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12 Attorneys for Plaintiffs City of Los Angeles,  
13 Responsible Biosolids Management, Inc.,  
14 R&G Fanucchi, Inc., and Sierra Transport, Inc.

JAMES B. SLAUGHTER (*pro hac vice pending*)  
BEVERIDGE & DIAMOND, P.C.  
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15 **SUPERIOR COURT OF THE STATE OF CALIFORNIA**  
16 **FOR THE COUNTY OF TULARE**

17 CITY OF LOS ANGELES; COUNTY  
SANITATION DISTRICT NO. 2 OF LOS  
18 ANGELES COUNTY; ORANGE COUNTY  
SANITATION DISTRICT; RESPONSIBLE  
19 BIOSOLIDS MANAGEMENT, INC.; R&G  
FANUCCHI, INC.; SHAEN MAGAN, BOTH  
20 INDIVIDUALLY AND D/B/A HONEY  
BUCKET FARMS AND TULE  
21 RANCH/MAGAN FARMS; WESTERN  
EXPRESS, INC.; CALIFORNIA  
22 ASSOCIATION OF SANITATION  
AGENCIES,

23 Plaintiffs,

24 vs.

25 COUNTY OF KERN; KERN COUNTY  
26 BOARD OF SUPERVISORS,

27 Defendants.  
28

Case No. Civ. 242057

**DECLARATION OF CHARLES P. GERBA, PH.D., SUPPORTING PLAINTIFFS' MOTION FOR PRELIMINARY INJUNCTION**

Hearing: June 9, 2011  
Dep't: 10  
Hearing Judge: Hon. Lloyd L. Hicks  
Action filed: April 18, 2011  
Trial date: Not set



1 panels on wastewater and microbiology issues, including two EPA Science Advisory Boards --  
2 Drinking Water and Research Strategies. I have also been active in professional associations around  
3 the world to further microbiology research that can be applied to environmental protection and  
4 public health. I was selected as a Fellow of the American Academy of Microbiology in 1993. My  
5 full Curriculum Vitae is attached as Exhibit 1 to this Declaration.

6       5. I have studied the occurrence and fate of pathogens (microorganisms that can cause  
7 diseases in humans, including certain bacteria and viruses) in biosolids for more than 30 years. In the  
8 past 24 years I have researched the fate of pathogens in Class B and Class A biosolids in Arizona  
9 and numerous other locations in the United States (including California), the Middle East and South  
10 America. During this time I have visited many farm sites where biosolids are land applied and  
11 wastewater treatment plants where biosolids are generated, and have been involved in research  
12 studies at numerous other sites. I have been involved in a program at the University of Arizona for  
13 the past 24 years designed to address emerging issues with pathogens in biosolids and to ensure the  
14 adequacy of the United States Environmental Protection Agency's Part 503 regulations that govern  
15 the generation and land application of biosolids.

16       6. Much of my research and scholarship has focused on land application of biosolids in  
17 the arid regions of the Southwest and other arid regions of the world, climates and environments that  
18 are similar to the area of Kern County where Green Acres is located. Like the City of Los Angeles,  
19 in recent years many communities have chosen to generate Class A biosolids that have no detectable  
20 pathogens. Accordingly, over the last nine years I have been conducting more studies on the  
21 potential environmental impacts of Class A biosolids. My colleagues and I have applied the latest  
22 and best technology (including molecular methods (polymerase chain reaction), advanced cell  
23 culture methods, and immunochemical methods) to the detection of well known and recently  
24 recognized potential pathogens in soil, air, and groundwater where Class A and B biosolids are  
25 applied. Examples of our recent published studies at land application sites are listed in Exhibit 2.

26       7. These studies, combined with scientifically rigorous studies on land application  
27 performed by numerous other scientists, have shown the adequacy of the current EPA Part 503  
28 regulations to protect the public and the environment from exposure to pathogens that may exist at

1 biosolids land application sites. Decades of research and data collection in laboratory and field  
2 studies have established certain principles that explain why the application of biosolids poses  
3 negligible risks, especially when the benefits of this recycling activity are taken into consideration.  
4 Pathogens are enteric organisms that prefer and need the conditions inside the human body to thrive  
5 and retain the potential to be infectious. Wastewater treatment processes alone, prior to specific  
6 biosolids treatments, destroy most pathogens. The conditions at wastewater plants lead to further  
7 die-off of the organisms. As established by Part 503, treatment of biosolids to Class A, or even  
8 Class B, standards eliminates 99% or more of the pathogens that may exist in biosolids. Perhaps  
9 most importantly, the farm field and the outdoor environment generally lead to rapid die-off of any  
10 surviving pathogens. Die-off of enteric (residing in the human body) pathogens proceeds rapidly  
11 because the enteric bacteria cannot compete with the native soil microorganisms for food. They may  
12 serve as food for the native soil microflora. In addition, the pathogens are killed or made non-  
13 infectious by desiccation, the ultraviolet light in sunlight, and heating of the soil. Simply put, a land  
14 application site is not a human gut. Finally, before there can be a health risk, any surviving  
15 pathogens would have to somehow be transported to a human receptor in an amount sufficient to  
16 trigger infection.

17         8.         Our past and ongoing biosolids studies continue to demonstrate that the warm arid  
18 and semi-arid climates of Southern California and Arizona are ideal for the land application of  
19 biosolids, including Class B biosolids that contain measurable quantities of indicator organisms,  
20 because of, among other factors, the rapid dilution and die-off of pathogens under these conditions.  
21 Our studies have confirmed the following principles that strengthen the safety of land application, all  
22 of which my observations and data review confirm are applicable to Green Acres Farm:

23                     (a) Warm air and soil temperatures in these regions result in the rapid inactivation  
24 of pathogens;

25                     (b) The low moisture soil and air also contributes to the rapid inactivation of  
26 pathogens;

27                     (c) Pathogens are tightly bound to biosolids and little or no significant leaching of  
28 pathogens occurs from biosolids. We have been monitoring the groundwater beneath sites

1 where biosolids have been applied for 15 years and never found a pathogen in  
2 groundwater. At Green Acres, the depth to groundwater is particularly deep and I cannot  
3 envision a plausible hypothesis for possible contamination of the groundwater by  
4 pathogens; and

5 (d) Class A biosolids meeting EPA's Part 503 requirements show undetectable  
6 levels of pathogens. Our studies have involved the production of Class A biosolids by  
7 heat, lime treatment and composting and have confirmed the absence of pathogens after  
8 these treatments.

9 9. In preparing my prior Declaration, on August 25, 2006, I visited Green Acres farm  
10 where Class A biosolids are being land applied to agricultural land by the City of Los Angeles. I  
11 witnessed the procedures and methods for land application of the Class A biosolids and  
12 incorporation into the soil matrix. This included watching tractor trailers loaded with biosolids  
13 arriving from Los Angeles, unloading the biosolids, the biosolids being spread by front-end loaders,  
14 and switch-blade plows being used to incorporate the biosolids into the soil. I also examined the  
15 soil, irrigation methods, crops under production, physical land features, and various farming  
16 operations. I interviewed personnel at Green Acres involved in all of these activities, including farm  
17 workers and contractors responsible for compliance with Part 503, the California State Water  
18 Resources Control Board General Order governing land application, and Kern County regulations.

19 10. I also examined and relied upon the following documents concerning the production  
20 of biosolids by the City of Los Angeles and the operations at Green Acres and monitoring reports of  
21 the microbial/chemical/physical quality of the biosolids land applied at Green Acres.

22 (a) *Achieving Exceptional Quality Biosolids*. City of Los Angeles, Department of  
23 Public Works, Bureau of Engineering and Bureau of Sanitation (July 2003).

24 (b) *1990-2003 Monitoring for the Protection of Groundwater Quality at I-5 and*  
25 *HWY 119 Beneficial Reuse Site for Bakersfield WWTP#3 Effluent and Class "A"*  
26 *Exceptional Quality Biosolids*. Various authors (November 2003).

27 (c) *Appraisal Report of City of Los Angeles Green Acres Farm*. AGT Appraisal  
28 Company (August 19, 2004).

1 (d) *Biosolids Program Management Monthly Progress Reports*. City of Los  
2 Angeles (including numerous compliance reports and data) through 2004.

3 (e) *Biosolids Program Summary of Sampling and Testing Requirements* (Part 503  
4 EPA regulations and California and Kern County requirements). City of Los Angeles.

5 11. On January 4, 2011, I again interviewed Steve Stockton of Responsible Biosolids  
6 Management, Inc., who manages biosolids operations at Green Acres. That interview verified  
7 consistently safe and effective practices at Green Acres since my prior visit.

8 12. For purposes of the present Declaration, I also have reviewed additional data and  
9 reports including:

10 (a) City of Los Angeles Biosolids Environmental Management System Reports  
11 for 2007, 2008 and 2009.

12 (b) Biosolids Annual Report for Hyperion Wastewater Treatment Plant for 2007,  
13 2008, and 2009.

14 (c) Biosolids Program Monthly Reports for July, August, and September 2010.

15 (d) Responsible Biosolids Management Reports on Green Acres Farm for 2007,  
16 2008, 2009, 2010.

17 The monitoring data demonstrates that the City of Los Angeles consistently produces Class A EQ  
18 biosolids that meet EPA standards for low amounts of trace metals and elimination of pathogens.

19 The thermophilic digestion process used by the City of Los Angeles is well recognized for its  
20 success and dependability in achieving Class A biosolids. This is confirmed by the City's monitoring  
21 of the treated land applied biosolids for fecal coliforms, *Salmonella*, enteric virus and *Ascaris*.

