflower

Moderator: Kaida Lang

Selective Grazing by Free-Living Amoebae May Modify the Bacterial Community and Select Opportunistic Pathogens Like *Legionella* in Drinking Water Systems

Mohamed Shaheen

Free-Living Amoebae and Persistence of Internalized Human Enteroviruses

Nikki Atanasova

Etiologic Agents of Symptomatic and Asymptomatic Enteric Infections among Children in Maputo, Mozambique: Baseline Data from the MapSan Study

Jacqueline Knee

Markers

Redbud

Moderator: Rachel Noble

Human-Associated *Escherichia coli* Marker Genes Are Useful for Microbial Source Tracking in Florida

Jacob Senkbeil

A Meta-analysis for Estimating the Persistence of HF183 Marker in Environmental Waters

Jade Mitchell

Defining Novel Molecular Marker Candidates for Fecal Indication and Source Tracking Using a Metagenomic Vertebrate Fecal Source Database

Georg Reischer

Break

3:30–4 p.m.

the international water association

Systems and Treatment

4–5 p.m.

Grumman Auditorium

Chairperson: Mark Sobsey

Comparison of Tolerable Risk Benchmarks Used in Water Safety

Dan Deere

Microbiological Quality in Small Water Supplies: Are the Traditional Indicators Enough?

Silvia Monteiro

Water Quality, Compliance and Health Outcomes Among Utilities Implementing Water Safety Plans in France and Spain

Karen Setty

Detailed Schedule
Monday (continued)

UNC

Verbal Presentations

4–5 p.m.

Dogwood, Bellflower and Windflower

Coliphages

Dogwood

Moderator: Mike Fisher

The Survival of Different F+ Coliphage Strains Under Direct Sunlight Exposure
Yvonne Yuen

Fate of Coliphages in Surface Water Environments in the Presence of *Escherichia coli* — Surrogates for Human Enteric Viruses?
Martin Mackowiak

U.S. EPA Coliphage Recreational Water Quality Criteria: A Year-Long Sampling Study, Treatment Impacts, and Cost Implications
Thomas Worley-Morse

Antimicrobial Resistance

Bellflower

Moderator: Lydia Abebe

The Invisible Problem — Movement and Accumulation of Antibiotic Resistance at the Human-Wildlife-Environmental Interface in Botswana
Kathleen Alexander

Surveillance of Antimicrobial Resistant Bacteria in Environmental and Wastewaters of North Carolina: A Methodological Evaluation of a Candidate Indicator Systems
Katy Brown

Quantitative Real-Time PCR Fecal Source Identification in the Tillamook Basin
Orin Shanks

Markers

Windflower

Moderator: Kaida Lang

Validation of Bacterial Community Sequencing Methods for Microbial Source Tracking of Human-Associated Fecal Sources Relevant to Low- and Middle-Income Countries
Valeria Bauza

Microbial Source Tracking of Fecal Contamination in Coastal Stormwater in Beaufort, North Carolina
Justin Hart

Molecular Fecal Source Investigation at an Urban Marine Beach with Chronic Microbial Water Quality Problems in Support of a Quantitative Microbial Risk Assessment
Joshua Steele

Poster Reception
5–6:30 p.m.
Atrium

Tuesday, May 16

Wastewater
8:30–10 a.m.
Grumman Auditorium
Chairperson: Scott Mescke

Occurrence of Reovirus at a Recycled Water Managed Aquifer Recharge Site
Walter Betancourt

Decentralized Treatment of Domestic Wastewater: Health Risk Implications for Effluent Reuse
Isaac Dennis Amoah

Two-Year Monthly Study on Viruses in Lake Water Polluted by Wastewater Effluents
Akihiko Hata

Use of Zooplankton in Natural Treatment Systems: Reducing Microbial Pollutants from Stormwater Runoff and Wastewater
Niveen Ismail

Side Events
8:30–10 a.m.
Windflower, Dogwood and Redbud

International Risk Consortium: A Team to Advance Public Health Research
International Risk Consortium
Windflower

NOTE: This side event ends at 10 a.m. The other side events at this time will continue after the break.

Detailed Schedule
Tuesday (continued)

Moving Molecular and Rapid Water Quality Methods from Research to Widespread Use
VisuGen Global, UNC–Chapel Hill Institute of Marine Sciences
Dogwood

The Critical Role of Accurate *L. pneumophila* Test Results in Reducing Disease Risk
IDEXX
Redbud

Break
10–10:30 a.m.

Waterborne Pathogens
10:30 a.m.–12 p.m.
Grumman Auditorium
Chairperson: Gary Toranzos

Do Current Regulatory Monitoring Frameworks Account for Microbial Risk Associated with Peak Contamination Events?
Emile Sylvestre

Towards Smart Decision-Making for the Sustainable Management of Environmental Waters
Dolores Gutiérrez Cacciabue

Improved Simultaneous Quantification of Multiple Waterborne Pathogens and Fecal Indicator Bacteria in Environmental Water Samples by Using a Sample Process Control
Qian Zhang

Predicting the Occurrence of Human Pathogens and Associated Health Risks in Surface Waters — Comparison Between Two Predictive Models: Bayesian Network and Decision Tree
Shin Giek Goh

A Modeling and Scenario Approach to Assess Waterborne Pathogen Concentrations in Surface Water and Consequent Health Risk
Nynke Hofstra

Side Events (continued)

10:30 a.m.–12 p.m.

Windflower, Dogwood and Redbud

Quantifying Human Exposure Estimates for Enteric Disease Transmission: Methods and Applications

Eawag (Swiss Federal Institute of Aquatic Science and Technology)

Windflower

Dogwood and Redbud: Programs continue from the 8:30–10 session. See opposite page, top.

Lunch

12–1 p.m.

Trillium Dining Room

Plenary Keynote: Ana Maria de Roda Husman, PhD

Towards a Global Perspective on Antimicrobial Resistance (AMR) and WaSH

1–2:15 p.m.

Grumman Auditorium

Break

2:15–2:30 p.m.

Agriculture

2:30–3:30 p.m.

Grumman Auditorium

Chairperson: Ricardo Santos

Swine Manure Treatment for Enteric Virus Removal and Phosphorus Recovery

Celia Baradi

Evaluating the Effects of Rainfall on Foodborne Pathogen and Fecal Indicator Presence in Surface Irrigation Waters on Southeastern U.S. Produce Farms

Mia Catharine Mattioli

High Resolution Activity Data to Model Risks of Human Excreta Use in Agriculture: Case Study from Vietnam

Tim Julian

Detailed Schedule
Tuesday (continued)

UNC

Verbal Presentations

2:30–3:30 p.m.

Dogwood, Bellflower and Windflower

Sanitation

Dogwood

Moderator: Kaida Lang

Impact of Sanitation on Household Fecal Contamination in Rural Bangladesh

Erica Fuhrmeister

Impact of a Controlled, Before-and-After Trial of Shared, Onsite Sanitation on Environmental Exposure to Fecal Contamination in Low-Income Neighborhoods of Urban Maputo, Mozambique

David Holcomb

The Efficacy of Alternative Reagents for Onsite Disinfection of Wastewater and Fecal Sludge Matrices

Diogo Trajano Gomes

Fecal Bacteria

Bellflower

Moderator: Mike Fisher

Prevalence and Characterization of Gram-Negative Bacteria Producing Extended Spectrum Beta-lactamase and Carbapenemase from Different Water Sources in Singapore

Laurence Glass-Haller

***Campylobacter* and *Arcobacter* Source Tracking in a Freshwater Lake Environment**

Satoshi Ishii

A Community-Based Approach for Determining Sources of Fecal Bacteria in a Freshwater System

Clairessa Brown

Watersheds

Windflower

Moderator: Denene Blackwood

Development of Ambient Marine Recreational Water Quality Standards in Abu Dhabi, United Arab Emirates

Katherine Woodward

Analysis of *Vibrio* Dynamics in the Neuse River Estuary, N.C., Using Next Generation Sequencing Amplicon Data
Kelsey Jesser

Regional Monitoring of Human Fecal Contamination in Flowing Storm Drains and Creeks Discharging to Southern California Bight
Yiping Cao

Break
3:30–4 p.m.

