

## **KERRY COOPER, PH.D.**

The University of Arizona  
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### **Education**

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Ph.D., Pathobiology, University of Arizona, Tucson, AZ 2007  
B.S., Biology, Sterling College, Sterling, KS 1998

### **Professional Experience**

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***Assistant Professor of Food Safety and Epidemiology*** 8/17 - Current  
School of Animal and Comparative Biomedical Sciences, University of Arizona

#### **Research:**

- Development of sequalae associated with *Campylobacter* and *Salmonella*
- Pathogenesis, genomics and epidemiology of *Campylobacter*
- Characterization of bacterial communities in various types of fresh produce
- Epidemiology of foodborne pathogens in produce fields
- Utilization of next generation sequencing for detection and characterization of foodborne pathogens in various food matrixes
- Transmission of antibiotic resistance via foods
- Assessing the public health threat of direct reclaimed wastewater for various applications

#### **Teaching:**

- MIC 450/550 – Veterinary Microbiology
- MIC 195G – Careers in Microbiology

***Assistant Professor*** 8/13 – 8/17  
Department of Biology, California State University, Northridge

#### **Research:**

- Epidemiology of foodborne pathogens on retail fresh produce and produce fields
- Development of methods to prevent fresh produce contamination with various foodborne pathogens, and validation and verification for produce producers in response to the Food Safety Modernization Act (FSMA)
- Role of foods in the transmission of antibiotic resistant bacteria, particularly raw and cooked meats, dairy products, and fresh produce

- Comparative genomics, epigenomics, and transcriptomics of various foodborne pathogens including *Campylobacter*, *Salmonella*, and Shiga-toxin producing *Escherichia coli* (STEC) strains
- Use of next generation sequencing in the epidemiology of foodborne pathogens
- Role of DNA methylation in *E. coli* gene expression and virulence
- Characterization of bacterial communities (microbiomes) of various fruits and vegetables
- Comparative genomics and epigenomics of the only spore-forming coccus: *Sporosarcina ureae*

**Teaching:**

- BIO 315L – Principles of Microbiology Laboratory
- BIO 410 – Medical Microbiology
- BIO 410L – Medical Microbiology Laboratory
- BIO 215 – Introductory Microbiology
- BIO 431 – Food Microbiology
- BIO 431L – Food Microbiology Laboratory
- BIO 655A – Seminar in Microbiology

**Postdoctoral Fellow / Research Microbiologist**

**6/11 – 8/13**

USDA, ARS, PSM, Albany, CA

**Research:**

- Genome sequencing, assembly and annotation of several strains of *E. coli* O145 from several foodborne outbreaks; 454, Illumina, PacBio and Sanger sequencing
- Bioinformatic analysis and comparative genomics of the various STEC strains, including genome re-arrangement, phage analysis, SNP analysis and methylome analysis (PacBio)
- Metagenomics data analysis including 16S rRNA amplicon read clipping and sorting and Ribosomal Database Project (RDP) classification
- RNA-seq analysis of various samples including isolation of RNA, conversion to cDNA, alignment of reads to reference genome and transcriptome analysis

**Postdoctoral Fellow / Research Associate**

**6/07 – 6/11**

Veterinary Science & Microbiology, University of Arizona

**Research:**

- Sequenced and annotated the entire genome and plasmid of non-invasive poultry *Campylobacter jejuni* strain S3 (Accession number CP001960 & CP001961), currently finishing the sequencing of additional *C. jejuni* strains for genomic comparison.
- Comparative genomic analysis of several non-invasive poultry *C. jejuni* strains versus invasive clinical strains to identify host specific genes and potential virulence genes.
- Bioinformatic analysis of *C. jejuni* strain S3 as well as other published *C. jejuni* strains.
- Sequenced and annotated the entire genome of low passage virulent *C. jejuni* NCTC11168.