22 13. From my experience on the risks of transmission of enteric pathogens in the  
23 environment and knowledge of the literature, I believe the risks of infection from pathogens at Green  
24 Acres from the land application of Class A biosolids are essentially non-existent. This is because the  
25 pathogen level has been reduced to below detection and local climate and soil conditions are an  
26 additional safety factor. In conclusion, the continued application of Class A biosolids from the City  
27 of Los Angeles presents no immediate or long term threat from enteric pathogens.  
28



# **EXHIBIT 1**

CURRICULUM VITAE  
of  
CHARLES PETER GERBA

EDUCATION AND DEGREES

Arizona State University, Tempe, Arizona B. S., Microbiology	June 1969
University of Miami, Coral Gables, Florida Ph.D., Microbiology	January 1973

POSITIONS

Postdoctoral Fellow, Department of Virology and Epidemiology, Baylor College of Medicine, Houston, Texas 77030	1973
Assistant Professor of Environmental Virology, Department of Virology and Epidemiology, Baylor College of Medicine, Houston, Texas 77030	
Adjunct Assistant Professor of Environmental Health, University of Texas School of Public Health, Houston, Texas 77030	1976-1983
Associate Professor and Professor, Department of Nutrition and Food Science and University Department of Microbiology and Immunology, University of Arizona, Tucson, Arizona 85721	1981-1990
Professor, Department of Soil, Water and Environmental Science The University of Arizona, Tucson, Arizona Phone (602) 621-6906	1990-
Adjunct Professor, Department of Nutritional Sciences The University of Arizona, Tucson, Arizona	1990-
Adjunct Professor, Department of Microbiology and Immunology, The University of Arizona, Tucson, Arizona	1993-2005
Adjunct Professor, Division of Epidemiology and Biostatistics, The University of Arizona, Tucson, Arizona	2000-
Adjunct Professor, Division of Environmental Health, Then University of Arizona, Tucson, Arizona	2010-

## HONORS

Beta Beta Beta (biology scholastic honorary)	
Epsilon Tau Lambda (adult scholastic honorary: University of Miami)	1969-1972
National Institutes of Health Postdoctoral Traineeship	1973
Fellow, American Academy of Microbiology	1993
Waksman Lectureship Fellow, American Society for Microbiology	2005-2007
Fellow, American Association for the Advancement of Science	2009
Fellow, International Water Association	2010

Listed in Who's Who in Technology Today, 1984, 1986, 1989, eds.  
Listed in International Who's Who in American Education, 1992-1993, 1995, 1996-1997, eds.  
Listed in Who's Who in the West, 1987-present  
Listed in Who's Who in Emerging Leaders in America, 1989-1990, 1991-1992, eds.  
Listed in Who's Who in the World, 1989-1995-present  
Listed in American Men & Women of Science, 1992-1993, 1996-1997-present  
Listed in Who's Who in Science and Engineering, 1992-1993, 1996-1997, eds.  
Listed in Who's Who in America, 1994 - present  
Listed in Who's Who in Medicine and Healthcare, 1997-1998-present

## AWARDS

Outstanding Research Scientist Award, College of Agriculture, The University of Arizona	1984
Environmental Science and Engineering Fellow, American Association for the Advancement of Science	1984
Tribute of Appreciation, Criteria and Standards Division, Office of Drinking Water, U.S. Environmental Protection Agency	1984
Service Award for Public Health, Pima County Health Department	1984
Outstanding Team Research Award, College of Agriculture, The University of Arizona	1992
Co-Recipient of Mckee Award (for outstanding contribution to groundwater protection), Water Environmental Federation	
Recipient of the A.P. Black Research Award for outstanding contributions to Water Science, American Water Works Association	1996
Honorary Lifetime Membership Award for dedicated service to the water treatment industry, Water Quality Association	1997
Award of Excellence in Environmental Health for outstanding and innovative research program, The National Association of Country and City Health Officials	1998
Selected as one of the 21 most influential people in the water industry in the 21 <sup>st</sup> century by Water Technology Magazine	2000
Best Paper Published in the Journal of the American Water Works Association, Water Resources Division	2002

Best Paper Published in the Journal of the American Water Works Association. Water Science and Research Division	2005
Shah Distinguished Lectureship in Risk Assessment, Stanford University	2005
Quentin Mees Research Award for outstanding research in applied water science Arizona Water Pollution Control Association	2007

PROFESSIONAL ORGANIZATIONS

American Society for Microbiology  
 American Association for the Advancement of Science  
 Sigma Xi  
 International Water Association  
 American Water Works Association  
 Society for Applied Microbiology  
 Society for Risk Analysis  
 International Association for Food Protection

ELECTED POSITIONS IN PROFESSIONAL ORGANIZATIONS

Chairman-elect and Chairman, Applied and Environmental Division of the American Society for Microbiology	1982-1984
President-elect and President, Arizona Branch of the American Society for Microbiology	1983-1984
Councilor, Arizona Branch of the American Society for Microbiology	1985-1986
Chairman-elect and Chairman, Applied and Environmental Division of the American Society for Microbiology	1986-1988

EDITORIAL BOARD MEMBERSHIPS

Applied and Environmental Microbiology	1979-1985
CRC Critical Reviews in Environmental Control	1984-
Journal of Food Protection	1984-1990
Journal of Industrial Microbiology	1986-1989
Journal of Applied Microbiology	2000-2005
Letters in Applied Microbiology	2000-2005
Regional Editor – Journal of Water and Health	2002-2010
Reviews in Environmental Toxicology and Contamination	2006-
Food and Environmental Virology	2008-

PROFESSIONALLY RELATED PUBLIC SERVICE

Member - U. S. Environmental Protection Agency Work- shop on "Protocol Development: Criteria and Standards for Potable Reuse and Feasible Alterna- tives", Committee on Groundwater Criteria	1980
Member - U.S. Environmental Protection Agency Work- shop on "Monitoring for Viruses in the Environment"	1980
Member - U.S. Environmental Protection Agency Work-	

shop on "Microbial Contaminants in Drinking Water"	1981
Member - U.S. Environmental Protection Agency Workshop on "Land Application of Municipal Wastewater and Sludge", Denver	1983
Member - University Technical Advisory Committee to the Pima County Board of Health	1982-1984
Member - Demonstration Recharge Advisory Committee, Tucson Water, City of Tucson	1984-1987
Member - Technical Advisory Board to the Pima County Water Hyacinth Wastewater Treatment Project	1984
Member - U.S. Environmental Protection Agency, Office of Drinking Water, Workshop on Revised Drinking Water Regulations	1985
Member - Task Force for Microbiological Water Purifier Guide Standards and Testing, Office of Drinking Water, U.S. Environmental Protection Agency	
Member - Pima County Board of Health	1986-1992
Member - Grant Review Panel, Office of Research and Development, U.S. Environmental Protection Agency	1986-1988
Member - Drinking Water Committee, Science Advisory Board, U.S. Environmental Protection Agency	
Member - Task Group on Copper/Silver Ion Generators, National Sanitation Foundation	1989-1991
Member - Technical Advisory Committee, Soil Aquifer Treatment Facility, Santa Ana Watershed Project Authority	1990-1992
Member Ad Hoc - FIFRA Scientific Advisory Panel, Antimicrobial Test Methodology, Office of Pesticides, U.S.	1991-1997
Member - Task Group on Drinking Water Treatment Units for Bacteriostatic Testing and Cyst Reduction, National Sanitation Foundation	1991
Member - "Workshop on Drinking Water and Health in the Year 2000", U.S. Environmental Protection Agency and American Water Works Research Foundation	1991
Member - "Workshop on Virology for the Water Supply in the Nineties", National Institute of Public Health and Environmental Protection, The Netherlands	1991
Member - "Expert Panel on Hazards of Municipal Solid Waste Recycling," U.S. Environmental Protection Agency	1991-1992
Member - "Workshop of Research Needs in Drinking Water Microbiology", American Water Works Foundation	1992
Member - "Workshop on the Methodology for Deriving National Water Ambient Water Quality Criteria for the Protection of Human Health", U. S. Environmental Protection Agency, Office of Science and Technology	1992
Member - "Blue Ribbon Panel on Research needs for Ultraviolet Disinfection", State of California, Dept. of Health Services	1993
Member - "Blue Ribbon Panel on Assessment and Acceptability of Risk", State of Calif., Dept. of Health Services.	1993
Member - Workshop on "Research Needs in Microbial Risk Assessment", National Institute of	

Public Health and Environmental Protection, The Netherlands	1992
Chairman - Microbiology Working Group "Workshop for Revision of National Guidelines for Deriving Human Health Criteria for Surface Water", U.S. Environmental Protection Agency	1992
Member - Technical Advisory Committee, Water Campus Wastewater Reuse Project, City of Scottsdale	1992-1994
Member - Science Advisory Board, Committee on Drinking Water and Committee on Research Strategies, U.S. Environmental Protection Agency	1994-1999
Member - Working Group on Microbial Risk Assessment, International Life Science Institute and U.S. Environmental Protection Agency	1995-
Member - Project Advisory Committee, UV Disinfection of Groundwater, American Water Works Research Foundation	1994-1996
Member - Project Advisory Committee National Survey of Viruses in Groundwater, American Water Works Association Research Foundation	1995-1999
Member - Working Group on Microbial Risk Assessment. International Life Science Institute, and the United States Environmental Protection Agency	1996-2000
Member - Workshop on Managing Microbial Risks of Potable Water in Space NASA	1997
Member - Workshop on New Microbial Indicators for Water, U.S. Environmental Protection Agency	1998
Member - Workshop on Water and Food Pathogen Risk Assessment, U.S. Environmental Protection Agency, and the International Life Science Institute	1999
Member - Workshop on Groundwater Indicator Evaluation, U.S. Environmental Protection Agency	1999
Member - Early Warning Monitoring to Detect Hazardous Events in Water Supply Systems U.S. Geological Survey, U.S. Environmental Protection Agency, Dept. of Defense	1999
Member – Susceptibility and Microbial Risk Assessment Workshop G.W. University and the Environmental Protection Agency	1999
Member - Mars Sample Handling Workshop, NASA	2000
Member – Research Needs for On-Site Wastewater Treatment Systems Workshop, U. S. Environmental Protection Agency	2001
Member – Recreational Water Quality Standards for Tropical Waters Workshop, U. S. Environmental Protection Agency	2001
Member – Research Needs for Biosolids and Animal Wastes, U.S. Department of Agriculture and	