Virus in Sewage
4–5 p.m.
Grumman Auditorium
Chairperson: Walter Betancourt

Time Series Analysis of Seasonal Correlation Between Concentration of Norovirus in Sewage and Clinical Cases of Acute Gastroenteritis
Fuminari Miura

Determining Ultraviolet Inactivation Rates for Adenovirus Isolated from Sewage
Roberto Rodriguez

Factors Affecting the Survival of Sewage-Specific Enterococci Bacteriophages for Microbial Source Tracking
Kwanrawee Joy Sirikanchana

Verbal Presentations
4–5 p.m.
Dogwood, Bellflower and Windflower

Methods
Dogwood
Moderator: Denene Blackwood

A Quantitative Comparison of Microbial Health Risks During Urine Collection and Struvite Production from Urine Using the Microlevel Activity Time Series (MLATS) Method
Heather Bischiel

Photoinactivation of Pathogenic Bacteria: Mechanisms and Cellular Response of *Staphylococcus aureus*
Jill McClary

Detailed Schedule
Tuesday (continued)

A Multi-Tier Approach to Assessing Microbial Contamination in Transient Non-Community Water Systems
Sharon Long

Enteric Viruses
Bellflower
Moderator: Kaida Lang

Method Comparison of the Two-Phase Separation and Bag-Mediated Filtration System for the Detection of Poliovirus from Haiti Environmental Samples
Angela Couliette-Salmond

Method Comparison of the Two-Phase Separation and Bag-Mediated Filtration System for the Detection of Poliovirus from Kenya Environmental Samples
Christine Fagnant

Enhanced Detection of Poliovirus in Environmental Samples from Pakistan Using the Bag-Mediated Filtration System
Nicolette Zhou

Stormwater and Surface Water
Windflower
Moderator: Rachel Noble

Are Current Stormwater Harvesting Guidelines and Treatment Technologies Adequate for Protecting Public Health from *Campylobacter*?
Heather Murphy

Survival of *Campylobacter* spp. in Urban Stormwater Wetlands
Ze Meng

Quantification of Multiple Waterborne Pathogens in Drinking Water, Drainage Channels, and Surface Water in Kampala, Uganda During Seasonal Variation
Sital Uprety

Poster Reception
5–6:30 p.m.
Atrium

Wednesday, May 17

Outbreaks

8:30–10 a.m.

Grumman Auditorium

Chairperson: Hiro Katayama

Characterization of a Norovirus Outbreak Caused by Bottled Mineral Water

Albert Bosch Navarro

Do Electronic Faucets Cause *Pseudomonas aeruginosa* Outbreaks in Hospital Environments? A Review

Émilie Bédard

The World's Largest Waterborne Campylobacteriosis Outbreak

Brent Gilpin

The Current Outbreak of Elizabethkingia: Water Treatment Options to Address the Public Health Concern

Kyana Young

Side Events

8:30–10 a.m.

Windflower, Dogwood and Redbud

Writing a Publishable Scientific Paper

Georgia State University

Windflower

Modeling Microbial Water Quality

Wageningen University

Dogwood

Coliphage: Methods, Fate and Other Issues

U.S. Environmental Protection Agency

Redbud

Detailed Schedule
Wednesday (continued)

Break
10–10:30 a.m.

Drinking Water
10:30 a.m.–12 p.m.
Grumman Auditorium
Chairperson: Regina Sommer

Managing Microbial Risks in Drinking Water
Mark LeChevalier

Minimizing Chlorine in Drinking Water Distribution Systems: Impact on Bacterial Diversity in Drinking Water Biofilms
Sophie Courtois

Antibiotics and Antibiotic Susceptibility Patterns of Bacteria from Source and Drinking Water
Carlos Bezuidenhout

The Effect of Pipeline Flushing on the Microbial Community in Drinking Water Distribution Systems
Louise Vanysacker

Side Events (continued)
10:30 a.m.–12 p.m.
Windflower and Redbud

Lunch
12–1 p.m.
Trillium Dining Room

Plenary Keynote: Rosina Girones, PhD

The Study of Viral Contamination of Water in the Metagenomics Era
1–2:15 p.m.
Grumman Auditorium

Break

2:15–2:30 p.m.

Reuse

2:30–3:30 p.m.
Grumman Auditorium
Chairperson: Andrea Rechenburg

Microbial Quality and Risk Assessment of Alternative Sources of Drinking Water Impacted by Wastewater: An Analysis of N.C. Type 2 Reclaimed Water for Potable Reuse
Emily Bailey

Microbial Risk Sensitivity Analysis of Direct Potable Reuse Treatment Trains
Jeffrey Soller

Extensive Fecal Contamination in the Fractured Dolomite Aquifer in Northeast Wisconsin
Mark Borchardt

Verbal Presentations

2:30–3:30 p.m.
Dogwood, Bellflower and Windflower

Antimicrobial Resistance

Dogwood
Moderator: Lydia Abebe

Antibiotic Resistant *Clostridium* spp. Isolated from the Surface Water and Sediment
Carlos Bezuidenhout

Occurrence of Carbapenem-Resistant *Escherichia coli* from Wastewater in the United States: A Retrospective Analysis of Isolates from 2005
Hodon Ryu

Aeromonas and *Arcobacter*: Two Genera of Bacteria Abundant in Wastewater with Implications for Human and Animal Health
Maria Figueras

Detailed Schedule
Wednesday (continued)

Fate of Fecal Indicator Organisms

Bellflower

Moderator: Mike Fisher

Diel Variation of Fecal Indicators and their Correlation with Enteric Viruses in Wastewater

Kyle Curtis

How Does Zooplankton Grazing Affect the Fate of *E. coli* in Water?

Jean-Baptiste Burnet

Effect of Holding Time on *E. coli* in Wastewater Samples

Debmalya Bhattacharyya

Watersheds and Receiving Waters

Windflower

Moderator: Rachel Noble

Comparing Engineered and Environmental Controls of Microbial Denitrification in Mature Bioretention Cells

Brian Badgley

High Density Sampling of Pathogenic Microbial Community in a Fecally Impaired Watershed

Jennifer Weidhaas

From Lab to Lake: Evaluation of Current Molecular Methods for the Detection of Infectious Enteric Viruses in Complex Water Matrices

Mats Leifels

Break

3:30–4 p.m.

Sediment, Sand and Pathogen Reduction

4–5 p.m.

Grumman Auditorium

Chairperson: Orin Shanks

Reduction of Indigenous Virus in Coagulation-Sedimentation, Sand Filtration and Ozonation in Large-Scale Water Treatment Plants

Hiroyuki Katayama

The Influence of Common Nutrient Contamination on Bacteriophage MS2 Removal by Biosand Filter

Chunhwa Jang

Influence of Sediments on Microbial Water Quality During Base Flow Conditions in Freshwater Rivers in New Zealand

Elaine Moriarty

Verbal Presentations

4–5 p.m.

