

Bruce M. Applegate

A. GENERAL INFORMATION

1. Academic Record

| <u>Degree Received</u> | <u>Institution</u> | <u>Date</u> |
|------------------------|--|-------------|
| A.S. Chemistry | Volunteer State Community College, Gallatin TN | 1985 |
| B.A. Microbiology | University of Tennessee, Knoxville | 1987 |
| Ph.D. Microbiology | University of Tennessee, Knoxville | 1997 |

2. Dates and rank of appointments held:

| | |
|---|--------------|
| Associate Professor, Departments of Food Science and Biological Science (courtesy appointment), Purdue University | 2009-present |
| Associate Professor, Department of Food Science, Purdue University | 2005-2008 |
| Assistant Professor, Department of Food Science, Purdue University | 2001-2005 |
| Research Assistant Professor, Department of Microbiology and Center for Environmental Biotechnology, University of Tennessee, Knoxville | 1999-2000 |
| Adjunct Faculty, Roane State Community College, Harriman, Tennessee | 1998-2000 |
| Senior Research Associate, Center for Environmental Biotechnology, University of Tennessee, Knoxville | 1997-1999 |
| Research and Teaching Assistant, Department of Microbiology, University of Tennessee, Knoxville | 1991-1997 |
| Lab Manager, Center for Environmental Biotechnology, University of Tennessee, Knoxville | 1988-1990 |
| Research Technician, Center for Environmental Biotechnology, University of Tennessee, Knoxville | 1987-1988 |

3. Memberships in Scientific, Professional, and Honorary Organizations

American Society of Microbiology
Institute of Food Technologists (Professional Member)
Hoosier Section of Institute of Food Technologists
International Association of Food Protection

4. Awards and Honors

| | |
|--|-----------|
| Entrepreneurship Leadership Academy Fellowship | 2013-2014 |
| College of Agriculture Millionaires Club | 2006-2013 |
| Purdue University Seed for Success Award | 2006-2013 |
| ESGR Patriotic Employer Award* | 2009 |
| NASA Inventions and Contributions Board Award | 2009 |
| Agriculture Team Award | 2006 |

*The Employer Support of the Guard and Reserve Patriotic Employer award was presented to Dr. Applegate for supporting his Ph.D. student Major Udit Minocha during his deployments to Kosovo and Iraq during his graduate studies.

B. Excellence in Discovery, Scholarship, and Creative Endeavor (Primary)

1. Description of Research Program

Dr. Applegate's research consists of both an applied and fundamental focus using molecular approaches to develop platforms for the detection of pathogenic bacteria in various matrices. His research efforts also use bacterial luminescence and imaging as a powerful tool to examine important environmental processes associated with bacteria (pathogens/spoilage) including: survival, inactivation, and dissemination (Farm to Fork). His core research on bioluminescence is a nucleator for his multidisciplinary research efforts across campus. He currently is working in four areas of research:

a. Bacteriophage based detection and inactivation of pathogens: Dr. Applegate has an extensive research effort exploiting the host/bacteriophage relationship of pathogenic bacteria and their corresponding phage to improve food safety. Phage have unique properties making them excellent platforms for pathogen detection: they have specificity at the strain level, a single parent phage particle can multiply to hundreds of progeny particles in less than an hour inside their specific host, and their amenability to genetic modification. Currently, Dr. Applegate is pursuing phage detection involving strategies combining immobilization with colorimetric and luminescence based simple visual interrogation method for live pathogens. For example, he has developed a luminescence based phage for the detection of live *E. coli* O157:H7 cells from food during the broth enrichment step, providing a simple easy-to-use low cost detection platform. The assay can be easily integrated with the currently used official methods used both by the Food Safety Inspection Service (FSIS) and other pathogen testing laboratories. The approach is being expanded for detection of other Shiga-toxin producing *E. coli* (STEC), *Salmonella* spp., and *Campylobacter* spp. He is also pursuing a second line of research using bacteriophage as method of inactivation of foodborne pathogens in preharvest applications. In collaboration with colleagues he is exploring the use of phage based coatings for seeds to prevent the colonization of plants from the rhizosphere during germination with foodborne pathogens. This approach is also being expanded to include plant pathogens as well with initial trial efforts to focus on *Acidovorax* contamination of watermelons which causes significant economic loss to melon growers. In another collaborative effort, Dr. Applegate is testing the efficacy of using phage for the reduction of *Salmonella* spp. in ground poultry products using a bioluminescent host to determine key parameters in situ.

b. Use of bioluminescence for in situ examination of bacterial physiology: Dr. Applegate also employed bioluminescence to study gene expression and physiology of bacterial cells for which he inserted *lux* gene cassettes downstream from user-specific promoters. Bioluminescence is an excellent monitoring tool as it has low backgrounds and the availability of ultra-sensitive light detectors results in excellent sensitivities and limits of detections and spatial determination of microbes in situ. The bioluminescence constructs have been used to provide information on carbon utilization (energy) by pathogens in situ to understand how these bacteria persist in the environment. Collaborative efforts using this approach have provided insight into key factors in fruit and vegetable contamination in the rhizosphere by monitoring carbon utilization in situ.

c. Use of bioluminescence to study in situ inactivation: Bioluminescence has been utilized extensively in toxicity assays in the commercial Microtox (Azur Environmental, Carlsbad, CA) format to determine aqueous toxicity in water samples. Furthermore, bioluminescence will not persist after cell death, thus the technique is an attractive way to study cell viability. Dr. Applegate is currently utilizing bioluminescence to examine inactivation in situ using light monitoring devices integrated with computers to provide real time monitoring of bacterial

inactivation. In collaboration with Dr. Youngblood on antimicrobial polymers the luminescent approach provided crucial information on their in situ activity in real-time allowing modelling of inactivation. These studies supported previously patented formulations and aided in the licensing of the technology for commercial use. Most recently Dr. Applegate, in collaboration with Dr. San Martin constructed a high pressure chamber with a quartz sapphire window allowing real time monitoring of luminescence in bacteria under high pressures. This work determined that at low pressures the effect on luminescence was reversible until certain threshold pressures were achieved which resulted in bacterial inactivation. This work is similar to previous work in which a biosensor was built for real-time monitoring of inactivation kinetics of pathogens to chlorine dioxide gas. This luminescence in situ monitoring approach has also been used to examine the effect of nanoemulsions and other aqueous based biocides in real time. As described above, the use of phage as an inactivation strategy for foodborne pathogens has been commercialized for certain applications, however, most efficacy determinations are based on reduction of pathogens which do not reflect in situ phage activity. Dr. Applegate's group published the first report of using luminescence to monitor phage inactivation of bacteria in real time. Using T4 (lytic phage) and a bioluminescent *E. coli* host, his group was able to determine kinetics of phage inactivation and phage concentration based on luminescence intensity. Real time results also allow insight into both the kinetics and the mechanisms of bacterial inactivation which cannot be determined using traditional methods.

d. Bacterial community analysis using a light scattering sensor for evaluation of inactivation: Luminescence based approaches for monitoring bacterial inactivation may have limitation for use in the field due to their recombinant nature. Therefore, Dr. Applegate has begun research using recently developed technology referred to as BARDOT (BACTERIAL Rapid Detection using Optical scattering Technology) in collaboration with Dr. Bhunia for determining viable bacterial community structure. This technology is based on scatter pattern imaging signatures and identifies bacterial colonies from their formation of complex multiorganism structures. The system is automated and scans petri plates producing an addressable map followed by pattern analysis. This microbial community analysis using the BARDOT technology has been used to compare the number and diversity of culturable organisms before and after processing. In an ongoing research project with Millisecond Technologies using a micro spray approach for milk pasteurization involving a pressure drop and rapid temperature increase, Dr. Applegate used BARDOT to examine the microbial community of raw milk pre and post treatment. When post treatment samples were examined the only survivors were spore formers at very low concentrations indicating the successful removal of vegetative organisms which consisted of a diverse community in the raw milk. These results validate that this novel pasteurization method has the potential to extend the refrigerated shelf-life of pasteurized milk to greater than 90 days. This work was recently presented at Aseptipak Europe (Warsaw, Poland) and was well received. This same community analysis approach is currently being applied to fruits and vegetables being treated with high voltage atmospheric plasma in collaboration with Dr. Keener to determine if loss of diversity can be utilized in field production environments. BARDOT-based bacterial community analysis data will provide information to farmers and food processors to make adjustments to their decontamination, interventions, and processing protocols to reduce problematic microbes to improve food safety and quality and prevent foodborne disease outbreaks.

1. Published Work since 2005

a. Patents and Disclosures (5 prior to 2005)

Issued

6. *Bioluminescent bioreporter integrated circuit detection methods*. Michael L. Simpson, Michael J. Paulus, Gary S. Sayler, Bruce M. Applegate, Steven A. Ripp. Patent # 6905834 (Jun 14, 2005)
7. *Cellular transcriptional logic devices*. Gary S. Sayler, Michael L. Simpson, Bruce M. Applegate, James T. Fleming. Patent # 7020560 (March 28, 2006)
8. *Bioluminescent bioreporter integrated circuit devices and methods for detecting estrogen*. Michael L. Simpson, Michael J. Paulus, Gary S. Sayler, Bruce M. Applegate, Steven A. Ripp. Patent # 7090992 (Aug 15, 2006)
9. *Bioluminescent bioreporter integrated circuit devices and methods for detecting ammonia*. Michael L. Simpson, Michael J. Paulus, Gary S. Sayler, Bruce M. Applegate, Steven A. Ripp. Patent # 7208286 (April 24, 2007)
10. *Microluminometer chip and method to measure bioluminescence*. Michael L. Simpson, Michael J. Paulus, Gary S. Sayler, Bruce M. Applegate, Steven A. Ripp. Patent # 7371538 (May 13, 2008)
11. *Methods for generation of reporter phages and immobilization of active bacteriophages on a polymer surface*. Bruce M. Applegate, Lynda L. Perry, Mark T. Morgan, Aparna Kothapalli. (2012) #8114622.