U. S. Environmental Protection Agency	2001
Member –Workshop on Indicators for Pathogens in Wastewater, Biosolids and Stormwater, Water Environment Research Foundation	2003
Member – Expert Panel to Review Centers for Disease Control Environmental Microbiology Program	2005
Member – Selecting Criteria for the Candidate Contaminate List, U. S. Environmental Protection Agency	2006
Member – Food Advisory Committee, U. S. Food and Drug Administration	2010

### SERVICE TO THE PROFESSION

Rapporteur - International Conference on Viruses in Water, Mexico City	1974
Vice-Chairman - Workshop on "Viral Pollution in the Environment", Fourth International Congress for Virology, The Hague, Netherlands	
Member - American Society for Testing Material, subsection committee on standard methods for detecting virus on solids and soils	
Member - American Society for Testing Material, subsection committee on standard methods for detecting viruses in fresh and marine waters	1978
Subcommittee on Virological Methods, "Examination of Seawater and Shellfish", pub- lished by the American Public Health Association	
Chairman - Workshop on "Ecology of Viruses in Water", Second International Symposium on Micro- bial Ecology, University of Warwick, England	
Session Chairman - "Distribution and Development of Pathogens", Second International Symposium on Microbial Ecology, University of Warwick, England	
Session Chairman - International Conference on Viruses and Wastewater Treatment, University of Surrey, England	1980
Co-Chairman - Workshop on "Environmental Aspects of Viral Hepatitis Transmission", International Symposium on Viral Hepatitis, New York	
Member - Session Committee, Institute of Food Technologists	1982
Member - Committee on Environmental Microbiology, American Society for Microbiology	1981-1983
Member - Microbial Problems in Drinking Water Committee, American Water Works Association	

Co-Chairman - Round Table - Fate of Genetically Engineered Organisms in the Environment, American Society for Microbiology, Las Vegas	
Senior Delegate - U.S. Committee of the International Association for Water Pollution Control and Research for the American Society for Microbiology	1985-1991
Member - Planning Committee for Symposium on "Microbial Aspects of Surface Water Quality", Water Pollution Control Federation.	1988-1989
Co-Chairman - Organizing Committee of the 2nd International Symposium on Contamination of the Environment by Viruses and Methods of Control. Vienna, Austria	1987-1989
Chairman - Enteric Virus Committee, Joint Editorial Board, 17th edition supplement and 18th edition, Standard Methods for the Examination of Water and Wastewater	1989-1997
Member - Project Advisory Committee, National Groundwater Virus Survey, American Water Works Research Foundation	1991-2000
Member - Research Committee, American Water Works Association	1992-1994
Member - Workshop on "Microbial and Disinfection By-products Research Needs", American Water Works Research Foundation	1993
Member - International Scientific Committee, "Assessing and Managing Health Risks from Drinking Water Contamination: Approaches and Application".	1993-1994
Member - Organizing Committee, "Second International Symposium on Wastewater Reclamation and Reuse"	1993-1995
Member - Organizing Committee "Global Issues in Microbiological Water Quality for the next Century". Sponsored by UNESCO, U.S. Environmental Protection Agency, and the American Academy for Microbiology	1994-1995
Member - American Soc. for Microbiology delegate. United States National Committee of the International Water Quality Association (now International Water Association)	1992-1999
Member - Public and Scientific Committee of the American Soc. Microbiology	1996-2006
Member- Organizing committee for Workshop on Acceptable Microbial Risks in Water, American Academy for Microbiology	2006
Member – Workshop on Select Criteria for Drinking Water Candidate Contaminate List,	

Office of Water, United States Environmental Protection Agency 2006  
Member – Scientific Review of the Proposed Risk Assessment Bulletin from the Office of  
Management and Budget, National Research Council 2006

#### DOCTORAL DISSERTATION

Gerba, C.P. 1973. Investigations into the effects of particulate matter on the survival of a virus in seawater, University of Miami.

#### PUBLICATIONS

##### **BOOKS (11)**

Gerba, C.P., and S.M. Goyal (eds.). 1982. *Methods in Environmental Virology*. Marcel-Dekker, Inc., NY.

Bitton, G., and C.P. Gerba (eds.). 1984. *Groundwater Pollution Microbiology*. John Wiley and Sons, NY.

Goyal, S.M., C.P. Gerba, and G. Bitton. 1987. *Phage Ecology*. John Wiley and Sons, N.Y.

Pepper, I.L., C.P. Gerba, and J.W. Bredecke. 1995. *Environmental Microbiology - A Laboratory Manual*. Academic Press, NY.

Pepper, I.L., C.P. Gerba, and M.L. Brusseau. 1996. *Pollution Science*. Academic Press, San Diego, CA.

Haas, C.N., J.B. Rose, and C.P. Gerba. 1999. *Quantitative Microbial Risk Assessment*. John Wiley, NY.

Maier, R.M., I.L. Pepper and C.P. Gerba. 2000. *Environmental Microbiology*. Academic Press, NY.

Pepper, I.L., C.P. Gerba, and J.W. Bredecke. 2004. *Environmental Microbiology - A Laboratory Manual*. Second Edition. Academic Press, San Diego.

Pepper, I. L., C. P. Gerba and M. L. Brusseau. 2006. *Environmental and Pollution Science*, Second Edition. Academic Press, San Diego.

Maier, R.M., I.L. Pepper and C.P. Gerba. 2008. *Environmental Microbiology*. Second Edition. Academic Press, NY.

##### **PEER REVIEWED JOURNAL ARTICLES (322)**

- Gerba, C.P., and G.E. Schaiberger. 1973. Biscayne Bay: bacteriological data interpretation. *Flor. Sci.* 36:104-109
- Gerba, C.P., and G.E. Schaiberger. 1975. Effect of particulates on the survival of virus in seawater. *J. Water Pollut. Contr. Fed.* 47:93-103.
- Gerba, C.P., and G.E. Schaiberger. 1975. Aggregation as a factor in loss of viral titer in seawater. *Water Res.* 9:567-571.
- Gerba, C.P., C. Wallis, and J.L. Melnick. 1975. Microbial hazards of household toilets. Droplet production and the fate of residual organisms. *Appl. Microbiol.* 30:229-237.
- Gerba, C.P., C. Wallis, and J.L. Melnick. 1975. The fate of wastewater bacteria and viruses in soil. *Jr. Irrig. Drain. Div. ASCE* 101:157-174.
- Gerba, C.P., M.D. Sobsey, C. Wallis, and J.L. Melnick. 1975. Factors influencing the adsorption of poliovirus onto activated carbon in wastewater. *Environ. Sci. Technol.* 9:727-731.
- Gerba, C.P., C. Wallis, and J.L. Melnick. 1975. Viruses in water: the problem, some solutions. *Environ. Sci. Technol.* 9:1122-1126.
- Farrah, S.R., C.P. Gerba, C. Wallis, and J.L. Melnick. 1976. Concentration of viruses from large volumes of tap water using pleated membrane filters. *Appl. Environ. Microbiol.* 31:221-226.
- Gilbert, R.G., R.C. Rice, H. Bouwer, C.P. Gerba, C. Wallis, and J.L. Melnick. 1976. Wastewater renovation and reuse: virus removal by soil filtration. *Science* 192:1004-1005.
- Gerba, C.P., and J.S. McLeod. 1976. Effect of sediments on the survival of *Escherichia coli* in marine waters. *Appl. Environ. Microbiol.* 32:114-120.
- Gilbert, R.G., C.P. Gerba, R.C. Rice, H. Bouwer, C. Wallis, and J.L. Melnick. 1976. Virus and bacteria removal from wastewater by land treatment. *Appl. Environ. Microbiol.* 32:333-338.
- Farrah, S.R., S.M. Goyal, C.P. Gerba, C. Wallis, and P.T.B. Shaffer. 1976. Characteristics of humic acid and organic compounds concentrated from tapwater using the Aquella virus concentrator. *Water Res.* 10:897-901.
- Payment, P., C.P. Gerba, C. Wallis, and J.L. Melnick. 1976. Methods for concentrating viruses from large volumes of estuarine water on pleated membrane filters. *Water Res.* 10:893-896.
- Lance, J.C., C.P. Gerba, and J.L. Melnick. 1976. Virus movement in soil columns flooded with secondary sewage effluent. *Appl. Environ. Microbiol.* 32:520-526.

