

ANNE K. CAMPER

Associate Dean for Research and Graduate Studies, College of Engineering
Professor, Civil Engineering, Adjunct Professor, Microbiology
Center for Biofilm Engineering
Montana State University, Bozeman, MT 59717

EDUCATION:

- Ph.D. Civil (Environmental) Engineering, Montana State University, 1995
- M.S. Microbiology, Montana State University, 1977
Emphasis on bacterial physiology and environmental microbiology
- B.S. Microbiology, Montana State University, 1975, with honors
Environmental Health option

CURRENT POSITION:

Associate Dean for Research and Graduate Education, College of Engineering (since 2001), Professor, Department of Civil Engineering (July 2004), faculty member in Civil Engineering since Sept., 1995. Member of research team, Center for Biofilm Engineering (since 1986) and research area leader (since 1992), Adjunct Professor, Dept. Microbiology (since 1992).

PROFESSIONAL MEMBERSHIPS:

American Society of Engineering Educators
International Society of Microbial Ecology
American Society for Microbiology
American Water Works Association

RELEVANT HONORS AND AWARDS:

Best Poster, AWWA Annual Meeting, 1993
Elected member of Chi Epsilon, National Civil Engineering Honor Society, 1993
Center for Biofilm Engineering Special Award for Overall Contributions, 1994
Foundation for Microbiology Lectures Program participant 1998-2000
Wiley Faculty Award for Meritorious Research, Montana State University, 2002
AWWA Distribution and Plant Operations Division Best Paper Award, 2004
American Consulting Engineers Council of Massachusetts Grand Conceptor Award
member of a project team (*Evaluation of Ozone and Ultraviolet Light*) that demonstrated the highest degree of engineering excellence and ingenuity, 2005
American Academy of Environmental Engineering Excellence in Environmental Engineering Research Grand Prize - member of a project team (*Evaluation of Ozone and Ultraviolet Light*), 2005
National Research Council, Water Science and Technology Board Committee on Public Water Supply Distribution Systems: Assessing and Reducing Risks. 2004 - 2006
Short list, US. EPA Homeland Security Advisory Committee, 2005
Division Q (Environmental Microbiology) Chair-elect, Chair, Past-Chair, American Society for Microbiology, 2007-2010

RELEVANT PAST RESEARCH PROJECTS:

Synthesis Document on the State of Science of Molecular Techniques for Application to the Drinking Water Industry. AwwaRF. \$98,000 (January 2006 – August 2008).
Health Implications of Biofilms in Drinking Water Systems. Army Research Office, \$937,000 (April 1 2003 - April 1, 2005). Renewal, \$1,980,000 (April 2004 – June 2008).
Towards Sustainable Materials for Drinking Water Infrastructure. National Science Foundation, MUSES program. Collaboration with Virginia Tech. Total budget \$5,000,000; MSU portion \$150,000. (September 2003 - August 2008)
Biofilm Capture of Biowarfare Agents, DARPA through MSE, \$130,000 (January 2004 - June 2006)