Pending

1. *Online real-time water quality monitoring and control system incorporating systems for automated microbiological testing and one-step DNA detection*. Bruce Applegate, Michael Kane, Sergei Savikhin, James Walsh, Paul Duffy, Gerry Woods. Filed: May 7, 2012. Application # US2012/0289423 A1
2. *Continuous-flow solar ultraviolet disinfection system for drinking water*. Ernest Blatchley, Bruce M. Applegate, Eric Gentil Mbonimpa, Bryan Vadheim. Filed: August 29, 2012. Application # PCT/US12/052767.

b. Refereed Papers (Prior to 2005, Dr. Applegate had 20 publications with an average impact factor of 5.63.)

Journal Information of Published and Submitted Articles after 2005

| Journal | Impact factor^a | Articles | Quartile | Primary ISI Category | Journal Rank |
|---|----------------------------------|-----------------|-----------------|--|---------------------|
| <i>Canadian Journal of Microbiology</i> | 1.316 | 1 | Q4 | Microbiology | 95/119 |
| <i>International Endodontics Journal</i> | 2.322 | 1 | Q2 | Dentistry Oral Surgery and Medicine | 21/82 |
| <i>Biophysics Journal</i> | 3.976 | 1 | Q2 | Biophysics | 16/74 |
| <i>Biosensors and Bioelectronics</i> | 6.054 | 1 | Q1 | Biotechnology and Applied Microbiology | 16/165 |
| <i>Biomacromolecules</i> | 6.034 | 5 | Q1 | Chemistry Organic | 5/58 |
| <i>Journal of Food Safety</i> | 0.851 | 1 | Q3 | Food Science and Technology | 84/123 |
| <i>Journal of Applied Physics</i> | 2.259 | 1 | Q2 | Applied Physics | 37/136 |
| <i>Environmental Science & Technology</i> | 6.277 | 2 | Q1 | Environmental Sciences | 9/225 |
| <i>International Journal of Phytoremediation</i> | 1.817 | 1 | Q3 | Environmental sciences | 109/215 |
| <i>Water, Air and Soil Pollution</i> | 1.943 | 1 | Q2 | Water Resources | 30/79 |
| <i>Applied Microbiology and Biotechnology</i> | 4.138 | 1 | Q1 | Biotechnology and Applied Microbiology | 29/165 |
| <i>International Journal of Nanomedicine</i> | 4.53 | 1 | Q2 | Nanoscience and Nanotechnology | 21/73 |
| <i>Macromolecular Research</i> | 1.484 | 1 | Q3 | Polymer Science | 44/82 |
| <i>FEMS Microbiology Letters</i> | 2.448 | 1 | Q3 | Microbiology | 64/119 |
| <i>Journal of Microbiological Methods</i> | 2.326 | 1 | Q3 | Microbiology | 70/119 |
| <i>Journal of Food Protection</i> | 1.974 | 1 | Q2 | Food Science and Technology | 45/123 |
| <i>Food Control</i> | 3.038 | 1 | Q1 | Food Science and Technology | 22/123 |
| <i>LWT - Food Science and Technology</i> | 3.019 | 1 | Q1 | Food Science and Technology | 23/123 |
| <i>The Annual Review of Analytical Chemistry</i> | 11.313 | 1 | Q1 | Analytical Chemistry | 1/76 |
| <i>Inorganic Chemistry</i> | 4.661 | 1 | Q1 | Chemistry Inorganic and Nuclear | 4/44 |
| <i>Soil Biology and Biochemistry</i> | 4.785 | 1 | Q1 | Soil Science | 1/33 |
| <i>American Journal of Experimental Agriculture</i> | * | 1 | * | * | * |

^aJournal 5-year impact factor, quartile, primary ISI category and journal rank were compiled from the 2013 Journal Citation Reports Edition. * Not available

c. List of refereed publications (average impact factor 4.05)

21. Sedgley, C. M., *A. C. Nagel, D. Hall, B. Applegate. 2005. Influence of irrigant needle depth in removing bioluminescent bacteria inoculated into instrumented root canals using real-time imaging in vitro. *International Endodontics Journal*. 38(2):97-104.
22. Perry, L. L., *N. G. Bright, R. J. Carroll, Jr., M. C. Scott, M. S. Allen, and B. M. Applegate. 2005. Molecular characterization of autoinduction of bioluminescence in the Microtox® indicator strain *Vibrio fischeri* ATCC 49387. *Canadian Journal of Microbiology*. 51(7):549-557.
23. Smith, M. J., P. E. Sheehan, L. L. Perry, K. O'Connor, L. N. Csonka, B. M. Applegate and L. J. Whitman. 2006. Quantifying the magnetic advantage in magnetotaxis. *Biophysics Journal*. 91(3):1098-1107.
24. Kim, H., M. D. Kane, S. Kim, *W. Dominguez, B. M. Applegate and S. A. Savikhin. 2007. Molecular beacon DNA microarray system for rapid detection of *E. coli* O157:H7 eliminating false signal risk. *Biosensors and Bioelectronics*. 22(6):1041-1047.
25. Sellenet, P. H., B. Allison, B. M. Applegate, and J. P. Youngblood. 2007. Synergistic activity of hydrophilic modification in antibiotic polymers. *Biomacromolecules*. 8(1):19-23.
26. Allison, B. C., B. M. Applegate, and J. P. Youngblood. 2007. Hemocompatibility of hydrophilic antimicrobial copolymers of alkylated 4-vinylpyridine. *Biomacromolecules*. 8 (10):2995-2999.
27. Perry, L., *P. Heard, M. Kane, H. Kim, S. Savikhin, *W. Dominguez, B. Applegate. 2007. Application of multiplex polymerase chain reaction to the detection of pathogens in food. *Journal of Food Safety*. 15(2):176-198.
28. Krichevsky, A., M. J. Smith, L. J. Whitman, M. B. Johnson, T. W. Clinton, L. L. Perry, B. M. Applegate, K. O'Connor, L. N. Csonka. 2007. Trapping motile magnetotactic bacteria with a magnetic recording head. *Journal of Applied Physics*. 101(1):14701-14706.
29. Tong, Z, M. Bischoff, L. Nies, B. Applegate, and R. F. Turco. 2007. Impact of fullerene (C60) on a soil microbial community. *Environmental Science and Technology*. 41(8):2985-2991.
30. Ho C., B. Applegate, and M. K. Banks. 2007. Impact of microbial/plant interactions on the transformation of polycyclic aromatic hydrocarbons in rhizosphere of *Festuca arundinacea*. *International Journal of Phytoremediation*. 9(2):107-114.
31. Bakhmutova-Albert, E. V., D. W. Margerum, *J. G. Auer, and B. M. Applegate. 2008. Chlorine dioxide oxidation of dihydronicotinamide adenine dinucleotide (NADH). *Inorganic Chemistry*. 47:2205-2211.
32. Habteselassie, M., M. Bischoff, E. Blume, B. Applegate, B. Reuhs, S. Brouder, and R. F. Turco. 2008. Environmental controls on the fate of *Escherichia coli* in soil. *Water, Air and Soil Pollution*. 190:143-155.
33. *del Busto-Ramos, M., M. Budzik, C. Corvalan, M. Morgan, R. Turco, D. Nivens and B. Applegate. 2008. Development of an on-line biosensor for in situ monitoring of chlorine dioxide gas disinfection efficacy. *Applied Microbiology and Biotechnology*. 8:573-580.
34. Park, M., M. K. Banks, B. M. Applegate, T. J. Webster. 2008 Influence of nanophase titania topography on bacterial attachment and metabolism. *International Journal of Nanomedicine*. 3(4):1-8.

35. Perry, L. L., P. SanMiguel, *U. Minocha, A. I. Terekhov, *M. L. Shroyer, L. A. Farris, N. Bright, B. L. Reuhs, and B. M. Applegate. 2009. Sequence analysis of *Escherichia coli* O157:H7 bacteriophage ΦV10 and identification of a phage-encoded immunity protein that modifies the O157 antigen. *FEMS Microbiology Letters*. 292(2):182-186.
36. Stratton T. R., R. E. Garcia, B. M. Applegate, and J. P. Youngblood. 2009. Application of a high throughput bioluminescence-based method and mathematical model for the quantitative comparison of polymer microbicide efficiency. *Biomacromolecules*. 10(5): 1173-1180.
37. Kim S., B. Schuler, A. Terekhov, *J. Auer, L. J. Mauer, L. Perry, and B. Applegate. 2009. A bioluminescence-based assay for enumeration of lytic bacteriophage. *Journal of Microbiological Methods* 79:18-22.
38. Stratton T. R., J. A. Howarter, B. C. Allison, B. M. Applegate, J. P. Youngblood. 2010. Structure–activity relationships of antibacterial and biocompatible copolymers. *Biomacromolecules*. 11(5):1286-1290.
39. Choi, J. H., S. Lee, H. Kang, J. Y. Lee, J. Kim, H. Yoo, T. R. Stratton, B. M. Applegate, J. P. Youngblood and H. K. Kim. 2010. Synthesis of water-soluble chitosan-g-PEO and its application for preparation of superparamagnetic iron oxide nanoparticles in aqueous media. *Macromolecular Research* 18(5):504-511.
40. Habteselassie, M., M. Bischoff, B. M. Applegate, B. Reuhs, and R. F. Turco. 2010. Understanding the role of agricultural practices in the potential colonization and contamination by *E. coli* in rhizosphere of fresh produce. *Journal of Food Protection*. 73(11):2001-2009.
41. Stratton T. R., B. M. Applegate, and J. P. Youngblood. 2011. Effect of steric hindrance on the properties of antibacterial and biocompatible copolymers. *Biomacromolecules*. 12(1):50-56.
42. Tong, Z., M. Bischoff, L. F. Nies, P. Myer, B. M. Applegate and R. F. Turco. 2012. Response of soil microorganisms to As-produced and functionalized single-wall carbon nanotubes (SWNTs). *Environmental Science & Technology*. 46(24):13471-13479.
43. Serrano-Niño, J. C., A. Cavazos-Garduño, A. Hernandez-Mendoza, B. Applegate, M. G. Ferruzzi, M. F. San Martín-González, H. S. García. 2013. Assessment of probiotic strains ability to reduce the bioaccessibility of aflatoxin M1 in artificially contaminated milk using an in vitro digestive model. *Food Control*. 31: 202-207.
44. *Duarte-Gómez, E. E., D. Graham, M. Budzik, B. Paxson, L. Csonka, M. Morgan, B. Applegate, and M. F. San Martín-González. 2014. High hydrostatic pressure effects on bacterial bioluminescence. *LWT - Food Science and Technology* 56(2):484-493.
45. Cho, I. H., A. D. Radadia, *K. Farrokhzad, E. Ximenes, E. Bae, A. K. Singh, H. F. Oliver, M. Ladisch, A. Bhunia, B. Applegate, L. Mauer, R. Bashir, and J. Irudayaraj. 2014. Nano/micro and spectroscopic approaches to food pathogen detection. *Annual Reviews of Analytical Chemistry*. 7: 65-88.
46. Thomson, S., B. Applegate, R. Martyn, and A. Liceaga. 2014. Analysis of seed vigor responses in soybean to invasive silver carp protein hydrolysate treatments. *American Journal of Experimental Agriculture*. In press
47. Orr, M. J., M. Bischoff, B. Applegate, J. J. Volenec, S. M. Brouder, and R. F. Turco. 2014. Response of soil microbial community to establishment of perennial and annual biofuel feedstock production systems. *Soil Biology and Biochemistry*. In Review.