- Lance, J.C., and C.P. Gerba. 1977. Nitrogen, phosphate and virus removal from sewage water during land filtration. *Prog. Water Technol.* 9:157-166.
- Farrah, S.R., C.P. Gerba, S.M. Goyal, C. Wallis, and J.L. Melnick. 1977. Regeneration of pleated filters used to concentrate enteroviruses from large volumes of tap water. *Appl. Environ. Microbiol.* 33:308-311.
- Gerba, C.P., C. Wallis, and J.L. Melnick. 1977. Disinfection of wastewater by photodynamic oxidation. *J. Water Pollut. Contr. Fed.* 49:575-583.
- Hobbs, M.F., C.P. Gerba, C. Wallis, J.L. Melnick, and J.S. Lennon. 1977. Photodynamic inactivation of infectious agents. *J. Environ. Eng. Div. ASCE* 103:459-472.
- Sobsey, M.D., C.P. Gerba, C. Wallis, and J.L. Melnick. 1977. Concentration of enteroviruses from large volumes of turbid estuary water. *Can. J. Microbiol.* 23:770-778.
- Farrah, S.R., S.M. Goyal, C.P. Gerba, C. Wallis, and J.F. Melnick. 1977. Concentration of enteroviruses from estuarine water. *Appl. Environ. Microbiol.* 33:1192-1196.
- Gerba, C.P., S.M. Goyal, E.M. Smith, and J.L. Melnick. 1977. Distribution of viral and bacterial pathogens in a coastal canal community. *Marine Pollut. Bull.* 8:279-282.
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Renovated water quality from two projects: Dan and Flushing Meadows, United States Binational Science Foundation, Co-Investigator, 1980-1983, travel of Dr. Gerba to Israel, \$2,500.

Rotavirus detection, The University of Arizona Biomedical Research Support, Principal Investigator, 1981-1982, \$9,300.

Detection of rotavirus and hepatitis A in water, Environmental Protection Agency, Principal Investigator, 1982-1984, \$117,000.

Development of a model for viral survival and transport in groundwater, Environmental Protection Agency through subcontract from the University of Oklahoma, Principal Investigator, 1982-1983, \$99,733.

Training program in ground water microbiology, Jessie Smith Noyes Foundation, Inc., Principal Investigator, 1982-1985, \$69,300.

Occurrence of viruses in water in Colombia, Tinker Foundation, Principal Investigator, 1983, \$1,200.

A predictive model for virus transport, Environmental Protection Agency, Principal Investigator, 1983-1986, \$333,058.

Removal of microorganisms by filtration, Tucson Water Reuse Project, Rubel and Hager, Inc., Principal Investigator, 1983, \$10,382.

Virus analysis of groundwater, Arizona Dept. of Health Services, Principal Investigator, 1984, \$3,000.

Prediction of virus persistence in Arizona groundwater, The University of Arizona Water Resources Center, Co-Principal Investigator, 1984-1985, \$9,982.

Virus analysis of drinking water in Puerto Rico, Environmental Protection Agency, Principal Investigator, 1984, \$24,421.

Insoluble polymeric contact disinfectants for point-of-use potable water disinfection, Environmental Protection Agency, Co-Investigator, 1984-1986, \$175,000.

Detection of potential viral contaminants in food and water, Dept. of Nutrition and Food Science, Hatch Project, Principal Investigator, 1984-1987, \$46,164.

Analysis of sludge and composted sludge for microorganisms, Erco Division, Enasco Companies, Principal Investigator, 1985, \$23,760.

Casa del Agua: A community water conservation demonstration and evaluation project, Tucson Water and Pima County, Co-Investigator, 1985-1989, \$74,000.

Studies on microbial contamination of groundwater, IBM Corporation, Principal Investigator, 1985-1986, \$23,395.

Viability of parasitic enteric infections in Arizona: *Giardia* and *Cryptosporidiosis*, Co-Investigator, Arizona Disease Control Research Commission, 1986-1987, \$79,281.

Water disinfection by material surface contact, U.S. Aid Program in Science and Technology, Principal Investigator, 1986-1989, \$149,878.

Development of gene probes for rapid detection of enteric viruses in water and sewage, U.S. Aid Program in Science and Technology, Principal Investigator, 1986-1989, \$149,651.

Salary support for Dr. Susan Stramer, Centers for Disease Control, Principal Investigator, 1985-1987, \$31,958.

Detection and isolation of *Cryptosporidium*, *Giardia*, and *Entamoeba* from waters throughout the United States, U.S. Environmental Protection Agency, Co-Investigator, 1986-1989, \$160,000.

Rotavirus survival and transport in the subsurface, U.S. Environmental Protection Agency, Principal Investigator, 1986-1988, \$199,946.

Gene probes for enteric virus detection, The University of Arizona Biomedical Research Support Grant, Principal Investigator, 1986-1987, \$6,995.

Surface-chemical factors affecting transport of bio-colloids in subsurface porous media, U.S. Geological Survey, Co-Principal Investigator, 1987-1989, \$257,748.

Development of ultrasensitive gene probes for the rapid detection of enteric viruses in water and food, Arizona Technology Development Corporation, Co-Principal Investigator, 1988-1989, \$150,000.

Development of methodology for detection of enteric viruses in food and water, Dept. of Nutrition and Food Science, Hatch Project, Principal Investigator, 1988-1991, \$41,929.

Rapid detection of enteric viruses in water using gene probes, Arizona Disease Control Research Commission, Co-Investigator, 1987-1988, \$24,442.

The effect of liquid smoke on *Listeria monocytogenes*, Bar S Foods, Co-Principal Investigator, 1987-1988, \$10,000.

Use of metal ions for water disinfection, Tarn-Pure, U.S.A., Principal Investigator, 1987-1989, \$42,500.

Effectiveness of hand washing for the removal of contaminating enteric viruses and *Giardia*, Dial Corp., Co-Investigator, 1987-1989, \$19,285.

Ionic purification of water, Sigma Products, Inc., Principal Investigator, 1988-1989, \$5,750.

Evaluation of a copper-silver electrolytic unit with chlorine under swimming pool conditions, U.S. Army, Principal Investigator, 1988, \$9,950.

Evaluation of a thermal-activated carbon microbiological water purifier, Regal Ware. Principal Investigator, 1988, \$7,200.

Determination of bacteriophage in deep soil samples and their ecological significance, DuPont de Nemours and Company, Principal Investigator, 1988-1989, \$19,943.

Efficiency of copper, polyvinylchloride, chlorinated-polyvinylchloride and galvanized pipes on the removal of MS-2 coliphage, International Copper Research Association, Co-Investigator, 1988-1989, \$49,142.

Efficiency of reverse osmosis membranes in virus removal, Shaklee Corporation, Principal Investigator, 1988, \$5,000.

Agricultural sludge reclamation, Pima County, Co-Investigator, 1988-1990, \$23,000.

Determination of the microbiological shelf-life of refrigerated sandwiches, Campbell Food Research Institute, Principal Investigator, 1988, \$3,150.

Evaluation of gene probe technology for the detection of human immunodeficiency virus in hospital wastewater concentrates, National Science Foundation, Co-Investigator, 1989-1990, \$29,994.

Gene Probe detection of pathogens in sludge-amended soils, U.S. Geological Survey, Co-Principal Investigator, 1989-1991, \$174,693.

Demonstrations of nanofilter method for treating Colorado River water, Consolidated Utilities, Co-Investigator, 1989-1990, \$33,575.

Microbiological evaluation of diapers, solid waste, and leachate from the Fresh Kill landfill, Proctor and Gamble Co., Co-Principal Investigator, 1989-1990, \$85,268.

Determination of the inactivation kinetics of poliovirus after exposure to potassium permanganate, Carus Chemical Co., Principal Investigator, 1989-1990, \$18,600.

Assessment of model equations for predicting survival and transport of microorganisms in groundwater in Arizona, Water Resources Center, Co-Principal Investigator, 1989-1990, \$8,770.

Inactivation of MS-2 coliphage and *Legionella* by potassium permanganate, Carus Chemical Co., Principal Investigator, 1989, \$10,950.

Virus removal by a wastewater treatment and recycling system, Thetford Systems, Inc., Principal Investigator, 1989, \$15,000.

Microbiological characterization of hotel bathrooms, Brushguard, Inc., Principal Investigator, 1989, \$6,950.

Microbiological evaluation of compost containing disposable diapers, Co-Principal Investigator, Proctor and Gamble Co., 1989-1990, \$32,985.

Investigations into the invasive properties of *Campylobacter*, Arizona Disease Research Commission, Co-investigator, 1989-1991, \$57,000.

Evaluation of the microbial efficacy of a porcelain cleaner, Musson Associates, Principal Investigator, 1989, \$6,950.

The role of soil aquifer treatment in wastewater reclamation/reuse: hydrological, chemical and microbiological considerations, Salt River Project and Tucson Water, Co-Principal Investigator, 1990-1991, \$283,665.

Subsurface transport of biocolloids, National Institute of Health, Principal Investigator, 1990-1992, \$124,340.

Molecular methods for evaluation of microbial quality of groundwater, USDA Cooperative State Research Service, 1990-1992, \$79,516.

Underground fate and transport of microorganisms, Water Resource Research Center. Co-Principal Investigator, 1990-1991, \$33,637.

Human enteric viral contamination of groundwater, Dept. of Environmental Protection, State of New Jersey, Principal Investigator, 1990-1991, \$48,325.

Health risks associated with bacterial and viral pathogens in groundwater, Arizona Disease Research Commission, Co-principal Investigator, 1990-1993, \$85,600.

Research support for studies on solid waste, Procter and Gamble Co., Principal Investigator, 1990, \$3,000.

Development of non-halogen disinfectants for swimming pools, 1990, Olin Corporation, Principal Investigator, 1990-1991, \$43,650.

Underground fate and transport of microorganisms, Water Resources Research Center, Co-principal Investigator, 1991-1992, \$40,531.

Evaluation of the hydraulic, chemical, and microbiological aspects of soil-aquifer treatment (SAT) during wastewater reclamation/reuse: laboratory and field studies, Tucson Water and the Salt River Project, Co-principal Investigator, 1992-1993, \$137,951.

Detection of viable *Giardia* cysts in water by polymerase chain reaction, Metropolitan Water District of Southern California, Co-principal Investigator, 1991-1992, \$52,809.