Dogwood, Bellflower and Windflower

Viral Survival and Infectivity

Dogwood

Moderator: Mike Fisher

Survival of Virus Surrogates in Hospital Sewage and Human Fecal Waste Contaminated with Ebola Virus Surrogates and other Highly Infectious Viruses

Sam Elmes

Elucidating the Long-Term Impact of Disinfection Strategies on the Drinking Water Microbiome

Zihan Dai

The Mechanism-Specific Resistance of Echovirus 11 Towards Common Disinfectants

Qingxia Zhong

Detailed Schedule
Wednesday (continued)

Viral Pathogens
Bellflower
Moderator: Jill Stewart

Human Adenovirus as Water Virological Quality Indicator
Annalaura Carducci

Photosensitizer Functionalized Chitosan-Polyethylene Oxide Nanofiber for Efficient Sunlight-Driven Disinfection of Enteric Viruses in Water
Hussaini Majiya

Genotyping Norovirus Genogroup II Isolated from Oysters During Epidemic Season in Japan
Toru Watanabe

QMRA and Molecular Source Markers
Windflower
Moderator: Rachel Noble

Quantifying Viral Pathogens and Molecular Source Markers for Quantitative Microbial Risk Assessment: Hurdles and Insights
Denene Blackwood

Systematic Literature Reviews and Development of Distribution Curves for Viral Densities in Ambient Water
Sorina Eftim

Quantitative Microbial Risk Assessment for Bathers in a Popular Bathing Area in Northern Italy
Annalaura Carducci

Poster Reception
5–6:30 p.m.
Atrium

Conferences Dinner and Dance
6:30–9 p.m.
Trillium Dining Room

Thursday, May 18

Viral Inactivation

8:30–10 a.m.

Grumman Auditorium

Chairperson: Daisuke Sano

Model Enveloped Virus Inactivation by Free Chlorine
Yinyin Ye

qPCR-based Monitoring of Virus UV Inactivation Environments
Johannes Ho

Characterization of the Efficiency and Uncertainty of Skimmed Milk Flocculation for the Simultaneous Concentration and Quantification of Water-borne Viruses, Bacteria and Protozoa
Eloy Gonzalez

The Mechanism Underlying the Solar Irradiation Disinfection of Rotaviruses and MS2 Phage
Elbashir Araud

Break

10–10:30 a.m.

Virus Dynamics

10:30 a.m.–12 p.m.

Grumman Auditorium

Chairperson: Georg Reischer

Performance Target of Virus Reduction Efficiency in Wastewater Reclamation: Effect of Tolerable Health Risk, Dose-Response and Reliability
Daisuke Sano

Viraqua — New Approaches for the Surveillance of Enteric Viruses in the Environment
Kata Farkas

Detailed Schedule
Thursday (continued)

Environmental Surveillance of Viruses in Kenya Using Metagenomics
Tiong Gim Aw

Modeling the Endogenous Sunlight Inactivation Rates of Laboratory-Strain and Wastewater-Sourced *E. coli* and Enterococci Using Biological Weighting Functions
Andrea Silverman

Lunch
12–1 p.m.
Trillium Dining Room

Panel Discussion
1–2:15 p.m.
Grumman Auditorium

Communicating Research and Evidence in the Clickbait Era

As the way in which we consume media continues to rapidly evolve, scientists are struggling to communicate evidence and help the public discern fact from fiction. Guest speakers will address steps our community can take to effectively impart scientific data and concepts to the masses.

Layla Dowdy, UNC Office of Research Communications
Brian Southwell, RTI International
Sarah Yelton, UNC Institute for the Environment

Break
2:15–2:30 p.m.

Bacterial Pathogens
2:30–3:30 p.m.
Grumman Auditorium
Chairperson: GwangPyo Ko

Choosing Dose-Response Norovirus and *Campylobacter* Dose-Response Functions
Jeff Soller

Infectivity Potential of VBNC Legionellae to Amoebae and Human Macrophages
Silvia Cervero-Arago

The Effect of the 2015 Earthquake on the Bacterial Community Compositions in Water in Nepal
Sital Uprety

Break
3:30–4 p.m.

Recreational Water
4–5 p.m.
Grumman Auditorium
Chairperson: Mark Sobsey

Distribution Comparison and Risk Assessment of Free-Floating and Particle-Attached Bacterial Pathogens in Recreational Water
Tingting Fang

Disease Burden from Recreational Activities Along an Urban River
David McCarthy

The Chicago River Microbial Health Study Prior to Disinfection
Geeta Rijal

Poster Reception
5–6:30 p.m.
Atrium

Best of Conference Awards Ceremony
6:30–7 p.m.
Grumman Auditorium

Detailed Schedule
Friday, May 19

World Health Organization Workshop
8:30–10:30 a.m.
Grumman Auditorium

Session 1: Recycled Water – Microbial Hazards

Introduction to Water Reuse
Kati Bell

Pathogens and Reference Pathogens in WWTP and Recycled Water
Rosina Girones

How Much Reduction of Virus is Needed for Recycled Water: A Continuous Changing Need for Assessment
Walter Betancourt

Do We Have to Regulate on ARB in Recycled Water?
Christiane Höller

Session 2: Approaches for Defining Minimum Quality Requirements for Potable Reuse

WHO: DALYs and Upcoming Guidelines on Water Reuse
Mark Sobsey

Quantitative Microbial Risk Assessment Approach for Direct Potable Reuse Applications
Jeff Soller

Interpreting Non-Culture or Non-Infectivity Based Data on the Microbial Quality of Reclaimed Water: The North Carolina Experience and Regulatory Implications
Mark Sobsey

Break
10:30–11 a.m.

World Health Organization Workshop (continued)

11 a.m.–12:30 p.m.

Grumman Auditorium

Session 3: Practical Experiences

QMRA Analysis of de Facto, Planned IPR, DPR in the United States

Dan Gerrity

Frameworks for Mitigating Water Reuse Risk in Military Contingency Operations

Martin Page

Panel Discussion

Explore the recycled water experience in different countries: South Africa, Israel, Japan; discuss various approaches for ensuring recycled water is safe; uncover data gaps and future research needs; make recommendations for defining minimum quality requirements for reuse applications. Summary of action items, research areas, and steps forward.

Lunch

12:30–1:30 p.m.

Trillium Dining Room

Keynote Speakers

Stephen A. Morse, PhD

Emerging Pathogens and Water Safety Implications for National Security

Dr. Morse has more than 47 years of experience in various aspects of microbiology including: infectious diseases, microbial pathogenesis, antimicrobial resistance, microbial forensics and environmental microbiology. He recently retired from the Centers for Disease Control and Prevention after having served as the director of the STD Research Program; associate director for science, Division of Bioterrorism Preparedness and Response; and associate director for environmental microbiology. He has published more than 325 peer reviewed articles, books and chapters. Dr. Morse currently advises the CDC Select Agent Program and the Science and Technology Directorate, Department of Homeland Security.

Ana Maria de Roda Husman, PhD

Towards a Global Perspective on Antimicrobial Resistance (AMR) and WaSH

Dr. de Roda Husman is professor in global changes and environmental infectious diseases at the Institute for Risk Assessment Sciences, Utrecht University, the Netherlands, and head of the Department of Environmental Infectious Diseases at the Dutch Centre for Infectious Disease Control at the National Institute for Public Health and Environment (RIVM). She is the director of the WHO Collaborating Center for Risk Assessment of Pathogens in Food and Water. She has contributed to the understanding of the fate and dissemination of pathogens in the environment and determining risks of pathogen exposure and subsequent infection and disease. In the past 10 years she has directed policy-based research specifically towards the role of the environment in the spread of AMR and possible intervention measures. With IWA, WHO and UNC she has organized several workshops on AMR. She contributed WaSH actions to the WHO Global Action Plan on Combating AMR. She recently joined the Scientific Advisory Board of the Joint Programming Initiative on AMR. She leads several national (European as well as global) research projects with respect to surveillance, health targets to limit severity, and impact from exposure to AMR in the environment.