- Effect of Nitrification on Corrosion in the Distribution System. Marc Edwards (Virginia Tech), PI. American Water Works Association Research Foundation. \$350,000. (July 2007 – July 2009).
- Microbiological Degradation of HAAs in Distribution Systems. Ray Hozalski, PI. AwwaRF. \$400,000. (January 2006 – February 2009).
- International: Modeling the Survival and Potential Proliferation of Microbial Agents in Drinking Water Distribution Systems. National Science Foundation. \$18,500. (February 2004 - February 2005).
- Innovative Biofilm Control Strategies. American Water Works Association Research Foundation. \$400,000 (January 2000 - August 2003).
- Influence of Distribution System Infrastructure on Bacterial Regrowth. American Water Works Association Research Foundation., with Black & Veatch. \$150,000 (January 1999 - January 2002).
- Interactions among Factors that Influence Biofilm, Bacterial Regrowth, and Corrosion in Distribution Systems. US EPA \$300,000 (March 1999 - July 2001).
- Use of Ultraviolet Light for the Disinfection of Drinking Water Drinking Water Assistance Program, US EPA through the Montana Water Center. (September 1999- September 2000)
- Integrated Wastewater Management: A Proposal for Innovation in the MSU EpiCenter Building. NIST. (March 1999 - September 2000)
- The MIOX Water Disinfection System as a Tool for the Removal of Iron and Manganese from Small, Rural Water Systems. (September 1997 - September 1999).
- Development of Red Water Control Strategies. Principal Investigator Jonathan Clement, Black & Veatch. American Water Works Association Research Foundation. (1997 -1999).
- Design and Optimization of Biological Reactors for the Pretreatment of Reverse Osmosis Feedwater. US Bureau of Reclamation. (Oct. 1998 – Oct. 1999)
- Influence of Ferrous Metal Surfaces and Natural Organic Matter on Biofilm Formation. NSF/Center for Biofilm Engineering. (April 1996 - April 1999).
- Interactions between Pipe Materials, Corrosion Inhibitors, Disinfectants, Organics, and Distribution System Biofilms. National Water Research Institute/US EPA. (June 1995 - June 1998).
- Relationship between Substratum Surface Features and Bacterial Colonization. Principal Investigator. NSF/ERC/Center Industrial Associates funding. (April 1993 - April 1999).
- Colonization of Biologically Active Filter Media with Pathogens. American Water Works Association Research Foundation. (June 1996 - May 1999).
- Investigation of Biological Stability of Drinking Water in Treatment Plants and Distribution Systems. American Water Works Association Research Foundation, NSERC Chair for Water Treatment at Waterloo, Ontario, NSF/ERC, and utility in-kind. (January 1995 - July 1998).
- Interactions between Pipe Materials, Corrosion Inhibitors, Disinfectants, Organics, and Distribution System Biofilms. National Water Research Institute/US EPA. (February 1995 - June 1998).
- Optimizing Filtration in Biological Filters. Principal Investigators Peter M. Huck, University of Waterloo and Bradley M. Coffey, Metropolitan Water District of Southern California. American Water Works Association Research Foundation. (January 1996 - November, 1998). As consultant
- Factors Affecting Microbial Growth in the Distribution System. American Water Works Association Research Foundation. (January 1995 - July 1997).
- Distribution System Water Quality Changes Following Implementation of Corrosion Control Strategies. Principal Investigators Gregory Kirmeyer, Economic Engineering Services, Inc. and Jonathan Clement, Black and Veatch. American Water Works Association Research Foundation. (July 1994 - April, 1998) As consultant.
- Validation of Mixed-Oxidants for the Disinfection and Removal of Biofilms from Distribution Systems. DWAP. (Sept. 1996 - Sept. 1997).
- Pathogens in Model Distribution System Biofilms. American Water Works Association Research Foundation and Australian Water Technologies. (February 1994 -July 1997).
- Development of a Laboratory Annular Reactor for Evaluation of Drinking Water. CERTT. (March 1996 - March 1997).
- Factors Limiting Microbial Growth in the Distribution System. American Water Works Association Research Foundation. (January 1992 - June, 1995).
- Microbial Impact of Biological Filtration. Principal Investigator Mark LeChevallier, American Water Works Service Co. American Water Works Association Research Foundation. (Sept. 1993 - June 1995).
- Colonization of Granular Activated Carbon with Pathogens: Impact on Distribution System Biofilms. Anjoue Reserche and Metcalf & Eddy. (May 1995 - May 1996).
- A Turnkey Biofouling Monitor for the Drinking Water Industry. CERTT. (March 1995-March 1996).