Transport of subsurface bacteria in porous media, Dept. of Energy, Co-Investigator, 1991-1993, \$300,100.

Microbial contaminate removal/inactivation by Asian point-of-use treatment system, Amway Corporation, Principal Investigator, 1991-1992, \$104,000.

Studies on viruses and parasites in reclaimed water, Microbial Analytical Laboratory, Principal Investigator, 1985-1993, \$972,809.

Delineation of wellhead protection zones: considerations of virus transport, U.S. Environmental Protection Agency, Principal Investigator, 1991-1994, \$200,000.

Determination of the inactivation kinetics of hepatitis A virus and *Giardia* cysts after exposure to potassium permanganate, Carus Chemical Company, Principal Investigator, 1992, \$52,000.

Transport of biocolloids in the subsurface, National Institute of Environmental Health Science, Co-principal Investigator, 1992-1995, \$425,000.

Agricultural sludge reclamation, Pima County Wastewater Division, Co-investigator, 1991-1992, \$83,793.

Multi-laboratory evaluation of the guide standard and protocol for testing microbiological water purifiers, U. S. Environmental Protection Agency, Principal Investigator, 1992-1994, \$164,964.

In use antibacterial dish detergent efficacy study, L and F Products, Principal Investigator, 1992-1993, \$35,716.

Characterization of the microflora of households and estimation of the impact of disease transmission by surfaces, Co-Principal Investigator L and F Products, 1992-1993, \$66,270.

Stability of HIV viral RNA under environmental conditions, Co-investigator, National Science Foundation, 1992-1993, \$50,000.

Incidence of pathogens in Mamala Bay: molecular and risk assessment, Co-Principal Investigator, Mamala Bay Commission, 1993-1995, \$350,000

Physical, chemical, and biological properties of the Schmutzdecke, Co-Investigator, U. S. Department of Agriculture, 1993-1996, \$180,000.

Microbial risk assessment for drinking water, Co-investigator, American Water Works Research Foundation, 1993-1995, \$200,000.

Studies on the inactivation of *Giardia* by pH, pressure, and disinfection, Principal Investigator, CDM Engineering, 1993, \$59,000.

Solas Water System Testing, Solas Corporation, Principal Investigator, 1993-1994, \$12,000.

SC Johnson Wax R&D Fellowship Grant, Johnson Wax, Principal Investigator, 1993-1994, \$20,000.

Biocolloid Transport in Groundwater. United States-Israel Binational Agricultural Research and Development Fund. Co-Principal Investigator. 1993-1995, \$250,000.

Application of PCR Technologies for virus detection in groundwater. American Water Works Research Foundation. Co-Principal Investigator. 1993-1997, \$400,000.

Soil treatability pilot studies to design and model a soil aquifer treatment system. American Water Works Research Foundation. Co-investigator. 1994-1995, \$224,000.

Field Tracer Experiments at Oak Ridge National Laboratory. University of Tennessee. Co-investigator. 1994. \$8,000.

Evaluation of a potable POU. Sweetwater Inc., Principal Investigator, 1994, \$19,000.

Risk Assessment of a Distillation Water Treatment System, In-sink-erator, 1994, \$57,000.

Microsporidium Reduction Testing. Amway Corp., Principal Investigator, 1995, \$13,000.

Efficacy of chlorine bleach disinfection on surfaces against *Giardia*, Principal Investigator, Clorox Corp., 1995, \$13,250.

Rapid PCR based monitoring of infectious enteroviruses in drinking water. Co-investigator, Amer. Water Works Research Foundation, 1995-1997, \$191,896.

Comparison of POU devices for microbial removal, Principal Investigator, Sweetwater Inc., 1995, \$53,000.

Evaluation of point-of-use water treatment devices for outdoor use, L.L. Bean, Inc. Principal Investigator, 1995, \$5,000. Evaluation of tablet formulations for water disinfection, Principal Investigator, Sweetwater, Inc., 1995, \$10,000.

Optimal Secondary Wastewater Reuse with Minimal Environmental Risks. United States-Israel Binational Agricultural Research Development Fund, Co-Principal Investigator, 1996-1999, \$339,000.

Enter Pathogen Reduction by Artificial Wetlands. Wyoming Water Resources Research Center, Principal Investigator, 1996-1998, \$126,350.

Quantitative microbial risk assessment of foods. Co-investigator. \$23, 206. International Life Science Institute, 1997-1998.

Development of low cost indicators of viruses and parasites on foods, Principal Investigator, \$18,500, USDA, 1996-1998.

Investigation of Soil Aquifer Treatment, Co-investigator, \$400,000, Amer. Water Works Research Foundation, and cities of Phoenix and Tucson, 1997-1998.

Evaluation of the economics and public health benefits from water chlorination for cholera using risk assessment, Co-Principal Investigator, \$90,000, Chlorine Chemistry Council, 1996-1997.

Inactivation efficiencies of emerging waterborne pathogens by chemical disinfection process. Co-investigator. Amer. Water Works Res. Foundation, 1998-2000, \$250,000.

Investigation of soil aquifer treatment, Co-investigator, EPA, \$1,500,000, 1998-2002.

Residential graywater systems, Co-investigator, CASA, \$16,413, 1998-2000.

Molecular detection of pathogens in irrigation water and their significance, Principal investigator, USDA, \$275,000, 1999-2001.

Impact of wildlife on enteric pathogens in a constructed wetland, Co-investigator, City of Phoenix, 2000-2001, \$48,651.

Microbial risk analysis of iceberg lettuce due to manure application. Co-investigator. Arizona Iceberg Lettuce Research Council. \$40,978. 2000-2002.

Effect of heterotrophic plate count bacterial populations in drinking water. Co-investigator. NSF Water Quality Center. \$50,000. 2000-2002.

Use of risk modeling to determine the benefit of topical antimicrobial products. Soap and Detergent Association. Co-investigator. \$20,000. 2000-2002.

Virus transport through soil. U.S. Dept. of Interior. Co-investigator. \$12,000. 2000-2002.

Measurement of Hormonal Activity and Volume Contribution of Treated Wastewater in Water from Wells along the Santa Cruz. U.S. Dept. of Interior. Co-investigator. \$12,700. 2001-2002.

Microbial risk analysis of water in the production of produce in Arizona. Co-PI. USDA. \$525,000. 2000-2003.

Assessment of bacterial contamination of oysters. Co-PI. USDA. \$1,200,000. 2001-2004.

Role of irrigation methods on microbial food safety. Co-PI. FDA. \$525,000. 2001-2004.

*Giardia/Cryptosporidium* transport and fate during subsurface infiltration: integrated laboratory and field study. Co-PI. EPA. \$519,725. 2001-2004.

Bioaerosol generation from biosolids. Co-PI. NSF Water Quality Center. \$60,000. 2001-2004.

Occurrence of emerging pathogens in the waters of Arizona. P.I. NSF Water Quality Center and State of Arizona. \$200,000. 2003-2005

Survival of the SARS virus in water and wastewater. P.I. NSF Water Quality Center. \$10,000. 2003-2004.

Development of an infectivity assay for norovirus in cells. Co-PI. American Water Works Research Foundation. \$400,000. 2004-2007.

Occurrence of viruses on fomites in work environments. PI. Clorox Company. \$52,000. 2004-2005.

Microbial quality in individual and small water systems in Arizona. PI. NSF Center for Water Quality and the State of Arizona. \$200,000. 2004-2006.

Development of a Ct for chlorine for enteroviruses. PI. U.S. Environmental Protection Agency. \$20,000. 2005.

Adenovirus and norovirus occurrence in sewage discharges. PI. Geosyntec. \$38,000. 2005.

Virus removal from Combined Sewage overflows. PI. CH2M Hill. \$20,000. 2005.

Occurrence of viruses on fomites in public facilities. PI. Clorox Company. \$35,000. 2005.

Assessment of a thermal point of use device for microbial treatment of water. PI. Johnson Research. \$28,000.

Center for Advancing Microbial Risk Assessment . Co-investigator. U. S. Environmental Protection Agency/Department of Homeland Security. \$1,100,000. 2005-2011.

Disinfectants in disease reduction in public schools. P.I. Clorox Company. \$224,000. 2005-2006.

Occurrence of bacteria in liquid soap. P.I. GOJO Industries. \$28,000, 2006.

Control of *Naegleria fowleri* in ground water in Arizona. P.I. NSF Water Quality Center and the State of Arizona. \$185,000. 2006-2008.

Development of a universal microbial concentrator. Co-PI. U. S. Environmental Protection Agency. STAR Grant Program. \$450,000. 2006-2009.

Survival of prions in biosolids. PI. NSF Water Quality Center. \$140,000. 2006-2010.

Development of an ozone/UV light disinfection system. P.I. NSF Water Quality Center/Vortex Technologies. \$78,000. 2006-2007.

Development of new disinfectant technologies. P.I. The Clorox Company \$84,000. 2006.

Microbiology of home vs. work offices. P.I. The Clorox Company \$59,000. 2007-2008.

Evaluating proposed operational practices for control of *Naegleria fowleri* in Arizona's Public Drinking Water systems. Co-investigator. Arizona Water Institute/City of Peoria \$58,028. 2008-2009.

A new generation of anti-microbial materials. Nexra. \$40,000. 2007-2008.

Microbial contamination of hospital scrubs. P. I. Molnlycke Health Care, Inc. \$9,000. 2007.

New Generation of water treatment devices for the developing world. P. I. Vestgaard. \$380,000. 2007-2009.

Assessment of Lumilife Systems. P. I. Lumilife. \$8,000, 2007.

Evaluation of a foaming hand product formulation in preventing the transfer of rhinovirus. P. I. Procter and Gamble Company. \$31,000. 2007.