48. *Myer, P., W. Dominguez, W. Peters, R. Turco, B. Applegate. 2014. Application of the solvent effect on bioluminescent reporter bacteria as a real-time membrane toxicity assay. *Journal of Microbiological Methods*. Submitted

Contributions to above manuscripts. Dr. Applegate was corresponding author on publications numbered 22, 33, 35, 37, 48. Publications 21, 25, 26, 32, 33, 34, 36, 38, 39, 40, 41, 42, 44 all were based on or had significant components involving the use of bioluminescence in which Dr. Applegate provided both creative input in obtaining resources, experimental design, bacterial strains, analytical equipment and manuscript preparation. Publications 23 and 28 were a result of *Magnetospirillum* mutants constructed in Dr Applegate's laboratory lacking functional magnetosomes and collaborative work with Dr. Whitman's group both at Purdue and ONR. Publication 24 was the result of a multiplexed PCR approach in which primers and target sets were developed in Dr. Applegate's lab and then integrated with an optical platform constructed by Dr. Savikhin's group in Physics from funds secured by Dr. Applegate. Publications 27 and 45 are both review articles in which Dr. Applegate provided input for related text (Dr. Applegate's postdoc Lynda Perry was corresponding author on publication 7). Publication 31 was based on preliminary work generated in Dr. Applegate's laboratory which was subsequently expanded into a more detailed study in collaboration with Dr. Margerum's group. In publications 29, 30, 46, 47 Dr. Applegate provided expertise on environmental considerations for the experimental approaches as well as bacterial strains for the study in publication 27. Dr. Applegate played a minor role in publication 43 providing resources and suggestions for the resultant manuscript.

c. Proceedings (12 prior to 2005)

None

d. Book Chapters (5 prior to 2005)

5. Farris, L., M. Y. Habteselassie, L. Perry, Y. Chen, R. Turco, B. Reuhs, and B. Applegate. 2008. Luminescence techniques for the detection of bacterial pathogens. In *Principles of Bacterial Detection: Biosensors, Recognition Receptors and Microsystems*. M. Zourob et al. (eds.). pp 213-230.
6. *Minocha, U., M. Shroyer, P. Romero, and B. M. Applegate. 2012. Phage-based detection of foodborne pathogens. In *Handbook of Food Safety Engineering*. Da-Wen Sun (eds.). pp 190-216
7. *Farrokhzad, K., *C. Rosenfield, and B. Applegate. 2014. Bacteriophage technology in high throughput screening for detecting pathogens in food. In *High throughput screening for food safety assessment*. Arun Bhunia, Moon Kim, Chris R. Taitt (eds.).
8. *Myer, P., *M. del Busto Ramos, *L. Hartono and B. Applegate. 2014. Bioluminescent biosensors in non-fiber optic formats. In *Luminescent Microbial Biosensor Devices: Design, Construction and Implementation*. Gerald Thouand and Robert Marks (eds.) In Press.

e. Published Research Abstracts (58 prior to 2005)

59. Callahan Jr., D. J., J. Mathieu, B. Applegate, K. Ziemer, K. Bergman, and A. Sacco Jr. 2005. Inhibition of bioluminescent gene expression in whole-cell bacterial biosensors using a high temperature switch. 2005. American Institute of Chemical Engineers Annual Meeting. Cincinnati, OH.
60. Youngblood, J. P., P. Sellenet, B. C. Allison, and B. Applegate. 2005. Hydrophilized pyridinium bactericidal polymers. Fall National American Chemical Society Meeting. Washington, DC.
61. S. Kim, E. E. Igboegwu, A. I. Terekhov, and B. M. Applegate. 2005. Bioluminescent assay for evaluating bacteriophage infectivity in a food model. American Society for Microbiology General Meeting. Atlanta, GA.
62. *Hartono, L. , *M.L. Shroyer, *L. Farris, H. Diefus-Dux, R. Turco, B. Reuhs, and B. Applegate. 2005. Development of an *Escherichia coli* O157:H7 bioluminescent reporter for measuring bioavailable carbon. American Society of Microbiology General Meeting. Atlanta, GA.
63. Eggink A., J. Fiser, A. Terekhov, R. Turco, and B. Applegate. 2005. The effect of carbon nanoparticles on the infectivity of bacteriophage using a T4 phage-based/bioluminescent *Escherichia coli* assay. American Society of Microbiology General Meeting. Atlanta, GA.
64. *Dominguez, W., S. Kim, H. Kim, S. Savikhin, M. Kane, and B. M. Applegate. 2005. Multiplex PCR for the simultaneous detection of the foodborne pathogens: *Escherichia coli* O157:H7, *Salmonella enterica*, and *Listeria monocytogenes*. American Society for Microbiology General Meeting. Atlanta, GA.
65. Turco, R. F., B. M. Applegate, and T. Filley. 2005. Repercussion of carbon-based manufactured nanoparticles on microbial processes in environmental systems. Nanotechnology and the Environment: Applications and Implications Progress Review Workshop III. Arlington, VA.
66. Han, J., K. Bergman, B. Applegate, K. S. Ziemer, and A. Sacco Jr. 2006. Effect of temperature, analyte concentration and cell growth phase on the luminescence of *Pseudomonas putida* TVA8 induced by trichloroethylene. American Institute of Chemical Engineers Annual Meeting. San Francisco, CA.
67. *Chen, Y., *E. Halim, *L. Farris, R. Turco, B. Applegate, B. Reuhs. 2006. Characterizing carbon utilization patterns of *Salmonella enterica* serotype Poona using a bioluminescence reporter. Institute of Food Technologists Annual Meeting. Orlando, FL.
68. *Burgula, Y., M. Cousin, B. Applegate, R. Linton, B. Reuhs, and L. Mauer. 2006. Effects of processing treatments on FT-IR based classification of dead *E.coli* K12 cells in comparison to live cells. Institute of Food Technologists Annual Meeting. Orlando, FL.
69. *Chen, Y., *E. Halim, *L. Farris, R. Turco, B. M. Applegate, and B. Reuhs. 2006. Use of a bioluminescent *E. coli* O157:H7 for detection of bioavailable carbon associated with plant material. American Society of Microbiology General Meeting. Orlando, FL.
70. Habteselassie, M., M. Bischoff, B. L. Reuhs, B. Applegate, and R. Turco. 2006. Manure and contaminated irrigation water as vehicles of *E. coli* transmission to fresh produces. The American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America International Annual Meetings. Indianapolis, IN.

71. Tong, Z., M. Bischoff, L. Nies, B. Applegate, and R. Turco. 2006. The impact of fullerenes on the soil microbial community composition and function. The American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America International Annual Meetings. Indianapolis, IN.
72. Stratton, T. R., B. C. Allison, B. Applegate, and J. P. Youngblood. 2007. Synthesis, characterization, and biocompatibility of vinyl pyridine-based bactericidal polymer surfaces. Spring National American Chemical Society Meeting. Chicago, IL.
73. *del Busto-Ramos, M., M. Budzik, M. Morgan, C. Corvalan, and B. Applegate. 2007. Development of an on-line biosensor for in-situ monitoring of chlorine dioxide gas disinfection. American Society for Microbiology General Meeting. Toronto, ON.
74. *Auer, J., T. Taliaferro, A. Terekhov, and B. M. Applegate. 2007. Use of bioluminescent *E. coli* O157:H7 to investigate chlorine dioxide mechanism of inactivation. American Society for Microbiology General Meeting. Toronto, ON.
75. *Minocha, U., L. Perry, *L. Farris, A. Terekhov, B. Reuhs, and B. M. Applegate. 2007. Identification of a lipopolysaccharide-altering immunity protein encoded by the lysogenic *Escherichia coli* O157:H7-specific bacteriophage Φ V10. American Society for Microbiology General Meeting. Toronto, ON.
76. *Chen*, Y., *A. Curtis, L. Perry, *L. Farris, M. Habteselassie, R. L. Turco, B. Reuhs, and B. M. Applegate. 2007. Utilization of a chromosomally based bioluminescent *Salmonella enterica* Poona to examine wound parameters affecting cantaloupe contamination. American Society for Microbiology General Meeting. Toronto, ON. (* recipient of ASM travel award)
77. *Kothapalli, A., *U. Minocha, B. M. Applegate, and Mark Morgan. 2007. Novel antimicrobial packaging using bacteriophage. American Society for Microbiology General Meeting. Toronto, ON.
78. *Farris, L., A. Curtis, *Y. Chen, M. Habteselassie, R. Turco, B. Reuhs, and B. M. Applegate. 2007. Metabolic activation of *E. coli* O157:H7 on lettuce tissue at non-optimal storage temperatures. American Society for Microbiology General Meeting. Toronto, ON.
79. Peters, W., *W. Dominguez, A. Salinas, R. Turco, and B. M. Applegate. 2007. Application of the solvent effect on bioluminescent reporter bacteria as a membrane toxicity assay for carbon nanoparticles. American Society for Microbiology General Meeting. Toronto, ON.
80. *Chen, Y., *A. Curtis, *L. Farris, L. Perry, M. Habteselassie, R. L. Turco, B. Reuhs, and B. M. Applegate. 2007. In situ monitoring of *Salmonella enterica* Poona contamination of cantaloupes using a bioluminescence reporter. Institute of Food Technologists Annual Meeting. Chicago, IL.
81. Turco, R., M. Bischoff, Z. Tong, L. Nies, B. Applegate, and L. Nyberg. 2007. Nanoparticle impacts on soil microbiological functions. The American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America International Annual Meetings. New Orleans, LA.
82. *del Busto-Ramos, M., O. Campanella, M. Morgan, *J. Auer, and B. Applegate. 2008. Use of an on-line biosensor for in-situ monitoring of chlorine dioxide gas disinfection efficacy of *E. coli* O157:H7. American Society for Microbiology General Meeting. Boston, MA.
83. *Romero, P., L. Perry, M. Morgan, and B. M. Applegate. 2008. A *cobA*-based bacteriophage reporter for the rapid detection of *Escherichia coli* O157:H7. American Society for Microbiology General Meeting. Boston, MA.