PEER REVIEWED PUBLICATIONS

- Camper, A.K. and G.A. McFeters. 1977. Chlorine injury and the enumeration of waterborne coliform bacteria. *Appl. Environ. Microbiol.* 37: 633-641.
- Temple, K.L., A.K. Camper, and G.A. McFeters. 1980. Survival of two Enterobacteria in feces buried in soil under field conditions. *Appl. Environ. Microbiol.* 40: 794-797.
- Temple, K.L., A.K. Camper, and R.C. Lucas. 1982. Potential health hazard from human wastes in wilderness. *J. Soil and Water Conserv.* 37: 357-359.
- LeChevallier, M.W., P.E. Jakanowski, A.K. Camper, and G.A. McFeters. 1984. Evaluation of m-T7 agar as a fecal coliform medium. *Appl. Environ. Microbiol.* 48: 371-375.
- LeChevallier, M.W., T.S. Hassenauer, A.K. Camper, and G.A. McFeters. 1984. Disinfection of bacteria attached to granular activated carbon. *Appl. Environ. Microbiol.* 48: 918-923.
- Camper, A.K., M.W. LeChevallier, S.C. Broadaway, and G.A. McFeters. 1985. Evaluation of procedures to desorb bacteria from granular activated carbon. *J. Microbiol. Methods* 3:187-198.
- Camper, A.K., M.W. LeChevallier, S.C. Broadaway, and G.A. McFeters. 1985. Growth and persistence of pathogens on granular activated carbon filters. *Appl. Environ. Microbiol.* 50: 1378-1382.
- Camper, A.K., M.W. LeChevallier, S.C. Broadaway, and G.A. McFeters. 1986. Bacteria associated with granular activated carbon particles in drinking water. *Appl. Environ. Microbiol.* 52: 434-438.
- LeChevallier, M.W., A.K. Camper, S.C. Broadaway, J.M. Henson, and G.A. McFeters. 1987. Sensitivity of genetically engineered organisms to selective media. *Appl. Environ. Microbiol.* 53: 606-609.
- Camper, A.K., S.C. Broadaway, M.W. LeChevallier, and G.A. McFeters. 1987. Operational variables and the release of colonized granular activated carbon particles in drinking water. *J. Amer. Water Works Assoc.* 79(5):70-74.
- Camper, A.K., G.A. McFeters, W.G. Characklis, and W.L. Jones. 1991. Growth kinetics of coliform bacteria under conditions relevant to drinking water distribution systems. *Appl. Environ. Microbiol.* 57: 2233-2239.
- Camper, A., J.T. Hayes, P.J. Sturman, W.L. Jones, and A.B. Cunningham. 1993. Effects of motility and adsorption rate coefficient on the transport of bacteria through saturated porous media. *Appl. Environ. Microbiol.* 59:3455-3462.
- Camper, A., M.A. Hamilton, K. Johnson, P. Stoodley, G. Harkin, and D.S. Daly. Bacterial colonization of surfaces in flowing systems: Methods and analysis. 1994. *Ultrapure Water.* 11:27-35.
- Rothmund, C., A. Camper, and P.A Wilderer. 1994. Biofilms growing on gas permeable membranes. *Water Sci. Tech.* 29:447-454.
- Hamilton, M.A., K.R. Johnson, A.K. Camper, P. Stoodley, G.J. Harkin, R.J. Gillis, and P.A. Shope. 1994. Analysis of bacterial spatial patterns at the initial stage of biofilm formation. 1995. *Biometrical Journ.,* 37:393-408.
- Veeh, R.H., W.P. Inskeep, and A.K. Camper. 1996. Soil depth and temperature effects on microbial degradation of 2,4-D. *J. Environ. Qual.,* 25: 5-12.
- Camper, A., W.L. Jones, and J.T. Hayes. 1996. Effect of growth conditions and substratum composition on the persistence of coliforms in mixed population biofilms. *Appl. Environ. Microbiol.* 62:4014-4018.
- Morin, P., A.K. Camper, W. L. Jones, D. Gatel and J.C. Goldman. 1996. Colonization and disinfection of biofilms hosting coliform-colonized carbon fines. *Appl. Environ. Microbiol.* 62:4428-4432.
- Stewart, P.S., A.K. Camper, S.D. Handran, C.T. Huang, and M. Warnecke. 1997. Spatial distribution and coexistence of *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* in biofilms. *Microbial Ecology.* 33:2-10.
- Morin, P. and A.K. Camper. 1997. Attachment and fate of carbon fines in simulated drinking water distribution system biofilms. *Water Research.* 31:399-410.
- Scheuerman, T., M.A. Hamilton and A.K. Camper. 1998. Effects of substratum topography on bacterial adhesion. *J. Colloids Surface Sci.* 208:23-33.
- Camper, A., M. Burr, B. Ellis, P. Butterfield, and C. Abernathy. 1999. Development and structure of drinking water biofilms and techniques for their study. *J. Appl. Microbiol.* 85:1S-12S.
- Ellis, B., P. Butterfield, W.L. Jones, G.A. McFeters and A. K. Camper. 2000. Effects of carbon source, carbon concentration, and chlorination on growth related parameters of heterotrophic biofilm bacteria. *Microbial Ecology* 38:330-347.
- Rice, A., M.A. Hamilton and A.K. Camper. 2000. Apparent surface associated lag time in growth of primary biofilm cells. *Microbial Ecology.* 41:8-15.
- Sharp, R.R., A.K. Camper, J.J. Crippen, O.D. Schneider and S. Leggiero. 2001. Evaluation of drinking water biostability using biofilm methods. *J. Environ. Eng.* 127(5):403-410.
- Sauer, K. and A.K. Camper. 2001. Characterization of phenotypic changes in *Pseudomonas putida* in response to surface-associated growth. *J. Bacteriol.* 183:6579-6589.