Rosina Girones, PhD

The Study of Viral Contamination of Water in the Metagenomics Era

Dr. Girones is professor of microbiology at the University of Barcelona, Spain, specializing in viruses. Dr. Girones was a postdoctoral researcher at the Hepatitis Viruses Section, Laboratory of Infectious Diseases, U.S. National Institutes of Health, and has been an invited researcher in laboratories in Sweden and the United States. Dr. Girones has more than 25 years of experience in the field of environmental virology, has been the head of the Microbiology Department of the University of Barcelona and is currently coordinator of the Section of Microbiology, Virology and Biotechnology at the University of Barcelona and team leader of the Laboratory of Viruses Contaminants of Water and Food (Vircont). She is the secretary of the Health-Related Water Microbiology Subgroup in the International Water Association and a member of the Scientific Panel on Biological Hazards (BIOHAZ) of the European Food Safety Authority. Her main area of interest is the study of classical and emerging viral pathogens and the development of new viral indicators and microbial source tracking tools. Dr. Girones is working on the improvement and control of the microbiological quality of water and food, including recycled water, irrigation water, superficial and groundwater.

UNC
Side Event Descriptions

Monday, May 15

Automated and Rapid Methods for Protecting Public Health by Improving Methods for the Sampling, Filtration and Detection of Pathogens in Drinking Water

University of East Anglia, The AQUAVALENS Consortium

Windflower, 8:30 a.m.–12 p.m.

This session will review and discuss the increase role of automated rapid and molecular methods for pathogen detection in drinking water and attempt to reach a consensus on the future role of such methods for routine use. The session will start with a summary of the recent key developments in the field with special reference to those developments that have come out of the five-year multi-partner AQUAVALENS project. The presentations will focus on the development and application of multi-pathogen platforms. We will then present a series of short scenarios around areas where the technological platforms could be used to protect public health. These scenarios will cover both large and small water systems. Each scenario will lead to a structured discussion and debate around the value that different approaches may or may not be able to deliver. This debate will be captured and summarized in a policy document and submitted for publication as an opinion piece.

	Title and Speaker
8:30	**The Changing Needs for Microbiology by Large Water Utilities** | Robert Pitchers
8:50	**Recent Developments in Integrated Platforms** | Abdelfateh Kerrouche
9:10	**Validating Novel Methods for Pathogen Detection** | Claudia Stange
9:30	**Structured Discussion: The Value of New Technologies for Large Water Utilities**
10:00	*BREAK*
10:30	**Public Health Risk Associated with Small Water Supplies** | Paul Hunter
10:50	**European Scenario of Small Water Systems** | Ricardo Santos
11:10	**Integrated Platform for Event and Remote Sampling in Small Water Systems** | Jorge Martins
11:30	**Structured Discussion: The Value of New Technologies for Small Water Systems**

Evolution of Quantitative Microbial Risk Assessment (QMRA): How to Fully Realize its Contribution to Water Policy and Human Health Risk Reduction

RTI International, Georgia Institute of Technology, Ohio State University

Dogwood, 8:30 a.m.–12 p.m.

Quantitative Microbial Risk Assessment (QMRA) is a scientific approach that has evolved over the past 35 years with significant improvements and developments in both methods and models. To realize the full potential utility of QMRA in tackling environmental and human health risk challenges, it is important to consider integration with other emerging methods and techniques in environmental health microbiology, epidemiology, social sciences and global public health. We will engage a multi-disciplinary panel composed of risk assessment experts, epidemiologists and other public health researchers in the United States and abroad to facilitate dialogue around these issues.

We will convene a set of presentations of applied QMRA research, with examples of how QMRA could be further expanded or applied to address large-scale issues in global public health, such as WHO's risk-based approach to its drinking water quality guidelines, and QMRA's integration with environmental epidemiology to conduct exposure assessments. We will also discuss specific challenges and innovation edges, including:

1. Integrating human behavior and risk perception data in to QMRA
2. Incorporating long-term sequelae of acute infections, such as undernutrition and stunting
3. Addressing the lack of representativeness of some models to different global populations (e.g., dose-response models derived from a specific population)
4. Utilizing big data and new microbiological methods and tools (e.g., next-generation sequencing, 'omics), including the necessary computational capacity to analyze the resulting data
5. Advancing QMRA's computational potential in global public health and engineering to be fully realized in the context of water, sanitation, and hygiene (WASH)

In Part 1, we will discuss the QMRA challenges listed above in three or four 15-minute presentations, then breakout into groups for 20 minutes to discuss these challenges in specific areas: drinking water, sanitation/hygiene and wastewater/irrigation water reuse. We will reconvene to hear each group's key discussion points for proceedings.

Part 2 will focus on the Global Water Pathogen Project (GWPP)—a platform to support global exposure assessments, risk assessments, and enable evaluation of sanitation technologies for achieving health-based targets. Attendees will learn about the GWPP in a 45-minute presentation by the GWPP team, followed by a 45-minute moderated panel discussion of how our advancing knowledge of water pathogens can be better integrated into QMRA.

How to Test and Teach about Water in Developing Countries to Eliminate Waterborne Diseases

International Water and Health Alliance

Redbud, 8:30–10 a.m.

The goal of this workshop is to provide microbiologists with the knowledge, skills, and reference materials to introduce successful water testing and hazardous waste tracking system (HWTS) projects in rural areas of developing countries where waterborne diseases still plague over a billion people.

The World Health Organization estimates that waterborne diseases among poor people in low-income countries every day lead to more than 4,600,000 people getting diarrhea and more than 2,000 deaths. This burden of chronic morbidity and mortality should not happen. Waterborne diseases are easily preventable—kill the germs with heat or chlorine, and people don't get sick.

As microbiology is key to understanding waterborne diseases, microbiologists are uniquely positioned to bring evidence-based microbiology to communities to demystify microbiology and help people understand the correlation between contaminated water and disease, and to present practical HWTS options to disinfect contaminated water.

The workshop will first cover the history of water quality testing methods and why *E. coli* is considered the best indicator of recent fecal contamination and disease risk. The workshop will then introduce two laboratory-independent testing methods that are currently being used in rural areas of developing countries: 1) the Portable Microbiology Laboratory (PML), which includes the 10 ml Colilert Presence/Absence test and the 1 ml *E. coli* Count Petrifilm test; 2) the Aquagenx 100 ml Compartmental Bag Test.

After the morning break participants will have an opportunity to inoculate PML tests with water samples. Slide photos will cover the steps to inoculate, incubate and read results of the Compartment Bag Test.

The workshop will then introduce disinfection options for HWTS. These will include biosand filters and chlorine (liquid, tablets, powders) and their costs, strengths and weaknesses. Solar water pasteurization

using a simple Cookit solar cooker will also be introduced, along with a reusable wax-based water pasteurization indicator (WAPI) to verify that the pasteurization temperature of 65°C has been reached.

The Friends of the Old (FOTO) project in Lower Nyakach, Kenya, will be used as a case study of a community-based approach to eliminate waterborne diseases among its 70,000 citizens despite having only highly contaminated, unimproved drinking water sources. The project has three components:

1. Use of practical field methods to test the bacterial quality of drinking water
2. Teaching basic microbiology and sharing test results with communities
3. Distributing a disinfecting chlorine solution to all households and schools.

