Sunday, May 10th 2009

8 am  Registration
1:30 pm  Plenary session
Particle and Pathogen Passage through Porous Media
Charles R. O'Melia, The John Hopkins University

2:40 pm  Break

3 pm  Session 1: Mechanistic Investigations 1:
Towards Better Representation of the Field in the Lab
CHAIR: Jack Schijven, RIVM

Laboratory Assessments of Carboxylated Microbial-Sized Microspheres to Estimate *Cryptosporidium parvum* Oocyst Fate and Transport within Russian River (Sonoma County, CA) Bank Filtration Sediments
David W. Metge, U.S. Geological Survey

3:20 pm  Comparison of Pilot Scale Transport with Theory
William P. Johnson, University of Utah

3:40 pm  The Influence of Influent Concentrations of Microspheres on the Removal by Sand Filtration
Isabelle Papineau, Ecole Polytechnique de Montreal

4 pm  Break

4:30 pm  Session 2: The Unsaturated Zone - A High Risk Environment?
CHAIR: Dave Rudolph, University of Waterloo

The Utility of Microspheres as Surrogates for the Transport of *E. coli* in Agricultural Soil
Joanne Passmore, University of Waterloo

4:50 pm  Colloid Transport with Advancing Wetting Fronts in Sand:
Effects of Solution Ionic Strength and Surface Tension
Jie Zhuang, University of Tennessee

5:10 pm  Impacts of nonionic and anionic surfactants on bacterial transport through unsaturated porous media
Derick G. Brown, Lehigh University

5:30 pm  Vadose Zone Monitoring to Assess the Capability of At-Grade Designs for Onsite Wastewater Treatment of Pathogens and Nutrients
Erin Motz, University of Calgary

7 pm  Welcome Reception
<table>
<thead>
<tr>
<th>Time</th>
<th>Session Details</th>
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<tbody>
<tr>
<td>7:30 am</td>
<td>Registration</td>
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<tr>
<td>8:30 am</td>
<td><strong>Plenary Session</strong>&lt;br&gt;Deposition of Motile and Non-Motile Bacteria onto Conditioning Films&lt;br&gt;Menachem Elimelech, <em>Yale University</em></td>
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<tr>
<td>9:30 am</td>
<td>Break</td>
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<tr>
<td>9:50 am</td>
<td><strong>Session 3: Mechanical Investigations 2</strong>&lt;br&gt;Synthesis of Multiple Factors that Impact Microbial Transport in Porous Media&lt;br&gt;CHAIR: Derick Brown, <em>Lehigh University</em></td>
</tr>
<tr>
<td>9:50 am</td>
<td>Coupled Factors Influencing the Transport and Retention of Microbes in Porous Media&lt;br&gt;Scott A. Bradford, <em>U.S. Salinity Laboratory</em></td>
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<tr>
<td>10:20 am</td>
<td>Role of Biofilm on the Fate of <em>Escherichia coli</em> in Saturated Porous Media&lt;br&gt;Yang Liu, <em>University of Alberta</em></td>
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<td>10:40 am</td>
<td>Improved Understanding of Mechanisms Impacting Colloid and Pathogen Transport in Saturated GUDI Environments&lt;br&gt;Nicole L. McClellan, <em>University of Waterloo</em></td>
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<tr>
<td>11 am</td>
<td>The Role of Inter-Strain Variability on the Sorption Behavior of <em>Escherichia coli</em> to Aquifer Sediments&lt;br&gt;Carl H. Bolster, <em>U.S. Department of Agriculture</em></td>
</tr>
<tr>
<td>11:20 am</td>
<td>Determining the Extent of Virulence and Influence of Motility in <em>Salmonella</em> Transport&lt;br&gt;Berat Z. Haznedaroglu, <em>University of California, Riverside</em></td>
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<td>11:40 am</td>
<td>TBD</td>
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<tr>
<td>Noon</td>
<td>Lunch</td>
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Monday, May 11th 2009

1:30 pm  
**Session 4: Microbial Data Collection and Regulatory Support**
CHAIR: Annie Locas, INRS Institut Armand Frappier

1:30 pm  
Utopia or Reality: The Quest for Correlations between Indicators and Pathogens
Pierre Payment, INRS-Institut Armand-Frappier

2 pm  
Risk Assessment Framework for Pathogens in Biosolids: Groundwater Pathway
Mira S. Olson, Drexel University

2:20 pm  
Monitoring the Occurrence of Microbial Contaminants within the Wellhead Protection Area of a Municipal Well Field in an Agricultural Setting
M. Christie, University of Waterloo

2:40 pm  
Using MPA to Characterize Surface, Ground, and Finished Drinking Waters
Jennifer L. Clancy, Clancy Environmental Consultants, Inc.