- Sauer, K., A.K. Camper, G.D. Erlich, J.W. Costerton, and D. Davies. 2002. *Pseudomonas aeruginosa* displays multiple phenotypes during development as a biofilm. *J. Bacteriol.* 184(4):1140-1154.
- Butterfield, P.W., A.M. Bargmeyer, A.K. Camper and J.A. Biederman. 2002. Modified enzyme activity assay to determine biofilm biomass. *J. Microbiol. Meth.* 50:23-31.
- Besner, M.-C., V. Gauthier, P. Servais and A. Camper. 2002. Coliforms in distribution systems: How do we explain their occurrence? *J. Amer. Water Works Assoc.* 94(8):95-109.
- Shirtiliff, M., J.T. Mader and A.K. Camper. 2002. Molecular interactions in biofilms. 2002. *Chemistry and Biology.* 9:1-20.
- Butterfield, P.W., A.K. Camper, J.A. Biederman, and A.M. Bargmeyer. 2002. Minimizing biofilm in the presence of iron oxides and humic substances. *Water Research.* 36:3893-3910.
- Butterfield, P.W., A.K. Camper, B.D. Ellis and W.L. Jones. 2002. Chlorination of model distribution system biofilm: Implications for growth and organic carbon removal. *Water Research.* 36:4391-4405.
- Rice, A.R., M.A. Hamilton and A.K. Camper. 2003. Movement, replication and emigration rates of individual bacteria in a biofilm. *Microbial Ecology.* 45:163-172.
- Webb, D., M.A. Hamilton, G.A. Harkin, S. Lawrence, A.K. Camper and Z. Lewandowski. 2003. Assessing technician effects when extracting quantities from microscopic images. *J. Microbiol. Methods.* 53:97-106.
- Wend, C., P. Stewart, W. Jones, and A.K. Camper. 2003. Biological treatment for membrane water treatment systems. *Water Research.* 37(14):3367-3378.
- Camper, A.K., K. Brastrup, A. Sandvig, J. Clement, C. Spencer and A.J. Capuzzi. 2003. Impact of distribution system materials on bacterial regrowth. *J. Amer. Water Works Assoc.* 95(7):107-121.
- Komlos, J., R. Sharp, A. Camper, and A. Cunningham. 2004. Biofilm barriers to contain and degrade dissolved trichloroethylene (TCE). *AIChE Journal of Environmental Progress.* 23(1):69-77.
- Camper, A.K. 2004. Involvement of humic substances in regrowth. *Int. J. Food Micro.* Special edition: HPC bacteria in drinking water: Public health implications. 92 (3): 355-364.
- Dietrich, A.M., D. Glindemann, F. Pizarro, V. Gidi, M. Olivares, M. Araya, A. Camper, S. Duncan, S. Dwyer, A.J. Whelton, T. Younos, S. Subramanian, G.A. Burlingame, D. Khiari and M. Edwards. 2004. Health and aesthetic impacts of copper corrosion on drinking water. *Water Sci. Technol.* 49(2): 55-62.
- Butterfield, P.W. and A.K. Camper. 2004. Development of a toolbox to assess microbial contamination risks in small water systems. *Journal of Water and Health* 2(4):217-232.