The project is strongly endorsed by village chiefs, elders, and community members who realize that the unique FOTO project has nearly eliminated waterborne diseases that were common before the 2012 start of this project.

Tuesday, May 16

International Risk Consortium: A Team to Advance Public Health Research

International Risk Consortium

Windflower, 8:30–10 a.m.

This side event will allow the first in-person opportunity to discuss the International Risk Consortium (IRC) vision, share ideas and plan collaborative efforts. The IRC is a team of internationally recognized risk assessment scientists who want to address large scale issues regarding public health through open dialogue that results in output and outcome-driven research.

The overall mission of the IRC is to develop and solve targeted research questions and projects focused at improving public health. We are interested in research targeted to improving public-health protection via applications of the research. The consortium will focus on combined efforts towards advancing the science and reducing competition among consortium members, exchanging this for routine, open and honest collaborative discussions among all members. This will result in routinely applying for multiple, collaborative, large-scale grants as well as developing optimal teams for standard grants. In addition to the standard research mission, we will serve as a location for research first responders. Teams of willing consortium members will provide technical and scientific expertise to communities in need (e.g., underfunded health departments). The mission will be supported through the development and achievement of these mission goals:

1. Identify core projects that a transdisciplinary consortium should pursue to achieve the greatest impact for public health protection, focusing on:
    a. The dynamics of the microbial ecologies that humans interact with on a regular basis
    b. The uncertainties of our current knowledge and their associated limitations on solution development and model accuracy
    c. Predictive microbiological modeling
    d. Predictive risk modeling
2. Identify and encourage consortium members to serve as research and risk first responders in order to provide timely and accurate recommendations and technical/scientific support to communities in need
3. Identify all applicable funding mechanisms, leaders and supporting investigators to develop the best teams for funding success
4. Develop teams of researchers to target current and future funding to answer both applied and fundamental research questions
5. Lead the way in predictive microbial risk assessment modeling and the development of advanced techniques to use modern molecular methods in risk assessment
6. Enhance collaborative potential and faster scientific development among consortium members

Moving Molecular and Rapid Water Quality Methods from Research to Widespread Use

VisuGen Global, UNC–Chapel Hill Institute of Marine Sciences

Dogwood, 8:30 a.m.–12 p.m.

Molecular methods detect the nucleic acid of target organisms, rather than relying on growth as in culture-based methods, potentially provide more rapid turnaround and superior sensitivity and specificity. Quantitative Polymerase Chain Reaction (qPCR) has been adopted (EPA Method 1611 and 1609) for the detection of enterococci, but end-users have hesitated on implementation of the methods because standardization, hardware, controls and sample processing approaches continue to evolve. Furthermore, inhibition has posed a problem for certain water types such as stormwater and wastewater, so many water quality managers have hesitated to adopt the methods for all water quality testing. More recently developed approaches exist that offer higher quantitative precision and are more tolerant of inhibitors such as droplet digital PCR (ddPCR). This method permits direct absolute quantitation without the need for a standard curve.

One limitation of molecular methods stems from the small reaction volumes of molecular approaches (less than 10 ul of analyzed material). This creates a macro to micro sample processing requirement. Options for sample preparation typically involve some form of membrane filtration to capture and concentrate target organisms and the end-result concentration of the target also results in heightened molecules that interfere with DNA and RNA chemistry and amplification polymerase enzyme, both of which are required for qPCR or ddPCR. One way to avoid this might be to not use any amplification but instead use a direct probe hybridization approach. Regardless of the limitations of rapid molecular methods, they offer advantages that cannot be ignored. They are sensitive, increasingly cost-effective and have the power to transform protection of public health in water.

This session will provide a state of the science review of the issues and opportunities that arise when using molecular approaches for the detection of microbes in surface, recreational, drinking, wastewater, and stormwater samples. Presenters will discuss the technical aspects of qPCR, ddPCR, sample processing interface options, the role of metagenomics in new method development, and several emerging non-amplification based molecular detection strategies. At the end of the side event, a panel of experts will be available for facilitated discussion with the final goal of a short white paper to be submitted for publication in the IWA Magazine *The Source*.

	Title and Speaker
8:30	**Welcome and Charge to Participants** | John Gerdes
8:40	**Benefits and Pitfalls to Molecular Approaches** | Rachel Noble
9:00	**qPCR and the Evolution of Rapid EPA Methods** | Richard Haugland
9:20	**Droplet Digital PCR in Water Quality Practice** | John Griffith
9:40	**Macro to Micro Interface-Existing Approaches** | Andy Page
10:00	*BREAK*
10:30	**Implementing Rapid Molecular Assays in Tropical Environments** | Marek Kirs
10:50	**A Non-amplification Molecular Probe Approach** | John Gerdes
11:10	**2017 Review of the 2012 Recreational Water Quality Criteria in the Context of Rapid Methods** | Sharon Nappier
11:20	**Panel Discussion: Scaling the Technical and Political Hurdles to Successful Molecular Method Implementation for Water Quality Management**

The Critical Role of Accurate *L. pneumophila* Test Results in Reducing Disease Risk

IDEXX

Redbud, 8:30 a.m.–12 p.m.

Dr. Dan Broder, lead scientist for the Legiolert R&D Team, will provide an overview of the Legiolert test for quantification of *Legionella pneumophila* and present recent research findings from Germany and the U.S. comparing the performance of Legiolert to standard methods for both potable and nonpotable water samples, as well as discuss Legionnaires' disease risk management strategies. Legiolert is a newly released, simple to use and highly accurate culture test that provides confirmed results in seven days.

This interactive session will:

1. Introduce attendees to Legiolert, a new quantitative culture-based method which simplifies the detection of *Legionella pneumophila*
2. Provide attendees an opportunity to engage with experts from the U.K., Canada and the U.S. in a discussion of strategies for reducing Legionnaires' disease risk

An expert roundtable on reducing the public health risks of *Legionella pneumophila* will cover the role of *Legionella pneumophila* detection in water safety plans in health-care and other on-premise settings, *Legionella pneumophila* risk in public water distribution systems, and creative ways to raise the water safety awareness needed to help reduce the risk of Legionnaires' disease around the world. There will be ample opportunity for attendees to participate in the discussion.

Panelists will include:

- Isabelle Barrette, Group EnvironeX
- Émilie Bédard, École Polytechnique de Montréal
- Colin Fricker, CRF Consulting
- Rebecca Ives, Michigan State University
- Moderator: Manja Blazer, IDEXX

The Side Event will also include a Legiolert demonstration.

Quantifying Human Exposure Estimates for Enteric Disease Transmission: Methods and Applications

Eawag (Swiss Federal Institute of Aquatic Science and Technology)

Windflower, 10:30 a.m.–12 p.m.

Enteric diseases are largely spread through the environment. This is frequently conceptualized by the F-diagram, a model of the transmission of pathogens from an infected person's feces to a susceptible person through one of five environmental reservoirs: fields, fingers, fluids, flies and food. Increasingly, infection control research is recognizing that to reduce enteric disease burden, we need a better understanding of the relative importance of various environmental routes of transmission. To improve understanding, we are increasingly relying on the quantitative microbial risk assessment framework to model health risks from various human-environment interactions. The QMRA approach, however, requires an accurate understanding of exposures, or the "processes that take place at the intersection between humans and the environment where the contaminant is." Exposure assessments can be obtained through multiple, diverse methods, including questionnaires, structured observations, videography and use of biomarkers.

This side event will detail how exposure assessments can be obtained through these various methods, the benefits and drawbacks of each method, and examples from contemporary research on the use of the methods in microbial risk assessment. This event is intended to train participants on exposure assessments and provide a forum for people working in the field to further discuss the methods. The results will be drawn up into a review by Tim Julian (lead), Heather Bischel (UC–Davis), and others interested in participating.