3 pm  
Break

3:30 pm  
**Session 5: Land Use and Subsurface Vulnerability**
CHAIR: William P. Johnson, University of Utah

3:30 pm  
Vulnerability of Unconfined Groundwater to Virus Contamination
Jack Schijven, Utrecht University

4 pm  
Transport of Pathogenic Prion Protein through Soil and Landfill Materials
Kurt Jacobson, University of Wisconsin, Madison

4:20 pm  
Transport of Pathogens in Agricultural Drainage Water
Robert Gordon, University of Guelph

4:40 pm  
Human Enteric Viruses as Tracers of Wastewater Pathways into Municipal Drinking Water Wells
Mark A. Borchardt, Marshfield Clinic Research Foundation

5 pm  
Biodegradation at the Limit: Tracking of Microbial Activity and Petroleum Hydrocarbon Biodegradation under Freeze-Thaw Conditions
Subhasis Ghoshal, McGill University

7 pm  
Reception and Dinner at Hillebrand Winery
<table>
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<td>Plenary Presentation</td>
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</tbody>
</table>
| | *How Important is Bacterial Chemotaxis Relative to Advective Subsurface Transport and Dispersion in Bioremediation?*  
Ronald Harvey, *US Geological Survey* |
| 9:30 am | Break |
| 9:50 am | Session 5: Mechanistic Investigations 3: From the Lab to the Field |
| | CHAIR: Scott Bradford, USDA |
| 9:50 am | “Virus Hitchhikers” – Colloid-Facilitated Virus Transport in Gravel Aquifer Media  
Liping Pang, *Institute of Environmental Science & Research Ltd. (New Zealand)* |
| 10:20 am | Intra-strain Variability in Pathogen Transport Behavior Examined Using Model Groundwater Systems: Role of Temperature and Cell Acclimation  
Nathalie Tufenkji, *McGill University* |
| 10:40 am | Transport and Deposition of *Pseudomonas fluorescens* in Granular Media: Role of Metabolic Activity  
Erwin Klumpp, *Agrosphere Institute* |
| 11 am | Transport of *Cryptosporidium parvum* Oocysts Through Variably and Permanently Charged Soils  
Arvind Mohanram, *University of Hawaii, Honolulu* |
| 11:20 am | Systematic Study on the Effects of pH, Ionic Strength and Ion Composition on Virus Attachment/Detachment in Saturated Sand Columns  
Gholamreza Sadeghi, *University of Utrecht* |
| 11:40 am | Pathogen Transport in a River-Connected Alluvial Aquifer  
Alicja Pawlak, *University of Calgary* |
| Noon | Lunch |
1:40 pm  **Session 6: Evaluating Microbial Transport and Survival in Porous Media: Methodological Considerations**  
CHAIR: Liping Pang, ESR

1:40 pm  **The Use of the PCR Technique in Determining Surface Structures of Multiple Environmental *Escherichia coli* Isolates**  
G. Lutterodt, UNESCO-IHE Institute for Water Education

2 pm  **Assessment of Transport and Retention of Bacteria in Porous Media using X-Ray Computed Tomography**  
Subhasis Ghoshal, McGill University

2:20 pm  **Colloid Transport in Granular Saturated Media: Impacts of Flow Orientation**  
Monica Emelko, University of Waterloo

2:40 pm  **Persistent Gene Expression and Toxin Production and Resuscitation of Viable but Noncultrable *Escherichia coli* O157:H7**  
Yanming Lui, University of Alberta

3 pm  Break

3:30 pm  **Session 7: Mechanical Investigations 4: Microscale Investigations**  
CHAIR: William P. Johnson, University of Utah

3:30 pm  **Role of Divalent Cations on Deposition Kinetics of Cryptosporidium parvum Oocysts onto Natural Organic Matter Surfaces**  
Thanh H. Nguyen, University of Illinois at Urbana-Champaign