- Komlos J., A. B. Cunningham, A. K. Camper and R. R. Sharp. 2005. Interaction of *Klebsiella oxytoca* and *Burkholderia cepacia* in dual-species batch cultures and biofilms as a function of growth rate and substrate loading. (online Jan. 28). *Microbial Ecology.* 49:114-125.
- Shirtiliff, M.E., A. Bargmeyer and A.K. Camper. 2005. Assessment of the bioelectric effect to eliminate mixed species biofilms. *Appl. Environ. Microbiol.* 71:6379-6382.
- Komlos, J., A.B. Cunningham, A.K. Camper and R.R. Sharp. 2006. Effect of substrate concentration on the dual-species population density of *Burkholderia cepacia* PR1-pTOM-31c and *Klebsiella oxytoca* in porous media. *Biotechnology and Bioengineering.* 93:434-442.
- Nocker, A. and A.K. Camper. 2006. Selective removal of DNA from dead cells from mixed bacterial communities by ethidium monoazide. *Appl. Environ. Microbiol.* 72: 1997-2004
- Burr, M., S. Clark, C. Spear and A.K. Camper. 2006. Denaturing gradient gel electrophoresis (DGGE) can rapidly display the bacterial diversity contained in 16S rDNA clone libraries. *Microbial Ecology* 51(4):479-486
- Brady, R., J. Leid, A. Camper, J.W. Costerton and M. Shirtiliff. 2006. Identification of *Staphylococcus aureus* proteins recognized by the antibody-mediated immune response to a biofilm infection. *Infection and Immunity.* 74(6):3415-3426
- Hein, I., G. Flekna, M. Wager, A. Nocker and A.K. Camper. 2006. Possible errors in the interpretation of ethidium bromide and PicoGreen DNA staining results from ethidium monoazide treated DNA. *Appl. Environ. Microbiol.* 72:6860-6861
- Nocker, A. C-Y. Cheung, and A. K. Camper. 2006. Comparison of propidium monoazide and ethidium monoazide for differentiation of live vs dead bacteria by selective removal of DNA from dead cells. *J. Microbiological Methods,* 67:310-320.
- Khan, Md. T., S. Takizawa, W.L. Jones, H. Katayama, F. Kurisu, A.K. Camper, and S. Ohgaki, 2007. Powdered activated carbon and biofiltration improve MF performance: Part I. *Membrane Technol.* 5:259-271.
- Nocker, A., M. Burr and A.K. Camper. 2007. Genotypic microbial community profiling: A critical technical review. *Microbial Ecology* 54:276-289.
- Khan, M. M.T., S. Takizawa, W. Jones, H. Katayama, F. Kurisu, A.K. Camper, and S. Ohgaki. 2007. Powdered activated carbon and biofiltration improve MF performance: Part II *Membrane Technol.* 6:259-271.
- Nocker, A., K. Sossa and A.K. Camper. 2007. Molecular monitoring of disinfection efficacy. *J. Molecular Methods.* 70:252-260.