Environmental microbial assessment of fomites. P.I. Microban. \$14,000. 2007

Assessment of the microbial contamination of vacuum cleaners. P.I. Oreck. \$14,500. 2007.

Impact of climate change on recreational water quality in Arizona. Co-P.I. NSF Water Quality Center. \$83,000. 2008-2009.

Creating the tools for site-specific biosolids risk assessment and communication. Co-investigator. Water Environment Research Foundation. \$600,000. 2008-2010.

Assessment of silver based disinfectants. Co-P.I. Micrdyn Corp., \$20,000. 2008-2009.

Environmental control of pathogens. P.I. Clorox Corp. \$87,000. 2008-2009.

Assessment of Metam to produce Class A biosolids. P.I Magna Corp.\$155,000 2008-2010.

Assessment of Medium vapor pressure UV light against adenovirus. Co-P.I. Altantium. \$30,000. 2010.

Control of microbial contamination of organically grown foods. Co-investigator. USDA. \$2,900,000. 2010-2013.

## INSTRUCTION

### FORMAL COURSES TAUGHT AT BAYLOR COLLEGE OF MEDICINE

Environmental Virology (3 units) (1978-1980)

### FORMAL COURSES TAUGHT AT THE UNIVERSITY OF ARIZONA

Food Microbiology (3 units) (1981-1990) (100% effort)

Food Microbiology Laboratory (1 unit) (1981-1990) (100% effort)

Food Safety (2 units) (1981-1988) (10-50% effort)

Advanced Food Science (3 units) (1988-1991) (10% effort)

Groundwater Pollution Microbiology (3 units) (1982) (90% effort)

Introduction to Virology (3 units) (1986-1987) (10% effort)

Environmental Microbiology (3 units) (1992-1997) (15-20% effort)

Environmental Microbiology Laboratory (2 units) (1992- ) (50% effort)

Environmental Biotechnology (2 units) (1993- 2001) (40% effort)

Pollution Science (3 units) (1994- ) (40% effort)

Risk Assessment (3 units) (2005- ) (15% effort)

Introduction to Environmental Science (2008- ) (15% effort)

#### SHORT COURSES TAUGHT AT OTHER UNIVERSITIES

(These courses are usually 1-2 weeks in length)

Virus and Parasite Detection in Reclaimed Water. Mexico City, 1988 (Sponsored by the World Bank and Pan American Health Association)

Methods for the Detection of Viruses in the Environment. Cochabamba, Bolivia, 1989. (Sponsored by the University of San Simon)

Application of Biotechnology to the Detection of Viruses, Parasites, and Bacteria in the Environment. Culiacan, Mexico, 1990. (Sponsored by the University of Sinaloa)

Detection of Parasites, Viruses and Bacteria in Water and Wastewater. Santiago, Chile, 1991. (Sponsored by the University of Chile and the American Society for Microbiology)

Applications of Biotechnology to the Detection of Enteric Microorganisms in the Environment. Panama City, Panama, 1992 (Sponsored by the University of Panama and the United States Agency for International Development)

Advances in the Detection of Enteric Bacteria, Viruses, and Parasites in Water and Wastewater, Maracaibo, Venezuela, Sept., 1992. (Sponsored by the University of Zulia).

Virus and Parasite Detection in water and Wastewater. Buenos Aires, Argentina, July, 1993 (Sponsored by the University of Buenos Aires and the International Life Sciences Institute).

Molecular methods for the Detection of Microorganisms in water, San Paulo, Brazil, August, 1994, University of San Paulo.

Detection of Microorganisms in Water and Food. University of Panama, Panama City, Panama, May, 1997. (Sponsored by the University of Panama)

Microbial Detection in Water and Environmental Microbiology. Univerdidad del Valle, Guatemala City, Guatemala. Feb. 25-28, 2000. (Sponsored by USDA, USAID, Merck, Procter and Gamble, and Universidad del Valle).

Environmental Microbiology. University of Panama. Panama City, Panama. February, 2005. (Sponsored by the American Society for Microbiology Latin American Lectureship Program).

Quantitative Microbial Risk Assessment. University of Sao Paulo, Brazil. June 14-16, 2005.

Transmission of Pathogens through the Environment. November 29-December 1, 2005. University of Sonora. Hermosillo, Mexico.

Environmental Microbiology. University of Panama. Panama City, Panama. January, 2008. (Sponsored by the National Science Foundation of Panama)

## PREPARATION OF INSTRUCTIONAL MATERIALS

Prepared the first training manual in Spanish on methods for the detection of viruses in water "Manual de Vigilancia de Virus Entericos en el Agua" (R.C. DeLeon, C.P. Gerba and J.B. Rose) under the sponsorship of the World Bank and Pan American Health Association. This has since been used in numerous training courses in South America at various universities.

Preparation of a laboratory manual with I. Pepper entitled "Environmental Microbiology Laboratory". Published in 1995 by Academic Press.

Aided in preparation of manual for training course in "Water Microbiology for the 21st Century" which has been used in training courses at Macquarre University (Sydney, Australia, Sept., 1993), the University of Washington (Seattle, March, 1994) and the University of York (York, England, Sept., 1994).

Designed and prepared wall posters for laboratory training in Environmental Microbiology "Procedure for the Concentration and Detection of Enteric Viruses in Water", "Detection of Enteroviruses by the Polymerase Chain Reaction", and "Procedure for the Concentration and Detection of *Giardia* and *Cryptosporidium* Oocysts".

Preparation of textbook with I. Pepper, and M. Brusseau, entitled "Pollution Science". Published in 1996 by Academic Press. Preparation of textbook Environmental Microbiology with R. Mier and I.L. Pepper, published 2000 by Academic Press.

## INSTRUCTIONAL VIDEOS

Prepared instructional video "Environmental Microbiology Laboratory" for training in methods for the detection of enteric viruses and parasites in water. 1991.

Participated in preparation of instructional video "Cleaning Products....In Our Homes, In Our Environment" under sponsorship of The Soap and Detergent Association and the University of Ohio. 1992.

Participated in preparation of instructional video "The World's Largest Landfill: A multidisciplinary Investigation". Sponsored by Proctor and Gamble and the Council for Solid Waste Solutions.

## OTHER

NFS (Micr) 470, Food Microbiology selected by Arizona Ambassadors, a student volunteer organization that assists the Office of Admissions to provide prospective students a positive teaching experience. 1989.

Participated in College of Agriculture "Horizons Unlimited" Program 1989-1995. A one-week course to provide high school students with an introduction to college level instruction.

Participated 1989-present in the Undergraduate Biology Research Program, The University of Arizona. This program is designed to provide undergraduates with an interest in research to work in the laboratories of faculty.

#### LIST OF THESES AND DISSERTATIONS DIRECTED

1. LaBelle, Raymond. Ph.D., 1979. The role of sediment in the ecology of enteric viruses in the marine environment. Systems Analyst. Honeywell Corp., Houston, TX
2. Smith, Eric. Ph.D., 1980. Development of a method for detection of rotavirus in water. Professor of Microbiology, University of Texas Medical School at Galveston, TX.
3. Hurst, Christian. Ph.D., 1980. Viral detection and persistence during the land treatment of sludge and wastewater. Environmental Virologist, Risk Reduction Laboratory, U.S. Environmental Protection Agency, Cincinnati, OH. Retired.
4. Zerda, Katherin S. Ph.D., 1982. Adsorption of viruses to charge-modified silica. University of Houston, Houston, TX.
5. Hurst, Pei-Fung Liew. Ph.D., 1982. Development and evaluation of an enzyme-linked immuno-sorbent assay for the detection of viruses from wastewater. Senior Group Leader, Dames and Moore, Environmental Consulting Engineers. Cincinnati, OH.
6. Soria, Gary A. Toranzos. M.S., 1983. Development of a microporous filter method for concentration of rotavirus from tap water. Professor, Dept. of Biology, University of Puerto Rico, Rio Piadras, PR.
7. Bassous, Marlene. M.S., 1983. Use of dyes and proteins as indicators of virus adsorption to soils. Clinical Laboratory Supervisor, VA.
8. Yates, Marylynn V. Ph.D., 1984. Virus persistence in groundwater. Professor and Chairperson, Department of Environmental Science, Univ. of Calif., Riverside, CA.
9. Toranzos, Gary A. Ph.D., 1985. Occurrence of enteric viruses in drinking water in South America. Professor, Dept. of Biology, University of Puerto Rico, Rio Piadras, PR.

10. Musial, Coral A. Ph.D., 1985. Development of a method for the detection of *Cryptosporidium* in water and selected studies on hepatitis A virus. Physician, Dept. of Infectious Disease, George Washington University, St. Louis.
11. Mullinax, Rebecca L. M.S., 1985. Isolation of enteric viruses from the recreational waters of Oak Creek. Research Associate, University of Calif. at Davis, CA.
12. Rose, Joan B. Ph.D., 1985. Virus removal during conventional drinking water treatment. Professor, Dept. Fisheries and Wildlife, Michigan State University, East Lansing
13. Payne, Holly. M.S., 1985. Development of methods for enteric virus detection in freshwater clams. Quality Control Supervisor, Soufer Foods, NC.
14. Margolin, Aaron B. Ph.D., 1986. Use of cDNA-blot hybridization techniques for detection of enteric viruses in water. Professor and Head, Dept. of Microbiology, University of New Hampshire, Durham, NH.
15. Badaway, Amin S. Ph.D. Survival and detection of enteric viruses on vegetables. Professor, Mosul, Iraq.
16. Thurman, Robert. Ph.D., 1987. Mechanisms of virus inactivation on modified soil surfaces. Associate Professor, Australian Catholic University Ballarat, Victoria.
17. Sun, Gwoshing. M.S., 1986. Gray water reuse for irrigation.
18. Madore, Mary. M.S., 1986. Resistance to *Cryptosporidium* to chlorine disinfection.
19. Grondin, Gerry. M.S., 1987. (Co-advisor). Modeling virus transport in ground water. National Groundwater Modeling Center, OH.
20. Kayed, Dima. M.S., 1986. Methods for the isolation of oocysts of *Cryptosporidium* from sludge and *Giardia* cysts from stool. Ph.D. Research Microbiologist. Phoenix, AZ.
21. Bradford, Alan. M.S., 1987. (Co-advisor) Transport of MS-2 virus through saturated soil columns. Working for a bioremediation company in Irvine, CA.
22. Messina, Maria Cipolla. M.S., 1989. The effect of liquid smoke on *Listeria Monocytogenes*. Working for a biotechnology company in New Jersey.
23. Landeen, Lee Kevin. M.S., 1989. Inactivation of *Legionella pneumophila* by copper, silver ions and free chlorine. Working for a biotechnology company in San Diego, CA.