84. *Tanner, P. E., R. Turco, B. Reuhs, B. Applegate, and M. Cousin. 2008. Visualization of attachment and internalization of a bioluminescent derivative of *Escherichia coli* O157:H7 ATCC 43895 on lettuce leaves. International Association for Food Protection Annual Meeting. Columbus, OH.
85. *Duarte-Gomez, E., B. Applegate, M. T. Morgan, M. F. San Martin-Gonzalez. 2009. Bioluminescence for monitoring real-time inactivation of *P. fluorescens* 5RL subjected to high hydrostatic pressure. American Society for Microbiology General Meeting. Philadelphia, PA.
86. *Minocha, U., D. Welkie, *P. Tanner, M-J. Orr, A. T. McCarthy, A. Bettasso, G. Wickham, D. Thompson, A. Bhunia, R. Turco, M. Cousin, and B. Applegate. 2010. Use of natural microbial flora to identify parameters associated with pathogen transference to leafy greens during primary production. American Society for Microbiology General Meeting. San Diego, CA.
87. *Farrokhzad, K*, *P. Tanner, J. Radcliffe, and B. Applegate. 2010. Studying the effect of plant extracts on attachment of pathogenic bacteria to intestinal tissue using a porcine model. American Society for Microbiology General Meeting. San Diego, CA. (*** recipient of PULSe Travel Award**)
88. Trinetta, V., R. H. Linton, B. M. Applegate, K. M. Keener, and M. Morgan. 2010. Comparison between E-beam irradiation and ozone treatment for pathogens inactivation on seeds. Institute of Food Technologists Annual Meeting. Chicago, IL.
89. Sequeira Mendonça, K., *E. Duarte-Gómez, A. K. Bhunia, and B. M. Applegate. 2011. Detection of protein expression using light-scattering sensor in *Salmonella enterica*, *P. fluorescens* and *E. coli*. American Society for Microbiology General Meeting. New Orleans, LA.
90. Erickson, L., *C. Vasquez, and B. Applegate. 2011. Bacterial expression of the MES1 from *Arabidopsis thaliana* for construction of a bioluminescent reporter for methyl salicylate. American Society for Microbiology General Meeting. New Orleans, LA.
91. Shehan, C., *E. Duarte-Gomez, F. San Martin-Gonzalez, and B. Applegate. 2011. The effect of pressure on bioluminescent reporter strains. American Society for Microbiology General Meeting. New Orleans, LA.
92. *Minocha, U., *P. Romero, J. Bourn, *C. Rosenfield, and B. Applegate. 2011. Detection of *Escherichia coli* O157:H7 using Φ V10cobA-kan lysogens. American Society for Microbiology General Meeting. New Orleans, LA.
93. *Duarte Gomez, E. E. , D. Graham, M. Budzik, B. Paxson, M. T. Morgan, L. Csonka, B. Applegate, and M. F. San Martin-Gonzalez. 2011. High hydrostatic pressure effect on *E. coli* heat stable and heat sensitive lux proteins. International Association for Food Protection Annual Meeting. Milwaukee, WI.
94. *Farrokhzad* K., *M. L. Shroyer, J. Patrick, B. Scholer, *N. Bright and B. Applegate. 2012. The study of two *Bacillus cereus* strains in pasteurized liquid egg. General Meeting Annual Meeting. Las Vegas, NV. (*** recipient of PULSe Travel Award**)
95. Pimentel-Gonzalez, D. J., *V. Rodriguez-Martinez, *E. Duarte-Gomez, K. Sequeira-Mendoza, B. Applegate, and F. San Martin-Gonzalez. 2012. Physical and antimicrobial properties of carvacrol nanoemulsions against a bioluminescent strain of *E. coli* O157:H7. 2012. Institute of Food Technologists Annual Meeting. Las Vegas, NV.

96. *Myer, P., U. Minocha, M. Morgan, and B. Applegate. 2012. In situ monitoring of bacteriophage/host interactions in milk using bioluminescence. Institute of Food Technologists Annual Meeting. Las Vegas, NV.
97. *Broady, A., P. Turner, *K. Farrokhzad, K. Parker, B. Applegate, and M. Morgan. 2013. Efficacy of chlorine dioxide gas at penetrating romaine lettuce tissue. American Society for Microbiology General Meeting. Denver, CO.
98. *Vasquez-Mejia, *C. M., *J. G. Auer, *E. E. Duarte-Gomez, *V. Rodriguez-Martinez, W. A. Peer, B. Applegate, and F. San Martin. 2013 The effect of 5-isopropyl-2-methylphenol on a bioluminescent strain of *E. coli* O157:H7. American Society for Microbiology General Meeting. Denver, CO.
99. Zhang, D., A. Opoku, *U. Minocha, P. Myer, R. Turco, J. Youngblood, F. M. San Martin-Gonzalez, and B. Applegate. 2013. Use of bacteriophage coating on seeds to prevent pathogen contamination during germination. American Society for Microbiology General Meeting. Denver, CO.
100. *Myer, P., K. Parker, A. Kanach, *W. Dominguez, R. Turco, and B. Applegate. 2013. Application of the solvent effect on bioluminescent reporter bacteria as a real-time membrane toxicity assay. American Society for Microbiology General Meeting. Denver, CO.
101. Horton, J. L., J. D. McGlothlin, B. M. Applegate, and J. F. Schweitzer. 2014. Evaluation and Control of Airborne Pathogens for Health Care Workers in the Post Anesthesia Care Unit (PACU) and Intensive Care Unit (ICU). American Industrial Hygiene Association (*student night*). Chicago, IL. **(First Place in Graduate Poster Competition)**
102. Ismail, H., T. Zhu, and B. M. Applegate. 2014. Effect of microbiological media and food matrix on phage infectivity. American Society for Microbiology. Boston, MA.
103. Zhang, D., S. P. Thomson, A. M. Liceaga, M. S. Martin-Gonzalez, and B. Applegate. 2014. Immobilization of bacteriophage using Asian carp proteins. American Society for Microbiology General Meeting. Boston, MA.
104. *Rosenfield*, C., *U. Minocha, *K. Farrokhzad, *P. Romero, M. Morgan, and B. Applegate. 2014. Bacteriophage Φ V10-mediated bioluminescent detection of *E. coli* O157:H7. American Society for Microbiology General Meeting. Boston, MA. **(*recipient of PULSe Travel Award)**
105. *Fleishman Littlejohn, A., *T. Lim, *A. Broady, *K. Farrokhzad, A. Bhunia, M. Morgan, and B. Applegate. 2014. Efficacy of low level chlorine dioxide gas treatment on romaine lettuce and cantaloupe as indicated by microbial diversity. American Society for Microbiology General Meeting. Boston, MA.
106. *Lim, T., *A. Broady, J. Jackson, B. Anderson, *A. Fleishman Littlejohn, J. Jensen, K. Keener, A. Bhunia, and B. Applegate. 2014. Microbial diversity as an indicator of the efficacy of atmospheric cold plasma treatments of produce. American Society for Microbiology General Meeting. Boston, MA.
107. *Rosenfield, C., M. Martinez, F. Zhu, *K. Farrokhzad, G. Paoli, M. Morgan, L. Csonka, and B. Applegate. 2014. Detection of *E. coli* O157:H7 with a reporter phage containing the *luxCDABE* cassette. ASSured, Safe and Traceable Food (ASSET) Conference 2014. Queen's University Belfast, Ireland. **(Awarded Best Poster Prize in the area of: New Analytical means of verifying the integrity of the agri food supply chain)**

108. Horton, J. L., J. D. McGlothlin, B. M. Applegate, and J. F. Schweitzer. 2014. Pilot Laboratory Study to Control Airborne Pathogens Using a New Scavenging Mask to Protect Health Care Workers in the Post Anesthesia Care Unit (PACU) and Intensive Care Unit (ICU). American Industrial Hygiene Conference. San Antonio, TX

f. Invited Lectures Presented at Educational Institutions and Meetings (12 prior to 2005)

National Meetings

13. "Detection of foodborne pathogens using recombinant bacteriophage" Department of Poultry Science. Auburn University, AL. 2005.
14. "Novel use of bioluminescence techniques" 25th International Workshop/Symposium Rapid Methods and Automation in Microbiology. Kansas State University, Manhattan, KS. 2005
15. "Use of bioluminescence for microbial detection" 26th International Workshop/Symposium Rapid Methods and Automation in Microbiology. Kansas State University, Manhattan, KS. 2006.
16. "Molecular beacon microarray platform for detection of *Escherichia coli* O157:H7 using multiplex PCR" Twenty-Sixth University of Wisconsin - River Falls Food Microbiology Symposium and Workshop. River Falls, WI. 2006.
17. "Multi-pathogen screening and/or confirmation via microarray detections" USDA-ARS. Ocean City, NJ. 2006.
18. "Multiplex PCR in a spatial quantification format" 27th International Workshop/Symposium Rapid Methods and Automation in Microbiology. Kansas State University, Manhattan, KS. 2007.
19. "Development of a recombinant bacteriophage for the concentration and colorimetric detection of *Escherichia coli* O157:H7" American Institute of Chemical Engineers Regional Meeting. Chicago, IL. 2008.
20. "The use of bioluminescent bacteria for toxicity assays for carbon nanoparticles" Nanotechnology and the Environment. Indianapolis, IN. 2008.
21. "Phage- based detection for foodborne pathogens" 29th International Workshop/Symposium Rapid Methods and Automation in Microbiology. Kansas State University, Manhattan, KS. 2009.
22. "Purdue center for food safety & engineering microbial detection platforms". Indiana Food Safety and Defense Task Force Meeting. Indianapolis, IN. 2008.
23. "Colorimetric phage- based detection of foodborne pathogens" 30th International Workshop/Symposium Rapid Methods and Automation in Microbiology. Kansas State University, Manhattan, KS. 2010.
24. "DNA/RNA and bacteriophage-based molecular sensor technologies" International Association for Food Protection Annual Meeting. Anaheim, CA. 2010.
25. "Use of the temperate bacteriophage Φ V10 for colorimetric detection of *E. coli* O157:H7" Thirtieth University of Wisconsin - River Falls Food Microbiology Symposium and Workshop. River Falls, WI. 2010.
26. "Food safety modernization act: implementation, cost and ramifications" March Meeting St. Louis Section of the Institute of Food Technologists. St. Louis, MO. 2011.
27. "Food safety and the media from an educational standpoint" International Association for Food Protection Annual Meeting. Charlotte, NC. 2013.