3:50 pm  **Predicting Microbial Transport in Porous Media Using Microfluidic Flow Cell Arrays**  
Leslie M. Shor, Vanderbilt University

4:10 pm  **Variation of Bacterial Metabolic Activity upon Adhesion to a Solid Surface**  
Derick G. Brown, Lehigh University

4:30 pm  **Quantitative Meso-Scale Imaging of Colloid Remobilization during Drainage in Porous Media: Implications for Pore-Scale Processes**  
Jonathan W. Bridge, University of Sheffield

4:50 pm  **Nano-Scale Forces that Affect the Transport and Biofilm Production of Metal Reducing *Desulfovibrio vulgaris***  
Pauline Nesaraja, State University of New York, Buffalo

5:10-6:30  **Poster Session**
Wednesday, May 13th 2009

8 am  Registration

8:30 am  Plenary Presentation
         Water Quality and Health in the Rural Environment
         Joan B. Rose, Michigan State University

9:30 am  Break

9:50 am  Session 8: Microbial Transport and Retention in
         Fractured Environments
         CHAIR: Edwin Cey, University of Calgary

9:50 am  Molecular Mechanisms Involved in the Survival and Transport of Viruses
         through the Subsurface
         Charles Gerba, University of Arizona

10:20 am Surface to Fracture Transport of E. coli-sized Microspheres and
         a Conservative Tracer in a Fractured Rock Aquifer, Perth, Ontario
         Titia Praamsma, Queens University

10:40 am Quantifying E. coli Removal in Single, Saturated, Variable-Aperture
         Fractures
         S. Rodrigues, McMaster University

11 am   A Comparison of Bicolloid and Colloid Transport in Single,
         Saturated Fractures
         J. Qu, McMaster University

11:20 am A Study of Traditional and Viral Pathogen Occurrence in Fractured
         Rock Wells in Rural Canada: The Potential Use of Particle Size
         Distribution as an Indicator of Pathogen Presence
         Shawn Trimper, Queen’s University

11:40 am Should We Be Purging When Sampling for Fecal Indicator Bacteria in
         Groundwater? Observations from Tests Conducted in Multi-Level
         Bedrock Monitoring Wells
         John Kozuskanich, Queen’s University

Noon  Lunch
### Wednesday, May 13th 2009

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<tr>
<th>Time</th>
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<tr>
<td>1:30 pm</td>
<td><strong>Session 9: GWUDI Assessment</strong></td>
<td>CHAIR: Sarah Dickson, McMaster University</td>
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<tr>
<td>1:30 pm</td>
<td><strong>GWUDISW and RBF – What’s the Difference?</strong></td>
<td>William D. Gollnitz, Earthworks</td>
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<tr>
<td>1:50 pm</td>
<td><strong>Improving Methods to Assess GWUDI for Bank Filtration Performance</strong></td>
<td>T. Rauch Williams, Carollo Engineers</td>
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<tr>
<td>2:10 pm</td>
<td><strong>A Protocol for Identifying Groundwater Under the Direct Influence of Surface Water (GWUDI) in Quebec</strong></td>
<td>Annie Locas, INRS-Institut Armand-Frappier</td>
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<td>2:30 pm</td>
<td><strong>Assessing an Angled Well Riverbank Filtration Site in New Hampshire</strong></td>
<td>Vasiliki Partinoudi, University of New Hampshire</td>
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<td>3 pm</td>
<td>Break</td>
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<tr>
<td>3:30 pm</td>
<td><strong>Session 10: The Subsurface and Beyond</strong></td>
<td>CHAIR: Dave Rudolph, University of Waterloo</td>
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<td>3:30 pm</td>
<td><strong>Impact of Cross-Flow on Particle Removal in Filtration Studies</strong></td>
<td>Stephen A. Hubbs, University of Louisville</td>
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<tr>
<td>3:50 pm</td>
<td><strong>GAC Adsorption Filters as Microbial Barriers for Viruses, Bacteria and Protozoan (Oo)cycts in Water Treatment</strong></td>
<td>Wim Hijnen, KWR Watercycle Research Institute</td>
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<tr>
<td>4:10 pm</td>
<td><strong>Removal of Total Coliforms, Escherichia coli, Girardia spp., Cryptosporidium ssp. And helminth eggs by direct filtration plus UV mactivation from Wastewater Treatment Plant Secondary Effluent in Brazil: Implications to Water Reuse</strong></td>
<td>Ricardo Isaac, UNICAMP, Brazil</td>
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<td>4:30 pm</td>
<td><strong>Ultrafiltration Performance as Determined by Recovery of In Situ Bacteria and Viruses</strong></td>
<td>Peter S.K. Knappett, University of Tennessee</td>
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<td>4:50 pm</td>
<td><strong>Numerical Simulations for Biological Clogging in Sand Biofilters</strong></td>
<td>Mohamed Mostafa, Carleton University</td>
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Poster Session