Wednesday, May 17

Writing a Publishable Scientific Paper

Georgia State University

Windflower, 8:30 a.m.–12 p.m.

Writing up your work for publication can be one of a scientist's biggest challenges. Your career advancement, and the advancement of your field, depends on getting your work into peer-reviewed literature. Do you have projects you need to write for publication? Does the writing process seem overwhelming and intimidating? Are you struggling with organization and presentation of your ideas? Do you have writing in progress that isn't coming together the way you want? Whether you are just starting research or ready to write, this interactive workshop will help you make progress on your paper with a framework for organizing your writing and help you work toward the goal of a publishable paper by tackling all stages of your writing process:

- What are my writing goals?
- How do I focus part of a large project into a clearly defined manuscript?
- How is a scientific paper structured?
- How do I organize my paper around my main research goals?
- What goes in each section?
- How do I organize the presentation of data?
- Where do I start in writing a discussion?
- How do I place my work in a larger context?
- How does the process of publication work? What can I expect?

Bring your questions and manuscript writing projects. This workshop is highly interactive—we will work with your specific examples to help you organize and plan your writing. This workshop is for scientists at any stage of the writing process, whether you are just starting or in the process of writing a manuscript.

Modeling Microbial Water Quality

Wageningen University

Dogwood, 8:30–10 a.m.

We aim to bring researchers together to discuss opportunities for microbiological water quality modeling as input for a workshop on global water quality modeling in September in Wageningen, The Netherlands. Discussion points are:

- What is the current status of microbiological water quality modeling and what are gaps?
- What are opportunities when microbial water quality models are used together with other water quality variables to determine water availability and water stress?
- How can scenario analysis be valuable to the field?
- What are the opportunities?

After a brief introduction, a structured discussion will be held. One of the outputs of the workshop in September is a review paper to which participants of the discussion group can be invited.

Coliphage: Methods, Fate and Other Issues

U.S. Environmental Protection Agency

Redbud, 8:30–12 p.m.

The newly emerging interest in the use of coliphage as a potential indicator of feces in surface water has revealed several gaps in information needed to support their use as a measure of water quality. The major gaps are:

- What coliphage to use as a water quality indicator?
- What methods are available to effectively measure coliphage in water samples?
- What is the fate of coliphage in water environments?
- Can coliphage be used to predict health effects in swimmers?
- Are there bacteriophages other than coliphage that might be used to measure water quality?

The intent of this side event is to present new research information related to the needs described above. The presentations will describe new methods to deal with quantitative recovery of coliphage, both somatic and male-specific, from environmental waters. The methods covered will include both molecular and enzymatic approaches to measuring coliphage in water samples. Other presentations will include a study that looked at the use of phage other than coliphage and a study that examined the die-off of culturable water quality indicators and somatic coliphage in a freshwater environment. The relationship between health effects in swimmers and water quality, as measured with coliphage, will also be discussed. Following the presentations, time will be set aside for questions and answers to discuss the impact of the presented data.

Poster Presentation Schedule

Monday, May 15

	Title	Presenter
1.	The Impact of Household Drinking Water Quality on Diarrhea and Specific Enteropathogens in Peruvian Infants	Miranda Delahoy, Emory University
2.	Occurrence of Human and Bovine Pathogens and Fecal Markers in Non-Disinfected Drinking Water from Community and Non-Community Wells in Minnesota	Joel Stokdyk, U.S. Geological Survey
3.	Potential Health Hazards from Residual Contaminants in Domestic Backwater-Recovered Struvite Fertilizer	Rachel Yee, University of Alberta
4.	Prevalence of Free-Living Amoebae in Households, Farming and Healthcare Potable Water of South Africa	Petros Muchesa, University of Johannesburg
5.	Isolation of Amoeba Associated Gram Negative Bacteria in Water Systems of a South African Public Hospital	Petros Muchesa, University of Johannesburg
6.	Isolation and Characterization of Non-Tuberculous Mycobacteria and Mycobacteriophages from a South Carolina River	Kim Borges, University of Maine
7.	Association of Land Use and Beach Closure in the United States	Jianyong Wu, U.S. Environmental Protection Agency
8.	Biological Control of Toxic Cyanobacteria	Luyanda Ndlela, Council for Scientific & Industrial Research
9.	Quantitative Microbial Risk Assessment (QMRA) in the Roof-Harvested Rainwater Intake	Jálvaro da Hora, IFBA
10.	Coastal Water Surveillance of Pathogenic Enteric Viruses as Complementary Faecal Indicators of Water Quality Management	José Manuel Carita Gonçalves, National Institute of Biology, Slovenia
11.	Characterizing Antibiotic Resistance Genes in a Singapore Wastewater Reclamation Plant	Hongjie Chen, National University of Singapore
12.	Selection of Microbial and Molecular Markers Useful to Differentiate the Source of Fecal Pollution in the Bogota River (Columbia)	Andrea Catherine Sánchez Alfonso, Pontificia Universidad Javeriana
13.	Microbial And Turbidity Removal By Chitosan Coagulation in Natural Waters To Optimize Ceramic Saree Cloth Water Filtration For Household Drinking Water Treatment	Hemali Oza, UNC–Chapel Hill
14.	Automated High Frequency Monitoring of Beta-D-Glucuronidase Activity in Source Water in Quebec, Canada: Relationship with *E. coli* and Catchment Dynamics	Jean-Baptiste Burnet, Polytechnique Montréal
15.	Longitudinal and Source-to-Tap New Orleans, LA, USA Drinking Water Microbiology	Natalie Hull, University of Colorado–Boulder

Poster Schedule: Monday, May 15 (continued)

	Title	Presenter
16.	Impact of Vegetable Surface Properties and Sanitizer Type on Rotavirus Infection Risks from Consumption of Fresh Produce	Miyu Fuzawa, University of Illinois at Urbana-Champaign
17.	Does Monochloramine Use for Municipal Drinking Water Disinfection Increase the Risk of Nontuberculous Mycobacterial Infection?	Nadine Kotlarz, University of Michigan
18.	Environmental Evaluation of Novel Crassphage Based qPCR Markers	Elyse Stachler, University of Pittsburgh
19.	Isolation of Amoeba Associated Gram Negative Bacteria in Water Systems of a South African Public Hospital	Amity Zimmer-Faust, U.S. Environmental Protection Agency
20.	Virus Removal by Chitosan Coagulation Pretreatment in Natural Waters To Optimize Ceramic Water Filtration For Household Drinking Water Treatment	Collin Knox Coleman, UNC–Chapel Hill
21.	Direct One-Step Culture Detection of *Vibrio cholerae* in Drinking Water in Low-Resource and Disaster Settings	Megan Lott, UNC–Chapel Hill
22.	Binding Affinity and Toxicity of 13 Microcystin Congeners	Debmalya Bhattacharyya, Northeast Ohio Regional Sewer District
23.	Viz-DR A Microbial Dose Response Visualization and Optimization Tools for QMRA Students and Novices	Mark Weir, Ohio State University
24.	SARA's Bacterial Source Tracking: How One Small Environmental Lab Developed an Impactful Molecular Biology Program	Hillary Halderman, San Antonio River Authority
25.	Opening Pandora's Box: Unmasking the Need for a Continuous Sample Processing Control for PCR Based Fecal Marker Analysis	Rita Linke, TU Wien, ICC Water & Health
26.	Development of a MALDI-TOF Database for Identification of Drinking Water Bacteria: Drinking Water Library Project	Maite Muniesa, Universitat de Barcelona
27.	Can We Get *E. coli* Results Faster from Fluorescence Fluorometry?	Elkana Kurgat, University of Arizona
28.	Results of Molecular and Culture-Based Assays to Target Human and Non-Human Faecal Contamination in the River Tagus	Silvia Monteiro, University of Brighton & Laboratorio Analises, Instituto Superior Tecnico
29.	Isolation and Detection of Diarrhoegenic *E. coli* from Environmental Water Sources in South Africa Using Molecular Biology Methods	Kousar Omar, University of Johannesburg
30.	Global *Cryptosporidium* Loads from Livestock Manure	Lucie Vermeulen, Wageningen University