- Nocker, A., P. Sossa, M. Burr and A.K. Camper. 2007. Use of propidium monoazide for live-dead distinction in microbial ecology. *Appl. Environ. Microbiol* 73:5111-5117.
- Kim, J., B. Pitts, P.S. Stewart, A. Camper and J. Yoon. 2008. Comparison of antimicrobial effect on biofilm of chlorine, silver ion and tobramycin. *Antimicrob Agents Chemother.* 52: 1446-1453.
- Klayman, B.J., I. Klapper, P.S. Stewart and A.K. Camper. 2008. Measurements of accumulation and displacement at the single cell cluster level in *Pseudomonas aeruginosa* biofilms. *Environ. Microbiol.* 10:2344-2354.
- Borch, T. A.K. Camper, J.A. Biederman, P.W. Butterfield, R. Gerlach and J.E. Amonette. 2008. Evaluation of characterization techniques for iron pipe corrosion products and iron oxide thin films. *J. Environ. Eng.* 134(10):835-844.
- Bauman, W. J., A. Nocker, W.L. Jones and A.K. Camper. 2009. Retention of a model pathogen in a porous media biofilm. *Biofouling* 25: 229-240.
- Nocker, A. and A.K. Camper. 2009. Novel approaches toward preferential detection of viable cells using nucleic acid amplification techniques. *FEMS Microbiology Letters* 291:137-142.
- Zhang, Y., A. Griffin, M. Rahman, A.K. Camper, H. Baribeau and M. Edwards. 2009. Lead contamination of potable water due to nitrification. *Environ. Sci. Technol.* 43(6): 1890-1895.
- Klayman, B.J., P.A. Volden, P.S. Stewart and A.K. Camper. 2009. *Escherichia coli* O157:H7 requires colonizing partner to adhere and persist in a capillary flow cell. *Environ. Sci. Technol.* 43(6): 2105–2111.
- Nocker, A., A. Mazza, L. Masson, A.K. Camper and R. Brousseau. 2009. Selective detection of live bacteria combining propidium monoazide sample treatment with microarray detection. *J. Microbiol. Methods* 76:253-261
- Altman, S., L. McGrath, C. Souza, J. Murton and A.K. Camper. 2009. Integration and decontamination of *Bacillus cereus* in *Pseudomonas fluorescens* biofilms. *Applied Microbiology.* 107:287-299.
- Leach, L.H., P. Zhang, T.M. LaPara, R.M. Hozalski and A.K. Camper. 2009. Detection and enumeration of haloacetic acid degrading bacteria in drinking water distribution systems using dehalogenase genes. *Applied Microbiology.* 107(3):978–988
- Faulwetter, J.L., V. Gagnon, C. Sundberg, F. Chazarenc, M.D. Burr, J. Brisson, K. Tonderski, A.K. Camper and O.R. Stein. 2009. A review of microbial processes in treatment wetlands. *Ecological Engineering* 35:(6) 987-1004
- Zhang, P., L. H. Leach, A.K. Camper, E.H. Goslan, S. A. Parson, Y.F. Xie, R.M. Hozalski and T.M. LaPara. 2009. Accepted. Isolation and characterization of novel haloacetic acid-degrading bacteria from drinking water. *FEMS Microbiology Letters.*