Tuesday May 12th
5:10-6:30 pm

Po1 ‘Body doubles’ – modifying the surface charge of pathogen-sized microspheres to study pathogen transport in groundwater: LIPING PANG, Institute of Environmental Science & Research Ltd, Christchurch, New Zealand

Po2 Microbial removal rates in subsurface media estimated from published studies of field experiments and large intact soil cores: LIPING PANG, Institute of Environmental Science & Research Ltd, Christchurch, New Zealand

Po3 Modeling water flow and bacterial transport in undisturbed lysimeters under irrigations of dairy shed effluent and water using HYDRUS-1D: SHUANG JIANG, Lincoln University, New Zealand

Po4 Applying groundwater contaminant flux measurement methods to assess pathogen transport in the subsurface: MARK N. GOLTZ, Air Force Institute of Technology, Wright Patterson Air Force Base, OH

Po5 Colloid remobilization during evaporation from near-surface pores: implications for fate and transport in soils and the vadose zone: JONATHAN W. BRIDGE, University of Sheffield

Po6 Changes in antibiotic resistance and pathogenicity of Salmonella exposed to artificial groundwater with residual antibiotics: BERAT Z. HAZNEDAROGLU, University of California,

Po7 Pathogenic and indicator bacteria in well water and surface water from the Salmon River watershed: CASSANDRA JOKINEN, Public Health Agency of Canada

Po8 The effect of microbial retention on permeability of the porous media: KOJI YAMASHITA, The University of Tokyo

Po9 Investigating the influence of cell concentration and media pre-coating on bacterial migration in granular porous media: C. CHORNEWICH, McGill University

Po10 Comparing the Migration Behaviour of Bacterial Pathogens in Quartz Sand and Agricultural Soil: TIM SCHINNER, McGill University
Poster Session

P11 Macromolecule Mediated Transport and Retention of Escherichia coli O157:H7 in Saturated Porous Media: HYUNJUNG N. KIM, University of California

P12 Validation of large volume MPN techniques using a modification of US EPA method 1601: detecting low concentrations of coliphage from secondary effluent substrata infiltration systems: RICHARD DANIELSON, BioVir Laboratories, Inc.

P13 Transport and fate of bacterial pathogens in Quebec agricultural soil: ARTI BHAKTA, McGill University

P14 Applying the RT Clean-Bed Filtration Model to Slow Sand Filters: JEFF SENDERS, University of New Hampshire

P15 Pathogens in Norwegian groundwater: current knowledge and future needs: HANNE KVITSAND, Norwegian University of Science and Technology

P16 Effective filtration monitoring of spring collector system: DENNIS MUTTI, Stantec Consulting Ltd

P17 Microscopic particulate analysis as a means of assessing river bank filtration at municipal wells in granular and factured rock aquifers along the Grand River, Waterloo, Ontario: CRAIG JOHNSTON, Stantec Consulting Ltd

P18 A continuous sampling MPA technique for GUDI evaluations: JOHN ST. MARSEILE The Thompson Rosemount Group

P19 Characterization and modeling of pathogen risks in groundwater of NN communities in Canada: A MAZUMDER, University of Victoria

P20 Inverse modeling of two-site kinetic attachment/detachment and liquid/solid inactivation from virus surrogate breakthrough observed in column studies of saturated basic oxygen furnace slag media: JESSE STIMSON, University of Waterloo

P21 Optimal preparation and purification of PRD1-like bacteriophage suspensions for use in environmental fate and transport studies: MESQUITA, M. M. F., University of Waterloo

P22 Pathogen Inactivation, Treatment and Fate in Constructed Treatment Wetlands: KEL P. WEBER, University of Waterloo
Brace Center for Water Resources Management

NWRI-USA National Water Research Institute

CANADIAN WATER NETWORK RÉSEAU CANADIEN DE L'EAU