28. “Phage mediated luminescent detection/identification of *E. coli* O157:H7” Emerging Sensor Technologies for Food Safety. Baltimore, MD. 2014.
International Meetings
29. “Use of bioluminescence to evaluate the efficacy of immobilized bacteriophage” Antimicrobial Research (SAR-2011) New Methods and Technologies. Beijing, China. 2011.
30. “New low temperature/short time pasteurization method yields better tasting, longer shelf life fresh milk” Aseptipak Europe. Warsaw, Poland. 2014.

2. Graduate and Undergraduate Student Research Involvement

Graduate students completed

(Completed 14 as major professor and 5 as co-major professor; 1 prior to 2005)

| Student | Degree | Dates | Thesis Title/Research Area | (Co-) Major Professor |
|--------------------|--------|-----------|--|--------------------------------------|
| Tiffany Taliaferro | M.S. | 2002-2005 | Preliminary experiments for evaluation of bioluminescent-based monitoring of ClO ₂ decontamination | Co-Major Professor (Dr. Mauer) |
| Wilfredo Dominguez | M.S. | 2003-2005 | Kinetic parameters of multiplex PCR for pathogenic virulence genes | Major Professor |
| Lisa Hartano | M.S. | 2003-2005 | Thermal inactivation rate in low cell concentration | Co-Major Professor (Dr. Diefus-Deux) |
| Melinda Shroyer | Ph.D. | 2002-2006 | Bioamplification using phage display for the detection of pathogens | Major Professor |
| Maria del Busto | M.S. | 2005-2006 | Construction of a bioluminescent based biosensor for evaluating chlorine dioxide decontamination efficacy | Major Professor |
| Leigh Farris | Ph.D. | 2005-2007 | Evaluation of <i>E. coli</i> O157:H7 internalization into romaine lettuce tissue and detection of metabolic changes of internalized bacteria in response to bioavailable carbon using developed bioluminescent assay | Major Professor |
| Preciaus Heard | M.S. | 2005-2008 | The use of reverse transcription to detect live vs. dead cells after treatment with chlorine dioxide | Major Professor |
| Yanyun Chen | Ph.D. | 2004-2008 | Use of bioluminescence to examine parameters associated with <i>Salmonella enterica</i> serotype Poona and <i>Escherichia coli</i> O157:H7 contamination of produce | Major Professor |
| Patricia Romero | M.S. | 2007-2008 | A <i>cobA</i> based reporter bacteriophage for the detection of <i>Escherichia coli</i> O157:H7 | Major Professor |
| Jameson Auer | Ph.D. | 2005-2009 | Use of bioluminescence to investigate mechanisms of chemical inactivation of bacteria | Major Professor |
| Patti Tanner | M.S. | 2007-2009 | Visualization of attachment and internalization of a bioluminescent derivative of <i>Escherichia coli</i> O157:H7 ATCC 43895 on lettuce leaves | Major Professor |
| Stephanie Theiman | M.S. | 2009-2010 | Evaluation of two carbon sources and <i>Pseudomonas putida</i> F1 for use in the | Major Professor |

| bioremediation of chromate: a whole soil microbial community approach | | | | |
|---|-------|-----------|--|-------------------------------------|
| Eileen Duarte-Gomez | M.S. | 2009-2011 | High hydrostatic pressure effects on bacterial bioluminescence | Major Professor |
| Udit Minocha | Ph.D. | 2003-2011 | Bacteriophage for detection and control of pathogenic bacteria | Major Professor |
| Amy Fleishman Littlejohn | Ph.D. | 2010-2013 | Host-pathogen interactions and novel technologies for the rapid detection of food borne pathogens | Co-Major Professor (Dr. Ladisch) |
| Phillip Myer | Ph.D. | 2009-2013 | Construction, characterization, and application of the bioluminescent bioreporter <i>Pseudomonas fluorescens</i> M3A | Major Professor |
| Khashayar Farrokhzad | Ph.D. | 2009-2014 | The use of phage and bioluminescence for monitoring and control of Shiga toxigenic <i>E. coli</i> | Major Professor |
| Ashley Broady | M.S. | 2013-2014 | BARDOT characterization of HVAP and chlorine dioxide treated produce | Major Professor |
| Clara Vasquez | M.S. | 2012-2014 | Effect of nanoemulsions loaded with carvacrol on a bioluminescent strain of <i>Escherichia coli</i> O157:H7 | Co-Major Professor (Dr. San Martin) |

Graduate Students Currently Advising
(5 as major professor and 2 as co-major professor)

| Student | Degree | Dates | Thesis Title/ Research Area | (Co-) Major Professor |
|---------------------|---------------|--------------|---|-------------------------------------|
| Carla Rosenfield | Ph.D. | 2009-present | Genetic modification and production of reporter phage | Major Professor |
| Eileen Duarte-Gomez | Ph.D. | 2011-present | A mechanistic approach to understanding the effects of pressure on enzyme activity in situ. | Co-Major Professor (Dr. San Martin) |
| Dandan Zhang | Ph.D. | 2011-present | Use of bacteriophage for reduction of seed contamination | Major Professor |
| Andrew Kanach | Ph.D. | 2014-present | <i>Listeria</i> environmental response | Major Professor |
| Steven Garrett | Ph.D. | 2014-present | <i>Listeria</i> contamination associated with cantaloupes | Major Professor |
| Caleb Waddel | M.S. | 2014-present | Bacteriophage in a prey/predator model | Major Professor |
| Clara Vasquez | Ph.D. | 2014-present | Mechanism of sulfite inactivation of microbes | Co-Major Professor (Dr. Butzke) |

Committee Member for Graduate Students
(Advisory Committee Member for 48 since 2005, 7 prior to 2005, total 55)

| Student | Degree | Dates | Thesis Title/ Research Area | Department |
|----------------|---------------|--------------|---|-------------------|
| Kauline Davis | Ph.D. | 2001-2005 | Genomic fingerprinting and identification of <i>Escherichia coli</i> O157:H7 in foods | Food Science |
| Amanda Lathrop | Ph.D. | 2002-2006 | A proteomic approach for specific detection of <i>Listeria monocytogenes</i> | Food Science |
| Travis Selby | Ph.D. | 2003-2006 | Use of mathematical modeling to predict microbial inactivation | Food Science |

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|------------------------|-------|-----------|--|------------------------------------|
| Chi Hua Ho | Ph.D. | 2003-2007 | kinetics (D- and Z-like values) after exposure to gaseous chlorine dioxide Use of tRFLP to evaluate the effect of plant associated enhanced degradation of xenobiotics | Civil Engineering |
| Michelle Park | M.S. | 2004-2005 | Bacterial attachment to nanomaterials | Civil Engineering |
| Daniele Cary | M.S. | 2004-2005 | Modulation of immune function of neonatal dairy calves fed a yeast cell-wall product with ascorbyl-2 polyphosphate | Animal Science |
| Senay Simsek | Ph.D. | 2004-2006 | Host specificity in <i>Medicago-Sinorhizobium</i> interactions: structural characterization of symbiotically significant LMW-EPS from <i>Sinorhizobium meliloti</i> | Food Science |
| Jessica Williams | M.S. | 2005-2006 | Host-pathogen interactions and behavioral benefits of lairage during prolonged transport of pigs | Animal Science |
| Victoria Waronski | M.S. | 2006-2007 | Environmental controls on the survival of <i>E. coli</i> in surface waters | Agronomy |
| Brad Allison | M.S. | 2006-2007 | Synthesis, characterization, and biocompatibility study of N-hexylated pyridinium antimicrobial copolymers | Material Science |
| Eric Warrick | M.S. | 2006-2008 | Isolation of <i>gpmA</i> , the last genetically characterized glycolytic mutation in <i>Enterobacteriaceae</i> | Biological Sciences |
| Andrew Curtis | M.S. | 2006-2008 | Determination of survival and carbon source utilization of pathogenic bacteria using bioluminescence on damaged green and red tomato fruit | Food Science |
| Jae Wook Yoon | Ph.D. | 2004-2008 | Structural analysis of lipopolysaccharides from <i>Sinorhizobium</i> sp. NGR234 induced by apigenin | Food Science |
| Zhonghua Tong | Ph.D. | 2005-2008 | Response of soil microorganisms to the introduction of nanoscale carbon materials | Argonomy |
| Janaka Morandage | M.S. | 2007-2008 | Methods of extraction of DNA from <i>Fusarium</i> conidia for use in immunocapture and real-time PCR | Food Science |
| Balamurugan Jagadeesan | Ph.D. | 2005-2009 | Molecular characterization of <i>Listeria</i> adhesion protein (LAP), an alcohol acetaldehyde dehydrogenase homologue involved in the adhesion of <i>Listeria monocytogenes</i> to intestinal epithelial cells | Food Science |
| Charles Hodgman | M.S. | 2008-2009 | Genetic modification of <i>Yarrowia lipolytica</i> to increase lipid accumulation when glycerol is used as a sole carbon source | Applied and Biological Engineering |
| Arpan Bhagat | Ph.D. | 2008-2009 | Modeling critical factors to optimize the treatment of fresh produce with chlorine dioxide gas | Food Science |