24. Manthriratna, Gothami Anoma. M.S., 1989. Efficacy of handwashing as an aid in the control of rotavirus and *Giardia* transmission.
25. Kroeger, Thomas William. M.S., 1989. (Co-advisor) Hydrophobic partitioning of the bacteriophage MS-2. Dept. of Water Resources, State of Wisconsin.
26. Stocking, Kristin. M.S., 1989. (Co-advisor) Adsorption of MS-2 bacteriophage to silica. Hydrologist, City of Tucson, AZ.
27. Richardson, Kenneth James. Ph.D., 1989. Use of nucleic acid probes on a nonradioactive labeling system for the detection of enteroviruses in water. Lawyer.
28. DeLeon, Ricardo. Ph.D., 1989. Use of gene probes and an application method for the detection of rotaviruses in water. Head, Microbiology, Metropolitan Water District, LaVerne, CA.
29. Hinkle, Stephen. M.S., 1990. (Co-Advisor) Modeling colloid transport in saturated porous media: an assessment of the importance of pH and kinetics in virus transport. Hydrologist, State of Washington.
30. Cassels, Jenna Marie. M.S., 1990. Inactivation of *Naegleria fowleri* amoebas by copper, silver and chlorine. Research Microbiologist, MBX Corporation, Tucson, AZ
31. Luedeman, Rene Annette. M.S., 1990. (Co-advisor) Development of *in vitro* primary cell cultures from the penaeid shrimp, *penaeus stylirostris* and *penaeus vannamei* and evaluation of a potential application. Research Associate, University of Arizona, Tucson, AZ.
32. Soares, Ana Cristina Fermino. M.S., 1990. Occurrence of enteroviruses and *Giardia* cysts in sewage sludge before and after anaerobic digestion.
33. Zhou, Xia. M.S., 1991. Inactivation of *Escherichia coli* and coliphage MS-2 by chloramine and copper. Working for a biotechnology company in Los Angeles, CA.
34. Kinoshita, Takashi. M.S., 1991. Effects of pH and hydrophobicity on the transport of viruses and bacteria in saturated media. Working with a consulting Engineering Firm in Japan.
35. Chiou, Ipeng. M.S., 1991. (Co-advisor) Inactivation of *Listeria monocytogenes* by copper, silver ions and free chlorine. Microbiologist, Hunts Foods, Los Angeles, CA.
36. Straub, Timothy Mark. M.S., 1991. Inactivation of bacteriophages MS-2 and PRD1 and poliovirus type 1 in Pima clay loam and Brazito sandy loam soils amended with anaerobically digested sewage sludge. Research Scientist, Battelle Labs Northwest. Richmond, WA.
37. Abbaszadegan, Morteza. Ph.D., 1991. Detection of *Giardia* cysts by cDNA probe and application to water samples. Professor, Dept. of Environmental Engineering, Arizona State University, Tempe, AZ.

38. Huber, Mary Susan. M.S., 1992. Occurrence of enteric viruses in disposable diapers from three landfills.
39. Lenczewski, Melisa E. M.S., 1993. Comparative transport of bacteriophage and microspheres in an aquifer under forced-gradient conditions. Associate Professor, Dept. of Geology, University of Northern Illinois.
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43. Ma, Ju-Fang. Ph.D., 1995. Development of methods for concentration and detection of enteroviruses in water. Physician, NY.
44. Reynolds, Kelly A. Ph.D., 1995. Detection of enteroviruses in marine waters using RT-PCR. Associate Professor, Colege of Public Health, University of Arizona, Tucson, AZ.
45. Meng, Q.S. 1995. Comparative inactivation of enteric adenovirus, poliovirus, and coliphages by ultraviolet irradiation.
46. Johnson, Dana C. Ph.D., 1996. The fate of *Giardia* and *Cryptosporidium* in marine water. Microbiologist. San Jose, CA.
47. Crabtree, Kristina D. Ph.D., 1996. Risk assessment of virus in water. Assoicate Professor. College of Public Health, University of Texas, El Paso, TX.
48. Asthana, Seema, M.S. 1996. Influence of hydrocarbons on the virulence factors associated with *Pudomonas aeruginosa*, Senior Research Assistant, Gen-Probe, San Francisco, CA.
49. Carroll, Sean M. M.S., 1996. Evaluations of virus removal by sandy soils during soil-aquifer treatment using indigenous bacteriophage as indicator organisms. Consulting Engineering Firm, Boulder, CO.
50. Falabi, Jeanne A. M.S., 1996. Pathogen removal by duckweed (*Lemna gibba* L.) - covered pond.
51. Vinlvan, Edlin Artruz. M.S., 1996. Survival of microbial indicators in a constructed wetland.

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53. Thurston, Jeanette Ann. M.S., 1997. Fate of pathogenic and indicator microorganisms in two subsurface multispecies constructed wetlands. Director, Epidemiology and Food Safety, NRI, USDA, Washington, DC.
54. Kamper, Matthew Frederic. M.S., 1997. The occurrence of microsporidia in environmental waters.
55. Nokes, Rita Lynn. M.S., 1998. Reduction of enteric viruses in small scale, subsurface flow constructed wetlands. Graduate Student, Northwestern University, Chicago, IL.
56. Papp, Julie Dawn. M.S., 1998. The concentration of animal waste to the microbial load of municipal solid waste. Reserved Technician, City of Hope, Los Angeles, CA.
57. Sabalos, Constantine Marc. M.S., 1998. Detection of enteric viruses in treated wastewater sludge using cell culture and molecular methods. Microbiologist. Biotechnology Company, Tucson, AZ.
58. Manshadi, Faezeh Dehghan. M.S., 1998. Occurrence of indicator and pathogenic enteric microorganisms in natural wetlands. Research Associate, Arizona State University.
59. Watson, Suzanne Michelle. M.S., 1999. Bacterial Survival during laundering with and without disinfectants. Microbiologist East Bay Municipal District, Oakland, CA.
60. Mahalahabis, Madhumita. M.S., 1999. Detection of infectious poliovirus by multiple passage ICC-PCR and cell culture. Graduate student, University of Washington, Seattle, WA.
61. Chaidez, Quiroz Cristobal. Ph.D., 1999. Risk assessment of selected opportunistic pathogens in drinking water: Director, Centro de Investigacion en Alimentacion y Desarrollo, Culican, Mexico.
62. Quinonez-Diaz, Maria de J. Ph.D., 1999. Removal of pathogens and indicator organisms by natural wetlands. Microbiologist. Centro de Investigacion en Alimentacion y Desarrollo, Culiacan, Mexico.
63. Karim, Mohammad R. Ph.D., 1999. Survival of indicator bacteria and enteric pathogens in wetlands. Research Microbiologist, U. S. Environmental Protection Agency. Cincinnati, OH.
64. Watt, Pamela. M.S., 1999. Research Specialist, Agricultural Research Service, USDA, Salinity Labs, Riverside, CA.
65. Sanchez, Luis R., Ph.D. 1999. Pathogen removal in dairy wastewater using a wastewater constructed treatment system with wetland cells. Quality Control Supervisor, produce company, Los Angeles, CA.

66. Gramos, Dawn M. M.S. 2000. Inactivation of selected enteric viruses using ultraviolet light. Hazardous Waste Risk Manager. U.S. Dept. of Defense. Kwajalein Atoll, Marshall Islands.
67. John, David. M.S. 2000. Inactivation of *Encephalitozoon intestinalis* by chlorine and ultraviolet light. Research Associate, University of South Florida.
68. Vladich, Frank, M.S. 2000. Development of a method for concentration of microsporidia from water. Research Specialist, University of Arizona, Tucson, AZ.
69. Vidales, Juan A. Ph.D. 2001. Removal of viruses and pollution indicators in constructed wetlands. Professor, Univ. of Monterrey, Mexico.
70. Alum, Absar, Ph.D. 2001. Control of viral contamination of reclaimed irrigated vegetables by drip irrigation. Research Associate, Arizona State University, Tempe, AZ.
71. Thurston, Jeanette A. Ph.D., 2001. Occurrence of human pathogens microsporidia in irrigation water and ultraviolet light and chlorine inactivation of enteric adenovirus type 40 and feline calicivirus. Director, Epidemiology and Food Safety, NRI, USDA, Washington, DC.
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73. Crenshaw, Tristen. N. M.S., 2002. Survival of enteric bacteria in chicken manure utilized as vegetable crop fertilizer. Research Specialist, University of Arizona.
74. Carreon, Joesph. D. M.S., 2003 Risk of infection by *Campylobacter*, *Salmonella*, and Norwalk virus in commercially grown oysters: a novel application of quantitative microbial risk assessment. Research Assistant, George Washington University, Washington.
75. Seidel, Georgetta Ph.D., 2003 Detection on non-CPE producing enteroviruses via ICC-PCR at waste water land application sites in Arizona and California; Endocrine disruption activity after wetland, pond, and soil aquifer treatment of wastewater. Senior Epidemiologist, Tucson Medical Center, Tucson, AZ.
76. Manshadi, Fashi. D. Ph.D., 2003. Occurrence of pathogenic and indicator microorganisms on produce irrigated with dairy wastewater. Research Assistant. Arizona State University. Phoenix, AZ.
77. Kayed, D. Ph.D. 2003. Microbial quality of irrigation water used in the production of fresh produce in Arizona. Microbiologist. Phoenix, AZ.
78. Bright, K. Ph.D. 2003. Reduction of pathogenic bacterial populations on stainless steel by silver and zinc ions: potential use in preventing cross contamination of environmental surfaces. Assistant Research Scientist, University of Arizona. Tucson, AZ.