Poster Schedule: Tuesday, May 16

	Title	Presenter
1.	Identifying Norovirus Exclusion Zones in Shellfish Production Areas Through Microbiological Monitoring, Drogue Tracking and Sewage Effluent Tracing: Studies in a Shallow Estuary and a Deep Coastal Embayment	David Walker, CEFAS
2.	Novel Bio-beads of PVA-Alginate Immobilized Marine Yeasts for the Treatment of Shrimp-Processing Effluent	Jesitha Salam Cochin, University of Science & Technology
3.	Optimizing the Performance of a Conventional Water Treatment System: First Application of Quantitative Microbial Risk Assessment in Iran	Alireza Mesdaghinia, Institute for Environmental Research, Tehran University of Medical Sciences
4.	Health-Related Inactivation Requirements for UV-Irradiated Wastewater Effluents Discharged to Recreational Surface Waters	Regina Sommer, Medical University Vienna, ICC Water & Health
5.	Effect of Holding Time on *E. coli* in Wastewater Samples	Mark Citriglia, Northeast Ohio Regional Sewer District
6.	Universal Neutralizer for Common Antimicrobials in Dental Unit Waterline Treatment Products	Nicole Beetsch, NSF International
7.	Human-Associated Bacteroidetes MST Markers in Communal and Domestic Wastewater and Comparison to Standard/Alternative Indicators of Faecal Pollution	René Mayer, TU Wien, ICC Water & Health
8.	Availability and Flows of Regulatory Microbial Water Quality Testing Data in Sub-Saharan Africa	Emily Kumpel, University of Massachusetts– Amherst
9.	Long-Term Spatial and Temporal Microbial Community Dynamics in Drinking Water Distribution Systems: A South African Case Study	Sarah MacRae, University of Pretoria
10.	Agreement Between Quantitative Microbial Risk Assessment and Epidemiology at Low Doses during Waterborne Outbreaks of Protozoan Disease	Tucker Burch, USDA-ARS
11.	Effect of High Flow Events on Spatiotemporal Variation of *E. coli* Concentrations in Creek Sediments	Matthew Stocker, USDA-ARS
12.	Development of a Sensitive and False-Positive Free PMA-qPCR Viability Assay to Quantify VBNC *Escherichia coli* and Evaluate Disinfection Performance in Wastewater Effluent	Richard Kibbee, Carleton University
13.	Assessing the Possible Human Health Effects from Gold Mining Polluted Water in South Africa and the Importance of Multiple Species Ecotoxicity Testing	Maronel Steyn, CSIR
14.	Evaluation of a Low-Cost Compartment Bag Test to Quantify Hydrogen Sulfide Producing Bacteria in Drinking Water	Claire Tipton, UNC–Chapel Hill
15.	Comparative Performance of a New Method, Legiolert, vs. Standard Methods for the Quantification of *Legionella pneumophila* in Potable and Nonpotable Water Samples	Daniel Broder, IDEXX Laboratories

Poster Schedule: Tuesday, May 16 (continued)

Title	Presenter
16. Verification of Alternate Wavelength UV Disinfection Systems	Jovan Lubardic, NSF International
17. A Loop-Mediated Isothermal Amplification (LAMP) Assay for the Rapid Detection of *Enterococcus* spp. in Water	Roland Martzy, TU Wien, ICC Water & Health
18. Validation of Quantitative PCR Assays to Detect Fecal Contamination of General, Human, and Poultry Origin in Low-Income Neighborhoods of Urban Maputo, Mozambique	David Holcomb, UNC–Chapel Hill
19. Examining Trends in General Fecal Indicator Bacteria and Microbial Source Tracking Genetic Markers at Non-Point Source Impacted Chicago Beaches	Abhilasha Shrestha, University of Illinois–Chicago
20. Occurrence of Antibiotic Resistant Fecal Indicator Bacteria in Point-Source Polluted Surface Waters	Asli Aslan, Georgia Southern University
21. Reducing Excreta-Borne Diseases in Rural Communities in Semi-Arid Climates: Evidence to Support the Formulation of Household "WASH Safety Plans" Rather Than Drinking Water Safety Plans	Mario Rodrigues Peres, University of Brighton
22. Phi6 Persistence in Liquid Media and its Suitability as a Surrogate for Enveloped Viruses	Nathalia Aquino de Carvalho, University of Pittsburgh
23. Hygienic-Sanitary Evaluation of the Water from Drinking Fountains and Vaporizers in Municipal Parks of the City of São Paulo	Geyse Aparecida Cardosa dos Santos, University of São Paulo
24. *Salmonella* Transport Through Irrigation Systems and the Risk of Fresh Produce Contamination on Farms in Southern Georgia	Debbie Lee, Emory University
25. Pathogenic *Acanthamoeba* in Recreational Water in Salta, Argentina	Veronica Beatriz Rajal, INIQUI-CONICET-UNSa
26. Linking Fecal Indicators, Microbial Source Tracking Markers and Pathogens to Characterize an Urban Stretch of the Danube River at Vienna as a Water Resource	Katalin Demeter, TU Wien, ICC Water & Health
27. Prevalence of Antibiotic-Resistant *E. coli* in North Carolina Watersheds with and without Swine CAFOs	Elizabeth Christenson, UNC–Chapel Hill

Poster Schedule: Wednesday, May 17

	Title	Presenter
1.	Virus Inactivation by Ozone: Kinetics and Influence of Water Quality Parameters	Camille Wolf, EPFL
2.	Inactivation of *E. coli* and MS2 Bacteriophage by Copper and Silver Ions in Stored Water	Mark Sobsey, UNC–Chapel Hill
3.	Active Bacterial Communities and Opportunistic Pathogens in Chlorinated and Non-Chlorinated Drinking Water Distribution Systems	Sallamaari Siponen, National Institute for Health & Welfare
4.	Microbiological Health Risks in Drinking Water After Artificial Ground Water Recharge Process	Anna-Maria Hokajärvi, National Institute for Health & Welfare
5.	Numbers of Somatic Coliphages Versus Numbers of Phages Detected by Strain CB390	Andrea Catherine Sánchez Alfonso, Pontificia Universidad Javeriana
6.	Infectivity of Human Norovirus through Water Reuse Disinfection Processes	Nicole Rockey, University of Michigan–Ann Arbor
7.	Biodegradation of Microcystins in Lake Erie Source Waters and Sand Filters from Drinking-Water Plants	Jessica Cicale, U.S. Geological Survey
8.	Inactivation of *Pseudomonas aeruginosa* by Electrochemical Oxidation	Rosa Maria Araujo Boira, Universitat de Barcelona
9.	Risk Assessment of *Legionella* Infection by the Release from Biofilms in Premise Plumbing	Conghui Huang, University of Illinois at Urbana-Champaign
10.	Quantitative Metagenomic Approach for Classifying Environmental Reservoirs of Antimicrobial Resistance	Emily Crossette, University of Michigan
11.	Characterization of Microbial Contamination in Water Vending Machines of Eastern Coachella Valley	Thomas Hile, Loma Linda University
12.	Quantification of *Toxoplasma gondii* in Source Water Samples from São Paulo State, Brazil	Ana Teresa Galvani, Environmental Company of the São Paulo State (CETESB)
13.	Diurnal Variability and Sources of Coliphage, Enterococci and Non-Typhoidal *Salmonella* in a Tidal Beach	Asli Aslan, Georgia Southern University
14.	Ability of Benzonase Pre-Treatment to Reduce False-Positive Rotavirus Results by RT-PCR	Leena Maunula, University of Helsinki
15.	Quantification and Genotyping of *Cryptosporidium* and *Giardia* from Surface Water Catchment in São Paulo, Brazil	Bruna Breternitz, University of São Paulo
16.	Quantification of *Giardia*, *Cryptosporidium* and *Toxoplasma* Oocysts in Wastewater for Reuse	Veridiana Bastos, University of São Paulo