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|-----------------------------|-------|-----------|---|--------------------------------|
| Kristin Burkholder | Ph.D. | 2005-2010 | The role of <i>Listeria</i> adhesion protein during the intestinal phase of <i>Listeria monocytogenes</i> pathogenesis | Food Science |
| Thomas Stratton | Ph.D. | 2006-2010 | Development and application of a framework for the production and improvement of antibacterial and biocompatible polymers | Material Science |
| Ok Kyung Koo | Ph.D. | 2007-2010 | <i>Listeria</i> adhesion protein and heat shock protein 60: application in pathogenic <i>Listeria</i> detection and implication in listeriosis prevention | Food Science |
| Sarimar Medina Malondo | M.S. | 2008-2010 | Effect of anaerobiosis on <i>Listeria</i> adhesion protein (LAP)-mediated <i>Listeria monocytogenes</i> pathogenesis | Food Science |
| Eric Mbonimpa | Ph.D. | 2008-2010 | Disinfection of drinking water using solar UV: A low cost system applicable in developing countries | Civil Engineering |
| Richa Vaid | Ph.D. | 2008-2010 | Inactivation of <i>Listeria</i> in biofilms | Food Science |
| Amanda Tuck | M.S. | 2004-2011 | Surface colonization of tomatoes by <i>Salmonella montevideo</i> . | Food Science |
| Rui Ma | M.S. | 2010-2011 | Develop and characterize active packaging based on 2-hydroxyethyl methacrylate through ultraviolet polymerization | Food Science |
| Courtney Creamer | Ph.D. | 2008-2012 | Changes in soil carbon and nitrogen cycling in response to woody plant encroachment into grasslands | Earth and Atmospheric Sciences |
| Mary Jane Orr | Ph.D. | 2009-2012 | Impacts of switch grass on the microbial community | Agronomy |
| Brittany Gasper | Ph.D. | 2011-2012 | Osmotic regulation of <i>proU</i> in <i>Salmonella typhimurium</i> | Biological Sciences |
| Jonathan Gately | M.S. | 2011-2012 | A two-step chromosomal <i>lacZ</i> -fusion method in <i>Salmonella enterica</i> serovar Typhimurium | Biological Sciences |
| Eric Warrick | Ph.D. | 2008-2013 | Characterization of <i>Enterobacteriaceae</i> glycolytic mutations | Biological Sciences |
| Titiksha Dikshit | M.S. | 2010-2013 | An anti-pyruvate kinase monoclonal antibody and translocated intimin receptor (tir) for specific detection of <i>Listeria</i> species and Shiga-toxigenic <i>Escherichia coli</i> | Food Science |
| Sarah Griffith | M.S. | 2012-2013 | The effects of light-dark cycles on the metabolism of <i>Cyanothece sp.</i> ATCC 51142 and <i>Cyanothece sp.</i> ATCC 7822 | Biological Sciences |
| Amanda Costello | M.S. | 2013 | Evaluation of process changes on finished water quality for gift of water systems | Civil Engineering |
| Veronica Rodriguez-Martinez | Ph.D. | 2010-2014 | Development of functionalized solid and liquid lipid nanodispersions as carriers for antimicrobials in cut leafy-greens and other minimally processed vegetables | Food Science |
| Jiayi Zhang | Ph.D. | 2010- | Antibiotic resistance profile in | Animal Science |

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|---------------------------|-------|--------------|---|------------------------------------|
| | | 2014 | chicken products and the efficacy of bacteriophage to control foodborne pathogens | |
| Vanessa Hale | Ph.D. | 2012-2014 | Co-evolution of gut microbes in Colobine monkeys | Biological Sciences |
| Joshua Horton | M.S. | 2013-2014 | Laboratory study of a scavenging mask system to evaluate and control airborne pathogens for healthcare workers in the post anesthesia care unit and intensive care unit | Health Sciences |
| Matt Rudisill | Ph.D. | 2010-present | Specialty crop production | Horticulture |
| Aaron Robert Gall | M.S. | 2010-present | Regulation of <i>mgtA</i> expression in <i>Salmonella typhimurium</i> | Biological Sciences |
| David Welkie | Ph.D. | 2010-present | Biofuels and <i>cyanobacteria</i> | Biological Sciences |
| Nigam Arora | Ph.D. | 2011-present | Detection of <i>P. aeruginosa</i> using siderophore capture | Chemistry |
| Amanda Storm | M.S. | 2011-present | <i>Map</i> in crop fields | Agronomy |
| Shanleigh Thomson | M.S. | 2012-present | Use of asian carp hydrosylates for increased seed vigor | Food Science |
| Yi Niu | M.S. | 2013-present | Detection of <i>Brucella</i> using microfluidics | Food Science |
| Jagpinder Brar | Ph.D. | 2013-present | Predictive modelling for thermal inactivation curves for non O157:H7 STEC | Food Science |
| Francy Helena Avila Arias | Ph.D. | 2013-present | Microbial toxicity of nanometals | Agronomy |
| Yi Li | Ph.D. | 2014-present | Use of bacteriophage as targeting entities for cancer cells | Applied and Biological Engineering |

Undergraduate Research (6 prior to 2005)

| Student | Dates | Research Topic | Program |
|-------------------------------|-----------|---|-------------------------------------|
| Anthony Eggink | 2004-2006 | The effect of carbon nanoparticles on the infectivity of bacteriophage using a T4 phage-based/bioluminescent <i>Escherichia coli</i> assay | Forestry |
| Eileen Duarte-Gomez | 2006 | Effect of growth phase on bacterial luminescence | Zamarano University Honduras |
| Alverro Salinas | 2007 | Phage cocktail (pslv-1) applied on almonds inoculated with <i>Salmonella enterica</i> serovar Enteritidis PT30 lux | Zamarano University Honduras |
| Whitney Peters | 2004-2008 | Application of the solvent effect on bioluminescent reporter bacteria as a membrane toxicity assay for carbon nanoparticles and the characterization of tomato waste lagoon microbial flora | Food Science |
| Miguel Angel Alvarez Gonzales | 2008 | Bioluminescence imaging of pathogens | Zamarano University Honduras |
| Andrew Bosserman | 2009 | Effect of freezing on the viability of spoilage organisms (<i>Pseudomonas</i> spp) | Biological Sciences |
| Abena Opokua Opoku | 2009 | Use of bacteriophage to prevent <i>Escherichia coli</i> O157:H7 contamination of alfalfa sprouts | Summer Research Opportunity Program |

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|---------------------------------|-----------|--|---------------------------------|
| Diego Garcia | 2009 | Use of bacteriophage for the control of spoilage organisms in milk | Zamarano University Honduras |
| Lauren Erickson | 2008-2010 | Construction of a bioluminescence reporter for wintergreen (methylsalicylate) | Biological Sciences |
| Clara Maria Vasquez Mejia | 2010 | Bacterial expression of the MES1 (Methyl Esterase 1) from <i>Arabidopsis thaliana</i> to create a bioluminescent reporter for methylsalicylate | Zamarano University Honduras |
| Cristhiam Eugena Gurdian Curran | 2011 | Bioluminescence for in situ monitoring of <i>Pseudomonas fluorescens</i> inactivation in milk by bacteriophage Φ S1 | Zamarano University Honduras |
| Jennifer Bourne | 2009-2012 | Use of bacteriophage for detection of foodborne pathogens | Biological Sciences |
| Catherine Sheehan | 2010-2012 | The effect of pressure on bioluminescent reporter strains (DURI Fellowship) | Food Science |
| Jose Bandao | 2012 | Optimize/develop procedures for the rapid and simple purification of bacteriophages | Zamarano University Honduras |
| Alba Mayta | 2013 | Use of bacteriophage for detection of <i>E. coli</i> O157:H7 on leafy greens | Zamarano University Honduras |
| *Austin Settles | 2013 | Construction of a Bioreporter for Curli expression in <i>E. coli</i> O157:H7 | Biological Sciences |
| Marcella Chavez | 2014 | Determining specificity of Φ V10 lux on previously isolated O157 outbreak strains | Zamarano University Honduras |

* Austin received a fellowship from the Institute for Accessible Science as he suffers from macular degeneration.

K-12 Research

| Student | Dates | Research Topic | Affiliation |
|---------------------------|-------|--|------------------------------|
| Lauren Haby | 2005 | Effects of alginate encapsulation on preventing bacteriophage T4 from infecting bioluminescent <i>Escherichia coli</i> | Jefferson High School |
| Lauren Haby ¹ | 2006 | The effect of diffusion on auto induction of bioluminescence in <i>Vibrio fischeri</i> | Jefferson High School |
| Lauren Haby | 2007 | The use of <i>Vibrio fischeri</i> as a model organism to determine the effect of diffusion in mucin | Jefferson High School |
| Rhea Mahajan ² | 2012 | The use of bioluminescence to determine effective duration of UVC exposure for the inactivation of <i>Escherichia coli</i> | West Lafayette High School |
| Neal Mahajan ³ | 2012 | Is antibacterial soap more effective than regular soap | Happy Hollow School |
| Neal Mahajan ⁴ | 2013 | Can solar disinfection be used to purify surface water | West Lafayette Middle School |

¹In 2006 Lauren won the gold medal in the microbiology division and the College of Science Recognition Award for an outstanding project. Purdue Regional Science Fair

²1st Place in Biological Sciences, 2nd Place in Microbiology 60th Purdue Regional Science Fair

³ Gold Medal in Microbiology, 60th Purdue Regional Science Fair

⁴ Gold Medal in Microbiology division, Outstanding Research Award, Junior division, from College of Science and College of Engineering, Ability and Creativity in an Atmospheric Science Exhibit Award, and Award from the Meteorological Society , 61st Purdue Regional Science Fair, 2013

3. Post Doctoral Involvement

| Post Doctoral Associate | Dates | Research Topic |
|-------------------------|-----------|--|
| Lynda Perry | 2002-2008 | Genetic engineering of bioreporter magnetotactic bacteria for magnetoelectronic sensing and bioreporter phage construction |
| Sol Kim | 2003-2006 | Multiplexed detection of pathogens using fluorescence resonance energy transfer in a spatial detection format |