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80. Balkhyour, M. Ph.D. 2004. Factors that affect respirator fit- testing programs. Professor, Saudi Arabia.
81. Tanner, B. D. Ph.D. 2004. Aerosolization of microorganisms and risk of infection from reuse of wastewater residuals. Research Scientist, Clorox Company. Pleasanton, CA.
82. Stine, S. W. Ph.D. 2004. Survival of enteric pathogens on the surface of fresh produce and intake of heterotrophic bacteria in the United States. U. S. Environmental Protection Agency. Dallas, TX.
83. Sutton, S. J. M.S. 2004. Inactivation of *Encephalitozoon intestinalis* by chlorine dioxide. Microbiologist. Aerotech Labs, Phoenix, AZ.
84. Law, B. F. Ph.D. 2005. Assessment of the pathogenicity of *Campylobacter* from broiler chickens. Associate Research Scientist, University of Arizona.
85. Boone, S. 2005. Ph.D. Occurrence and persistence of viruses on fomites. Research Scientist, Agricultural Research Service, United States Department of Agriculture, New Orleans, LA..
86. Jones, E. L. Ph.D. 2006. Norovirus in recreational waters of Arizona. Microbiologist. Public Health Specialist. Clorox Company. Pleasanton, CA.
87. Black, S. M.S. 2006. Determination of Ct values of resistant enterovirus by chlorine inactivation. Research Specialist, University of Arizona.
88. Bronson-Lowe, D. L. Ph.D. 2006. Impact of an environmental hygiene intervention on illness and microbial levels in child care centers. Epidemiologist. State of Arizona Department of Health. Phoenix, AZ.
89. Chattman, M. M.S. 2006. Bacterial contamination of liquid hand soaps. Research Technician. University of Arizona. Tucson, AZ.
90. Blair, Barbara. M.S. 2006. Occurrence of *Naegleria fowleri* in wells in Arizona.
91. Castro, Nehelia. 2007. Ph.D. Survival of enteric bacteria and viruses in biosolids. Research Scientist, Center for Food Safety and Biotechnology. Culiacan, Mexico.
92. Goartares-Moroyoqui, Pablo. 2007. Ph.D. Microbiological water quality in irrigation water, treated wastewater, and untreated wastewater and its impact on vegetables in Sonora, Mexico. Director of Biotechnology Programs, Sonora Institute of Technology. Obregon, Sonora.

93. Ruelas, Enue Erdemely Sicaros. 2007. Ph.D. The development of alternative methods of disinfection. Research scientist. The Clorox Company. Pleasanton, CA.
94. Marrero-Ortiz, Roberto. 2007. Ph.D. Assessment of the microbial and chemical water quality of individual and small water groundwater supplies in Arizona. Research Associate. WI.
95. Rodriguez, R. A. 2007. Ph.D. Occurrence of enteric viruses on combined sewer overflows. Postdoctoral Fellow. University of North Carolina. Chapel Hill, NC.
96. Carpenter, K. 2007. M. S. The ecology of bacterial pathogens and *Salmonella* in Irrigation canals. Laboratory Manager. The Clorox Company. Oakland, CA
97. Moghe, A. 2007. M.S. Persistence of bacteria on fomites.
98. Carpenter, K. S. 2007. M.S. Occurrence and survival of fecal bacteria in water and sediment from canals used to irrigate produce. Microbiology Laboratory Manager, Clorox Company, Pleasanton, CA.
99. Henley, J. B., 2008. M.S. Determining inactivation rates of viruses on indoor surfaces. Research Tech. Midwest University, Phoenix, AZ.
100. Sarkar, P. 2008. Ph.D. Occurrence and control of *Naegleria fowleri* in well water. Postdoctoral Research Fellow. Dept. of Environmental Science, University of Calif., Riverside.
101. Gundy, P. 2008. M.S. Survival of coronaviruses in water and wastewater. Senior Research Specialist. University of Arizona. Tucson, AZ.
102. Fong, Florence. 2008. M.S.
103. Fankem, S. L. Ph.D. 2009. The role of fomites in the transmission of norovirus. Postdoctoral Fellow, University of Arizona, Tucson, AZ.
104. Yepiz, Maria Suanaa. Ph.D. 2009. Occurrence of bacteria in dishcloths used in restaurants and survival of respiratory viruses on produce. Assistant Professor, University of Sonora.
105. Nordstrom, J. M. Ph.D. 2009. Evaluation of the occurrence and risk of microbes in laundry and laundry-associated surfaces. Director risk management, Veterans Hospital, Tucson, AZ.
106. Fillar, J., M.S. 2009. Bacteria persistence in sediments. Environmental scientist. Consulting environmental firm in Tucson, AZ.

#### POSTDOCTORAL FELLOWS

1. Dr. Samuel Farrah, Professor of Microbiology, Department of Microbiology and Cell Science, University of Florida, Gainesville, FL.
2. Dr. Pierre Payment, Professor of Microbiology, Institute Armand-Frappier, University of Quebec, 531, Blv. Des Prairies, Laval-des-Rapides, Quebec, Canada.
3. Dr. Sagar Goyal, Professor of Microbiology, Veterinary Diagnostic Laboratories, College of Veterinary Medicine, University of Minnesota, St. Paul, MN.
4. Dr. Bruce Keswick, Director, Director of Global Microbiology, Proctor and Gamble Co., Cincinnati, OH.
5. Dr. Thomas Hejkal, Physician, Lincoln, NE.
6. Dr. De-Shin Wang, Compac Computers, Houston, TX.
7. Dr. Marylynn Yates, Professor , Department of Soil and Environmental Science, University of California, Irvine, CA.
8. Dr. Shri N. Singh, Professor, Director of Diagnostic Microbiology, University of Kentucky, Hopkinsville, KY.
9. Dr. Susan Stramer, Research Scientist, Centers Disease Control, Atlanta, GA.
10. Dr. Susan M. Bradford (Kutz), Private consultant to the water industry, Fountain Valley, CA.
11. Dr. Joan Rose, Professor, Department of Fisheries and Wildlife, Michigan State University, East Lansing, MI
12. Dr. Aarron Margolin, Professor and Chairman, Department of Microbiology, University of New Hampshire, Durham, NH.
13. Dr. Morteza Abbaszadegan, Professor, Department of Environmental Engineering, Arizona State University, Tempe, AZ.
14. Dr. David K. Powelson, Assistant Research Scientist, University of Florida, Gainesville.
15. Dr. Timothy Straub, Research Scientist, Battelle Labs Northwest. Richmond, WA.
16. Dr. Patricia Rusin, Associate Research Scientist, Dept. of Soil, Water and Environmental Science, University of Arizona, Tucson, AZ.
17. Dr. Carlos Enriquez, Professor, Xavier College, CA

18. Dr. Dana Johnson, Microbiologist, San Jose, CA.
19. Dr. Kelly Bright, Assistant Research Scientist, University of Arizona, Tucson, AZ.
20. Dr. Stephanie Boone, Research Scientist, Agricultural Research Service, New Orleans, LA.
21. Dr. Ryan Sinclair, Assistant Professor, Loma Linda University, Calif.

# **EXHIBIT 2**

## Exhibit 2

- Chetochine, A. S., M. L. Brusseau, C. P. Gerba and I. L. Pepper. 2006. Leaching of phage from class B biosolids and potential transport through soil. *Appl. Environ. Microbiol.* 72:665-671.
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- Brooks, J. P., C. P. Gerba and I. L. Pepper. 2004. Biological aerosol emission fate, and transport from municipal and animal wastes. *J. Residuals Sci. Technol.* 1:16-28.
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- Pepper, I. L., J. P. Brooks, R. G. Sinclair, P. L. Gurian and C. P. Gerba. 2010. Pathogens and indicators in United States class B biosolids: national and historic distributions. *J. Environ. Qual.* 29:1-6.
- Zeraghi, H., C. P. Gerba, J. P. Brooks and I. L. Pepper. 2010. Long-term effects of class B biosolids on soil microbial population, pathogens and activity. *J. Environ. Qual.* 39:402-408.
- Zeraghi, H., J. P. Brooks, C. P. Gerba and I. L. Pepper. 2010. Influence of long-term land application of class B biosolids on soil diversity. *J. Appl. Microbiol.* 109:698-706.

Castro-Del Campo, N., E. Espinoza, J. B. Valdez-Torres, C. P. Gerba and C. Chaidez. 2010. Comparison of *Salmonella enterica* subsp. *enterica* survival in agricultural soil amended with vermicompost and class A biosolids. *J. Residuals Sci. Technol.* 7:81-85.

Suleiman, W., C. P. Gerba, A. H. Tamimi, R. J. Freitas, A. Al Sheraideh and B. Hayek. 2010. Management of sludge and biosolid treatment and disposal in Jordan. *J. Residuals and Technol.* 7:63-67.