Poster Schedule: Wednesday, May 17 (continued)

	Title	Presenter
17.	Incidence and Diversity of *Arcobacter* spp. in Shellfish, in Water from a Harvesting Bay Area and a Freshwater Heavily Contaminated Channel	Maria Figueras, University Rovira & Virgili
18.	Modelling the Present Dynamics and Future Impact of Socio-Economic and Climate Changes on Faecal Indicator Bacteria in a Surface Water Source	Nynke Hofstra, Wageningen University
19.	Complex Phylogenetic Group Pattern of *Escherichia coli* from Commensal Human and Wastewater Treatment Plant Isolates	Nancy Stoppe, SMS-PMSP
20.	Fate and Persistence in Soil Microcosms of Environmental and Fecal *Escherichia coli* Isolated from Low-Income Countries	Maria Camila Montealegre, Swiss Federal Institute of Aquatic Science & Technology
21.	Inactivation of Foodborne Viruses in Fresh Produce Using Green Tea Extract	Celia Barardi, Universidade Federal de Santa Catarina
22.	Urban-Rural Differences in the Effects of Heavy Rainfall Events on Diarrheal Disease Epidemiology	Aniruddha Deshpande, Emory University
23.	Changes on the Bacterial Populations of Water Processing in a Paper Mill and Their Potential Effects on Microbial Quality and Safety in Wastewater Effluents	Anicet Blanch, Universitat de Barcelona
24.	Could Septic Systems be the Source of Human Fecal Markers in Private Wells in Rural Pennsylvania, USA?	Heather Murphy, Temple University
25.	The Impact of Combined Sewer Overflows (CSOs) on the Presence of Pathogens and Indicator Organisms in Urban Creeks	Heather Murphy, Temple University
26.	Simultaneous Measurement of Genetic Fecal Indicators in Water Column and Periphyton Biofilms in Artificial Streams	Orin Shanks, U.S. Environmental Protection Agency
27.	Poikilothermic Animals as a Previously Unrecognized Source of Fecal Indicator Bacteria	Katalin Demeter, TU Wien, ICC Water & Health

Poster Schedule: Thursday, May 18

	Title	Presenter
1.	A Decision Support System (DSS) for Recreational Water Use — Revision of the South African Water Quality Guidelines	Bettina Genthe, CSIR
2.	Development and Validation of Cultural and Molecular Methods for the Detection and Quantification of *Campylobacter* in Water Samples	Michael Hügler, DVGW-Technologiezentrum Wasser
3.	Adenoviruses, JC Polyomavirus and GB-124 Phages in Reclaimed Water Produced by Sand-Anthracite Filtration and MBR/Reverse Osmosis System	Tatiana Prado, Environmental Company of the São Paulo State (CETESB)
4.	Application of Bacteriophages as Indicators of the Removal of Enteric Viruses in Wastewater Treatment Processes	Edgard Dias, Federal University of Juiz de Fora
5.	Advancing Evidence-Based Management of Recreational Waters: Integration of Microbial Source Tracking and Risk Assessment	Sonya Kozak, Griffith University
6.	Efficacy of Flushing and Chlorination in Removing Faecal Microorganisms from a Pilot Distribution System	Nikki van Bel, KWR Watercycle Research Institute
7.	Advanced UV Treatment for Inactivation of Emerging Microbiological Contaminants	Vincent Martino, Marquette University
8.	Critical Elements for Local Indigenous Water Security	Tessa Latchmore, Public Health Ontario
9.	Assessment of the Human Infectious Disease Health Risks Associated with the Use of Recycled Wastewater to Augment Potable Water Supplies	Sarah Purnell, University of Brighton
10.	Comparison of Two-Dimensional Gel Electrophoresis-based and Mass Spectrometry-Based Proteome Analysis of Virus Protein	Ryohei Kuraoka, Kyoto University
11.	Development of a 2D Simulation Based Method for Dose Response Model Optimization for Uncertain Pathogens	Mark Weir, Ohio State University
12.	An Isothermal Amplification Method Complementary to US EPA qPCR for the Detection of Enterococci in Environmental Waters	Claudia Kohm, TU Wien, ICC Water & Health
13.	Antibiotic-Resistant Bacteria in Therapy Pools	Stefanie Huber, Bavarian Health & Food Safety Authority
14.	Determining the Antimicrobial Resistance Profiles of Diarrheagenic *Escherichia coli* Strains from Rainwater Harvesting Tanks in Eastern Cape, South Africa	Shirley Makoba Malema, CSIR
15.	Propagation of Bacteriophages in the Host Cell in the Biofilm	Hiroshi Hirotani, Osaka Kyoiku University
16.	Do Electronic Faucets Cause *Pseudomonas aeruginosa* Outbreaks in Hospital Environments? A Review	Émilie Bédard, Polytechnique Montréal

Poster Schedule: Thursday, May 18 (continued)

	Title	Presenter
17.	Dissemination and Prevalence of Enteric Viruses in Surface Waters and in Children with Acute Gastroenteritis	Regina Keller, UFES
18.	A Metagenomic Assessment of Viral Contamination on Fresh Parsley Plants Irrigated with Fecally Tainted River Water	Eloy Gonzalez, Universitat de Barcelona
19.	Should We Study Sediments Microbial Quality in Natural Aquatic Environments?	Lucía Chávez Díaz, CONICET
20.	Clinically Relevant Antibiotic Resistant Bacteria in Water Used for Drinking Water Production	Claudia Stange, DVGW-Technologiezentrum Wasser
21.	Occurrence of Antibiotic Resistance Genes and MST Markers in a Rural Catchment Area	Claudia Stange, DVGW-Technologiezentrum Wasser
22.	Detection Sensitivity Assessment of Sewage Markers in Recreational Beach Waters	Warish Ahmed, CSIRO Land and Water
23.	A Seasonal Distribution of Opportunistic Pathogens in Roof-Captured Rainwater Tanks	Warish Ahmed, CSIRO Land and Water
24.	Survival and Replicate of *Helicobacter pylori* in Water: Effect of Grazing by Free Living Amoebae	Rafik Dey, University of Alberta

Planning Committees

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The Water Institute at UNC

The Water Institute at UNC provides global academic leadership for sustainable management of water for health and human development. Based in UNC's Gillings School of Global Public Health, one of the highest ranked public health schools, we work to solve the complex global water challenges through our four main strategic functions: research; teaching and learning; knowledge and information management; and networking and partnership development. We have seven focus areas to support these functions, which are: monitoring, valuation and learning for WaSH; WaSH governance; sanitation for the 21st century; adapting to water scarcity and climate change; drinking water for all; national and regional WaSH challenges in the U.S.; and the water-food-climate-energy nexus.

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