4. GRANT ACTIVITIES

Summary Table of Dr. Applegate's Research Funding since 2005

| Type of Funding | Total Amount Awarded | Applegate's Portion |
|--------------------------------|----------------------|---------------------|
| External Funding (competitive) | \$18,577,657 | \$2,227,821 |
| Internal Funding (Purdue) | \$244,346 | \$111,423 |
| External Funding (industry) | \$147,188 | \$84,891 |
| Grand Total | \$18,969,725 | \$2,424,135 |

(Prior to 2005 Dr. Applegate received \$973,797 of funding from grants totaling \$2,911,669)

Current Grants

- 1) **Agency/Title of Grant:** Improved Detection Techniques for Foodborne Pathogens. (Bacteriophage Based Detection of Foodborne Pathogens)
Duration of Funding: 06/01/11 - 05/31/15
Total amount of award: \$3,885,466.00
Your role: PI
If Co-PI, for how much of the total funding are you directly responsible: \$420,000.00

- 2) **Agency/Title of Grant:** Teleflex Medical / Evaluation and Control of Airborne Pathogens for Health Care Workers in the Post Anesthesia Care Unit (PACU) and Intensive Care Unit (ICU).
Duration of Funding: 06/01/14 - 12/31/14
Total amount of award: \$55,000.00
Your role: Co-PI
If Co-PI, for how much of the total funding are you directly responsible: \$16,500.00

- 3) **Agency/Title of Grant:** Millisecond Technologies Inc
Duration of Funding: Unrestricted Gift
Total amount of award: \$35,000.00
Your role: PI
If Co-PI, for how much of the total funding are you directly responsible: N/A

- 4) **Agency/Title of Grant:** AgSeed Agricultural Research and Extension Leading to Economic Development in Indiana Agriculture and Rural Communities / Development of a sanitizing treatment to improve safety and quality of Indiana cantaloupe
Duration of Funding: 04/01/14 - 03/31/15
Total amount of award: \$58,611.00
Your role: Co-PI
If Co-PI, for how much of the total funding are you directly responsible: \$11,258.00
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Past Grants

- 5) **Agency/Title of Grant:** Elanco / Finalize Testing Agreement
Duration of Funding: 08/01/12 - 12/31/13.
Total amount of award: \$9,594.00
Your role: PI
If Co-PI, for how much of the total funding are you directly responsible: N/A
-
- 6) **Agency/Title of Grant:** EPA / Community-scale Water Treatment System for Application in Developing Countries.
Duration of Funding: 08/01/12 - 07/30/13
Total amount of award: \$15,000.00
Your role: Co-PI
If Co-PI, for how much of the total funding are you directly responsible: \$3,750.00
-
- 7) **Agency/Title of Grant:** Showalter Trust/ Bacteriophage Coatings of Seeds for Increased Food Safety.
Duration of Funding: 08/01/11 - 06/30/13.
Total amount of award: \$60,761.00
Your role: Co-PI
If Co-PI, for how much of the total funding are you directly responsible: \$15,191.00
-
- 8) **Agency/Title of Grant:** Millisecond Technologies, Inc/ Microbial Efficacy Testing of an MST pilot-scale system for milk pasteurization.
Duration of Funding: 08/01/2012 - 07/30/2013
Total amount of award: \$47,594.00
Your role: Co-PI
If Co-PI, for how much of the total funding are you directly responsible: \$23,797.00
-
- 9) **Agency/Title of Grant:** USDA/ARS /Multiplexed Detection of Pathogens using Fluorescence Resonance Energy Transfer in a Spatial Detection Format.*
Duration of Funding: 06/01/08 - 05/31/11
Total amount of award: \$401,148.00
Your role: PI
If Co-PI, for how much of the total funding are you directly responsible: N/A
-

10) Agency/Title of Grant: USDA-NIFA/ Functionalized lipid nanoparticles for pathogen inactivation in cut leafy-greens and other minimally processed vegetables.

Duration of Funding: 09/01/10 - 08/31/13

Total amount of award: \$404,000.00

Your role: Co-PI

If Co-PI, for how much of the total funding are you directly responsible: \$80,800.00

11) Agency/Title of Grant: USDA/NRI/ Novel surface activation technology for bioactive packaging.

Duration of Funding: 06/01/08 - 05/31/10

Total amount of award: \$222,253.00

Your role: Co-PI

If Co-PI, for how much of the total funding are you directly responsible: \$88,901.00

12) Agency/Title of Grant: Purdue Research Foundation/ Prototype development of a rapid, easy to use, highly cost-effective test for visual detection of *E. coli O157:H7* contamination in food and water samples.

Duration of Funding: 11/09 - 07/10

Total amount of award: \$49,974.88

Your role: PI

If Co-PI, for how much of the total funding are you directly responsible: NA

13) Agency/Title of Grant: NSF/Response of aquatic and terrestrial microorganisms to carbon-based manufactured nanoparticles.

Duration of Funding: 07/04 - 06/09

Total amount of award: \$1,600,000.00

Your role: Co-PI

If Co-PI, for how much of the total funding are you directly responsible: \$118,055.00

14) Agency/Title of Grant: Showalter Trust/"Hydrophilized Polymeric Bactericides for Medical Applications"

Duration of Funding: 07/01/05 - 06/30/06

Total amount of award: \$75,000.00

Your role: Co-PI

If Co-PI, for how much of the total funding are you directly responsible: \$35,000.00

15) Agency/Title of Grant: EPA/Repercussion of carbon based manufactured nanoparticles on microbial processes in environmental systems.

Duration of Funding: 10/04 - 04/08

Total amount of award: \$400,000.00

Your role: Co-PI

If Co-PI, for how much of the total funding are you directly responsible: \$24,720.00

16) Agency/Title of Grant: USDA CSREES/Improving the safety of fresh fruits vegetables with ClO₂ gas using a miniaturized industrial-size scale tunnel system.
Duration of Funding: 10/04 - 09/07
Total amount of award: \$599,790.00
Your role: Co-PI
If Co-PI, for how much of the total funding are you directly responsible: \$178,000.00

17) Agency/Title of Grant: DARPA/NRL Genetic Engineering of Bioreporter Magnetotactic Bacteria for Magneto-electronic Sensing (Phase2).
Duration of Funding: 05/15/03 - 05/14/06
Total amount of award: \$450,000.00
Your role: PI
If Co-PI, for how much of the total funding are you directly responsible: N/A

18) Agency/Title of Grant: NASA/ Minimizing Equivalent System Mass for a Regenerative Life-support System
Duration of Funding: 12/01/02 - 09/30/07
Total amount of award: \$10,000,000.00
Your role: Co-PI
If Co-PI, for how much of the total funding are you directly responsible: \$466,000.00

19) Agency/Title of Grant: USDA/ Use of GFP and Lux to Track Pathogen Contamination, Growth, and Inactivation on Produce
Duration of Funding: 09/01/03 - 08/31/06
Total amount of award: \$500,000.00
Your role: Co-PI
If Co-PI, for how much of the total funding are you directly responsible: \$174,447.00

20) Agency/Title of Grant: USDA/ Nanotechnology Interdisciplinary Educational Experiences for Undergraduates in Food and Agricultural Sciences.
Duration of Funding: 07/01/04 - 12/31/05
Total amount of award: \$100,000.00
Your role: Co-PI
If Co-PI, for how much of the total funding are you directly responsible: \$33,333.00

* Grants were part of the Center for Food Safety USDA funding which was reviewed by the Office of Scientific Quality Review. Dr. Applegate was a CoPI/coauthor on both submissions.

5. Evidence of Interdisciplinary Research Activity

Dr. Applegate is unique in terms of interdisciplinary research as his graduate training was done at the Center for Environmental Biotechnology (CEB) at the University of Tennessee at

Knoxville. The CEB was one of the first interdisciplinary research Centers in the U.S. incorporating Chemists, Ecologists, Microbiologists, Chemical Engineers, Civil Engineers, Environmental Engineers, and Electrical Engineers in a combined effort in Environmental Research. Therefore he was trained as an interdisciplinary researcher throughout his graduate work. He has used his interdisciplinary training to facilitate numerous interactions across Purdue spanning **five colleges** including **twelve departments**. These interdisciplinary collaborations have also included other universities as well including: University of Michigan's Dental School, Northeastern University, Kyung Hee University, Seoul and the Dublin Institute of Technology.

a. Interdisciplinary research refereed publications (14 prior to 2005)

Dr. Applegate has authored or coauthored a total of 23 publications involving interdisciplinary research. Refereed publications numbered: 21, 23, 25-34, 36, 38-42, 44-48.

b. Interdisciplinary research published proceedings (9 prior to 2005)

c. Interdisciplinary published research abstracts (15 prior to 2005)

Dr. Applegate has authored or coauthored 28 abstracts involving interdisciplinary research. Published abstracts numbered: 59, 60, 62-67, 69-73, 76-88, 91, 93, 95, 97-103, 104, 105-108.

d. Interdisciplinary patents issued/pending

All 13 patents coauthored by Dr. Applegate (11 issued and 2 pending) have involved interdisciplinary research teams.

e. Interdisciplinary Funded Projects

Every funded project except number 5 is composed of an interdisciplinary team.

6. Evidence of National and International Scholarly Activities

National

a. Ad hoc reviewer for journals

Molecular and Cellular Probes
Analytical Chemistry
Applied and Environmental Microbiology
Environmental Science and Technology
Journal of Food Science
Journal of Food Safety
LWT - Food Science and Technology
PLoS One
Journal of Food Protection
Journal of Microbiological Methods

b. Reviewer for federal grants

National Science Foundation (ad hoc)

DOE SBIR program (ad hoc)

Water and Environmental Research Foundation (Project Reviewer)

USDA Review Panel (2009, 2010, 2012)

USDA Exploratory Grant Reviewer

International**a. Visiting Scientists Hosted (2 prior to 2005)**

1. Karla Sequeira Mendonça (Ph.D. student) Capes Foundation Fellowship recipient. She is from Doutorado em Ciência e Tecnologia Agroindustrial Universidade Federal de Pelotas, RS – Brazil.
2. Dandan Zhang (M.S.) Research assistant from Shanghai Jiao Tong University in China. Shanghai Jiao Tong University is a major collaborator with the Center for Food Safety Engineering.
3. Dr. Hesham Ismail, Lecturer of Meat Hygiene, Faculty of Veterinary Medicine, Assiut University, Egypt.

b. International invited talks

See section B 1.f presentations numbers 27 and 30.