BOOKS/ CHAPTERS:

- McFeters, G.A. and A.K. Camper. 1983. Enumeration of bacteria exposed to chlorine. In: *Advances in Applied Microbiology*, Vol. 29: 177-193.
- Camper, A. 1994. Coliform regrowth and biofilm accumulation in drinking water systems: A review. G.G. Geesey, Z. Lewandowski, and H.-C. Flemming eds, In: *Biofouling/Biocorrosion in Industrial Water Systems*, Lewis Publishers, Inc., Chelsea, MI.
- Camper, A.K. and M.A. Hamilton. 1998. Evaluation of regulations for monitoring the microbial quality of drinking water. R. A. Meyers, ed. In: *Encyclopedia of Environmental Analysis and Remediation*, John Wiley & Sons. Pgs. 2789-2797.
- Camper, A.K. and G. A. McFeters. Problems of biofouling of drinking water systems. 2000. *Biofilms and Biofouling: Volume 1 - Biofouling in Industry and Process Engineering.* J. Walker, S. Surman and J. Jass, eds., John Wiley & Sons. Pgs. 13-38.
- Camper, A.K. Biofilms in drinking water treatment and distribution. 2000. *Biofilms: Recent Advances in their Study and Control.* L.V. Evans, ed. Harwood Academic Publishers. Pgs. 311-332.
- Camper, A.K. Microbiology of activated carbon. 2002. *Encyclopedia of Environmental Microbiology*, G. Bitton, ed., John Wiley & Sons.
- Camper, A.K. History and use of heterotrophic plate counts in water systems. 2004. *Advances in Biofilm Science and Engineering*, R. Jordan and U. Charaf, eds. Cytergy Publishing, Bozeman MT.
- Besner, M.-C., V. Gauthier, P. Servais and A. Camper. 2005. Chapter 2; Explaining the occurrence of coliforms in distribution systems. *Water Quality in the Distribution System.* W. Lauer, ed. American Water Works Association, Denver, CO. Pgs. 27-63.
- Laurent, P., M.-C. Bessner, P. Servais, V. Gauthier, M. Prevost, and A.K. Camper. 2005. Chapter 5: Water quality in distribution systems. *Biodegradable Organic Matter in Drinking Water Treatment and*

Distribution. M. Prevost, P. Laurent, P. Servais and J.-C. Joret, eds. American Water Works Association, Denver, CO. Pgs. 205-284.

- Water Science and Technology Board, National Research Council. 2006. Drinking Water Distribution Systems: Assessing and Reducing Risks. Water Science and Technology Board, National Research Council of the National Academies. The National Academies Press, Washington D.C. Vernon L. Snoeyink, Chair, University of Illinois, Urbana-Champaign Charles N. Haas, Vice-Chair, Drexel University, Philadelphia, Pennsylvania Paul F. Boulous, MWH Soft, Broomfield, Colorado Gary A. Burlingame, Philadelphia Water Department, Philadelphia, Pennsylvania Anne K. Camper, Montana State University, Bozeman Robert N. Clark, Shaw Environmental and Infrastructure, Inc., Cincinnati, Ohio Marc A. Edwards, Virginia Polytechnic and State University, Blacksburg Mark W. LeChevallier, American Water Corporation, Voorhees, New Jersey L. D. McMullen, Des Moines Water Works, Des Moines, Iowa Christine L. Moe, Emory University, Atlanta, Georgia Eva C. Nieminski, Utah Department of Environmental Quality, Salt Lake City Charlotte D. Smith, Charlotte Smith and Associates, Inc., Orinda, California David P. Spath, California Department of Health Services, Sacramento Gary A. Toranzos, University of Puerto Rico, San Juan Richard L. Valentine, University of Iowa, Iowa City National Research Council Staff Laura J. Ehlers, Study Director Ellen A. De Guzman, Research Associate
- Faulwetter, J.L., P. P. Sossa-Fernandez, M. D. Burr, A. Camara, A. Nocker, A. K. Camper, and O. Stein. 2008. Chapter - Microbial Community Analysis by Denaturing Gradient Gel Electrophoresis (DGGE). *Prospects and Applications for Plant-Associated Microbes. A Laboratory Manual, Part A: Bacteria*. S. Sorvari and A. M. Piirtila (eds.). BioBien Innovations. Piikkiö, Finland.