Dr. Applegate chaired the session entitled: “New analytical means of verifying the integrity of the agri food supply chain” at ASSET 2014, Queen’s University Belfast, Ireland. During the same conference his student Carla Rosenfield was awarded best poster prize in the area of: *New Analytical means of verifying the integrity of the agri food supply chain*.

c. International collaborations

Dr. Applegate also has co-filed a utility patent with collaborators located at the Dublin Institute of Technology based on collaborative work for detecting coliform bacteria in water. Pending patent #2 section B 1 a.

Dr. Applegate coauthored a paper (31) with researchers from Kyung Hee University using a bioluminescent approach for evaluating nanoparticle toxicity using bioluminescence.

C. Excellence in Learning (Secondary)

Although research is the primary focus of Dr. Applegate’s appointment, he has shown innovation in teaching and the pursuit of incorporating new areas of technology development in the

classroom. He has a joint appointment in the Department of Biological Sciences and divides his teaching efforts between there and Food Science.

Courses taught at Purdue Since 2005

1. Food Biotechnology 2005 (spring) / 4 students/ course 3.8 / instructor 3.8
2. Food Biotechnology 2007 (spring) / 6 students/ course 4.3 / instructor 4.3
3. Microbiology 438 2009 (fall) / 98 students/ course 3.6 / instructor 3.9
4. Microbial Ecology 549 2010 (spring) / 14 students/course 4.3 / instructor 4.2
5. Food Fermentations 2010 (spring) / 10 students/ course 4.4 / instructor 4.4
6. Microbiology 438 2010 (fall) / 96 students/ course 3.8 / instructor 4.1
7. Microbiology 438 2011 (fall) / 98 students/ course 3.9 / instructor 4.6
8. Microbial Ecology 549 2012 (spring) / 15 students/ course 4.2 / instructor 4.4
9. Food Media and Public Opinion 291 2012 (spring) / 9 students/ course 4.0 / instructor 4.0
10. Food Fermentations 2012 (spring) / 10 students/ course 3.7 / instructor 4.1
11. Microbiology 438 2012 (fall) / 120 students/ course 3.4 / instructor 4.5
12. Civil Engineering 564 2012 (fall) Water Supply in Developing Countries: Development of a Community-Scale Water Treatment System in the Dominican Republic 14 students/ course 4.5 / instructor 4.8
13. Food Media and Public Opinion 291 2013 (spring) / 11 students/ course 4.3 / instructor 4.7
14. Microbiology 438 2013 (spring) / 27 students/ course 4.1 / instructor 4.2
15. Civil Engineering 564 2013 (spring) Water Supply in Developing Countries: Development of a Community-Scale Water Treatment System in the Dominican Republic 16 students/ course 4.8 / instructor 4.8
16. Microbiology 438 2013 (fall) / 67 students/ course 3.6 / instructor 4.2
17. Civil Engineering 564 2013 (fall) Water Supply in Developing Countries: Development of a Community-Scale Water Treatment System in the Dominican Republic. 11 students/ course 5.0 / instructor 5.0
18. Food Fermentations 2014 (spring) / 42 students/ course 4.3 / instructor 3.9
19. Food Fermentations lab 2014 (spring) / 14 students/ course 4.3 / instructor 3.5
20. Microbial Ecology 549 2014 (spring) / 16 students/ course 4.4 / instructor 4.6
21. Food Media and Public Opinion 291 2014 (spring) / 7 students/ course 3.5 / instructor 3.5
22. Civil Engineering 564 2014 (spring) Water Supply in Developing Countries: Development of a Community-Scale Water Treatment System in the Dominican Republic. 11 students/course 5.0 / instructor 4.5
23. Microbiology 221 2014 (summer) 20 students/ course 3.5 / instructor 4.3
24. Microbiology 438 2014 (fall) 70 students/ course 4.1/ instructor 4.4
25. Civil Engineering 597 2014 (fall) Water Supply in Developing Countries 9 students/ course 5.0/ instructor 5.0
26. Food Microbiology Lab 2014 (fall) 22 students/ course 3.8/ instructor 4.2
27. Civil Engineering 597 2015 (spring) Water Supply in Developing Countries 14 students/ course 4.8/ instructor 4.5

International Lectures:

1. Guest lecturer at the Dublin Institute of Technology, Dublin Ireland, June 2010.

Presented information on biosensor development and applications for environmental monitoring.

2. Guest instructor at Shanghai Jiao Tong University in China December 2013. Presented instructional material on aseptic technique and principles, strengths, and limitation of the polymerase chain reaction.

Course and Curriculum Development

Dr. Applegate is currently co teaching food fermentations with Dr. Butzke in which they have developed a laboratory component of the class to augment the lecture. The laboratory components span a wide breadth of fermentations from vegetables to grains and cereals. Dr. Applegate also participated in the development of an interdisciplinary experience learning course in the summer of 2012 with Dr. Chip Blatchley (Civil Engineering), Dr. Ken Foster (Agriculture Economics), Dr. Libby Richards (Nursing), and Dr. Vicki Simpson (Nursing). The course was based around constructing a water treatment system at a school in the Dominican Republic to provide potable water. Students designed the system and developed educational materials in 2012-13 and implemented the system in 2014. Dr. Applegate has also been involved in undergraduate curriculum development previously in the school of agriculture. In a collaborative educational proposal with Dr. Heidi Diefus-Deux and Dr. Kumar Hagaghigi they obtained a \$100,000.00 USDA challenge grant entitled “Nanotechnology Interdisciplinary Educational Experiences for Undergraduates in Food and Agricultural Sciences” to address the burgeoning new field of Nanotechnology and its application in agriculture.

D. Excellence in Engagement (Tertiary)

1. Participation in Educational Outreach

Bacterial bioluminescence is an integral component in Dr. Applegate’s research program; however, he has included it in over **60 workshops** and hands on educational programs. Bacterial luminescence is an excellent tool for teaching science concepts which can be tailored for all age groups including K-12 and their parents as well. In 2007, Dr. Applegate provided editorial assistance and a photograph of a glowing chicken to Anita Sitarski to aid the description of Robert Boyles initial luminescence observations in 1667 (Cold Light, Boyds Mills Press). This book is targeted for fourth to fifth grade students and Dr. Applegate has provided copies to several libraries for their children’s science section.

a. Diversity related

Science Bound

Dr. Applegate has been an active participant in the Science Bound program at Purdue University since 2005. This program is in line with the University’s constant efforts to increase the participation of underrepresented groups. He has enthusiastically participated in many facets of the program which are listed below:

1. **2005, 2007, 2008, 2009, 2013** Science Bound Parents weekend: Hands on work shop for parents involving bioluminescent bacteria, alginate and properties of non-Newtonian fluids”.

2. **2007-2013** Hosted science bound interns which worked in the laboratory on individual projects followed by presentations of their work.
3. **2007-2014** Participated in the annual interview workshop in which the potential interns interview with potential employers to help develop their skills.
4. **2014** Presented participants of the Science Bound Explorers Program a hands on workshop on Food Safety using bioluminescence.

He has also contributed to the Hoosier Agribusiness Science Academy (HASA) as well by providing demonstrations and workshops on food safety to participants in the summer programs (below).

5. **2010, 2011:** Presented four programs entitled “Nature’s Curiosities to Biotechnology” to middle school student HASA participants during summer workshops.
6. **2009-2014:** Engaged HASA High School students in applied science multiple mornings during two week summer workshops.

b. K-12 Workshops (10 prior to 2005)

2005 -2014 Program entitled “Lights Out for Bacteria” consisting of a hands on demonstration of bacterial inactivation using bioluminescent bacteria. Two 75 minutes sessions.

2011-2014 Experience Purdue, conducted hands on luminescent based workshop 1.5 hour sessions

2014 4-H Bio-Tech Science Workshop, presented program on Natures Curiosities to Biotechnology

2013 Roosevelt Middle School’s visit to Discovery Park. Performed luminescence based workshop for 2 session of middle school students

2013 Presented workshops for student participants of the World Food Prize Youth Institute

2006-2011 Family Day informal luminescence experiments for approximately 1 hour on a Saturday

2008-2011 FFA Career Success “Natures Curiosities to Biotechnology” two 45 minutes sessions

2008 Presented a program entitled “Natures Curiosities to Biotechnology” to attendees of the national FFA convention

2008 Presented a program entitled “Natures Curiosities to Biotechnology” to attendees of the Gifted Education Resources Institute

2008 Presented a program entitled “Natures Curiosities to Biotechnology” to attendees of the Ag Discovery Camp

2008 Presented a program entitled “Natures Curiosities to Biotechnology” to attendees of the Indiana FFA Tours

2. Extension Workshops

1. **2014** (May) Better Process Control Workshop, Purdue University
Participants: 33, Instructor Rating 4.9, Course Rating 4.6
2. **2013** (October) Better Process Control Workshop, Fairlife LLC, Coopersville, Michigan
Participants: 19, Instructor Rating 4.7, Course Rating 4.4
3. **2013** (May) Better Process Control Workshop, Purdue University
Participants: 46, Instructor Rating 4.9, Course Rating 4.7
4. **2012** (August) Acidified Food Course, Custom Culinary, Avon, Ohio.

5. **2012** (July) Better Process Control Workshop, Mead Johnson, Evansville, Indiana
6. **2012** (May) Better Process Control Workshop, Purdue University

3. University or Departmental Administrative Services

Department

1. Graduate Committee 2003-2005
2. Space Committee 2005-2007
3. Spring Fest 2008, 2009, 2011, 2013
4. Commencement Representative 2006-2013
5. Undergraduate Advisor 2014
6. Safety Committee 2013-present
7. Faculty Search Committee (Enologist)
8. Faculty Search Committee (Microbiologist)
9. Faculty Search Committee (Extension, Food Safety)
10. Faculty Search Committee, Chair (Mycologist)

University

1. Grievance Committee 2001-2005
2. Undergraduate Readmissions Committee, 2008-2010
3. PULSe Curriculum Committee Chair 2006-2013
4. PULSe Microbiology Training Group Chair 2011-present