REVIEWED REPORTS

- Camper, A.K. 1996. Factors Influencing Microbial Growth in the Distribution System: Laboratory and Pilot Experiments. 121 pgs. American Water Works Association Research Foundation.
- Camper, A.K. and M. Warnecke. 1998. Bacterial Pathogens in Model Distribution System Biofilms. 68 pgs. American Water Works Association Research Foundation.
- Camper, A.K., P. Morin, B. Ellis and W. Jones. 1998. Microbial Impacts of Biological Filtration (one chapter, 14 pgs). American Water Works Association Research Foundation.
- Jones, W.L. and A.K. Camper. 2000. Factors Affecting Microbial Growth in Model Distribution Systems. 60 pgs. American Water Works Association.
- Camper, A.K., B. Ellis, P. Butterfield, B. Anderson, P. Huck, C. Volk and M. LeChevallier. 2000. Biological Stability of Water in Treatment Plants and Distribution Systems. 468 pgs American Water Works Association Research Foundation.
- Burr, M., A.K. Camper, P. Hacker and R. DeLeon. 2000. Colonization of Biologically Active Filter Media with Pathogens. 141 pgs. American Water Works Association Research Foundation.
- Kirmeyer, G.J., G. Pierson, J. Clement, A. Sandvig, V. Snoeyink, W. Kriven and A. Camper. 2000. Distribution System Water Quality Changes Following Corrosion Control Strategies. 329 pgs. American Water Works Association Research Foundation.
- Clement, J., C. Spencer, A.J. Capuzzi, A.K. Camper, K. Van Andel and A. Sandvig. 2003. Influence of Distribution System Infrastructure on Bacterial Regrowth. 121 pgs. American Water Works Association Research Foundation.
- Friedman, M.J., K. Martel, A. Hill, D. Holt, S. Smith, T. Ta, C. Sherwin, D. Hildebrand, P. Pommerenk, Z. Hinedi and A. Camper. 2003. Establishing Site-Specific Flushing Velocities. 203 pgs. American Water Works Association Research Foundation.
- Bargmeyer, A., M. Shirliff, P. Butterfield, A.K. Camper, M. Friedman and G. Boyd. 2004. Innovative Biofilm Prevention Strategies. American Water Works Association Research Foundation.
- Nocker, A., M. Burr and A.K. Camper. 2009. Synthesis Document on the State-of-Science of Molecular Techniques for Application to the Drinking Water Industry. American Water Works Association Research Foundation.

PROCEEDINGS PUBLICATIONS AND POSTERS (NOT REVIEWED)

- McFeters, G.A., A.K. Camper, D.G. Davies, S.C. Broadaway, and M.W. LeChevallier. 1985. Enumeration, transport, and survival of bacteria attached to granular activated carbon in drinking water. In: AWWA Proc. Water Qual. Technol. Conf.
- Jones, W.L., K.E. Bucklin, and A.K. Camper. 1989. Determination of a method for optimization of *in situ* biodegradability of subsurface soil contaminants. Proceedings, Conference on US EPA Region 7/8 Hazardous Waste Research, Kansas State University.

- Jones, W.L., P.J. Sturman, C. Ellison, A.K. Camper, W.P. Inskeep, S.J. Rogers, and A.B. Cunningham. 1990. Use of soil column test apparatus for evaluation of *in situ* bioremediation potential. Proceedings, Conference on US EPA Region 7/8 Hazardous Waste Research, Kansas State University.
- Camper, A., J.T. Hayes, W.L. Jones, and N. Zilver. 1994. Persistence of coliforms in mixed population biofilms. In: AWWA Proc. Water Qual. Technol. Conf., Miami, FL
- Camper, A., N. Wright, W.L. Jones, and A.B. Cunningham. 1994. Modeling the interaction of biofilm processes and system hydrodynamics on water quality. In: AWWA Proc. Water Qual. Technol. Conf., San Francisco, CA
- Camper, A., W.L. Jones, and L. Goodrum. 1994. The effect of chlorine on the persistence of coliforms in mixed-population biofilms. In: AWWA Proc. Water Qual. Technol. Conf., San Francisco, CA
- Jones, W.L., A.K. Camper, X. Xu and S. Bakich. 1994. Direct and indirect measurements of microbial growth rate in drinking water distribution systems. In: AWWA Proc. Water Qual. Technol. Conf., San Francisco, CA
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 Title: "Use of phenanthridium derivatives for distinguishing between intact and membrane-compromised cells using molecular nucleic acid based techniques"
 Inventors: Andreas Nocker, Anne Camper
 Counsel Ref.: MONT-049/01WO

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