- Single nucleotide polymorphism (SNP) analysis of low passage virulent *C. jejuni* NCTC11168 versus the original sequenced high passage, non-virulent *C. jejuni* NCTC11168.
- Performed a variety of tissue culture assays, including invasion & attachment assays and CHO cell assay for toxin activity.
- Worked on the identification and purification of potential cytotoxin and enterotoxin proteins produced by *C. jejuni*.
- Worked on the identification and characterization of cytotoxin and enterotoxin genes.
- Investigated various methods for the *in vitro* production of cytotoxin and enterotoxin.
- Pathogenesis studies utilizing *in vivo* neonatal piglet model.
- Mentored, supervised and assisted in numerous graduate student projects, as well as supervising every-day operation of the laboratory.

**Teaching:**

- Course Instructor MIC 428R – Microbial Genetics, University of Arizona, Spring 2011
- Course Coordinator/Instructor MIC428L – Microbial Genetics Laboratory, University of Arizona, Spring 2011

**Graduate Research Assistant**

**8/01 – 6/07**

Veterinary Science & Microbiology, University of Arizona

**Research:**

- Developed an effective animal model for necrotic enteritis in poultry.
- Investigated the role of alpha toxin in the pathogenesis of necrotic enteritis in poultry.
- Examined the ability of various strains of *Clostridium perfringens* to produce necrotic enteritis in the animal model.
- Researched the ability of a recombinant alpha toxin vaccine to protect poultry from necrotic enteritis.
- Studied the role of *in vivo* passage of strains and supernatant of *C. perfringens* on the virulence of *C. perfringens* in the animal model.

**Teaching:**

- Immunology
- General Microbiology
- Mechanisms of Disease
- Microbial Physiology

**Environmental Health Director**

**11/98 – 8/01**

Navajo County Health Department

- Performed food safety inspections on various food establishments.
- Investigated environmental health complaints.
- Executed plan reviews for new food establishments.

- Performed in-field/epidemiological investigations of foodborne, zoonotic and vectorborne outbreaks.
- Epidemiological surveillance of zoonotic and vectorborne pathogens.
- Conducted bioterrorism surveillance.
- Wrote a grant to facilitate online training of food service workers in an effort to improve food safety.
- Created a series of videos that were broadcast locally to highlight how people could improve food safety in their homes.

### **Other Experience and Professional Memberships**

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- 2001-present: American Society of Microbiology
- 2001-2011: American Society of Microbiology – Arizona/Nevada Branch
- 2004-2011: Conference of Research Workers in Animal Diseases (CRWAD)
- 2008-present: Ad-hoc reviewer for *Veterinary Microbiology* journal
- 2010-present: Ad-hoc reviewer for *Anaerobe* journal
- 2010-present: Ad-hoc reviewer for *PLoS One* journal
- 2012-2017: Anaerobe Society of the Americas
- 2013-present: Ad-hoc reviewer for *Vaccine* journal
- 2014-present: Ad-hoc reviewer for *BMC Research Note* journal
- 2014-present: Ad-hoc reviewer for *BMC Veterinary Research* journal
- 2014-present: Ad-hoc reviewer for *Frontiers in Microbiology* journal
- 2014-present: Ad-hoc reviewer for *Vector-Borne and Zoonotic Diseases* journal
- 2014-present: American Association for the Advancement of Science (AAAS)
- 2014-present: International Association for Food Protection (IAFP)
- 2014-2018: American Society of Microbiology – Southern California Branch (SCASM)
- 2017-present: Ad-hoc reviewer for *Scientific Reports* journal
- 2018-present: Executive board for University of Arizona One Health Consortium
- 2018-present: Grant reviewer for Gates Foundation
- 2018-present: Technical review committee for Water Research Resource Center (WRRC)
- 2019-present: Ad-hoc reviewer for *F1000 Research* journal
- 2019-present: Ad-hoc reviewer for *Gut Microbes* journal
- 2019-present: Grant reviewer for US-Israel Binational Agricultural Research and Development (BARD) Fund

### **Honors and Awards**

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- 2004: Most outstanding oral presentation, CRWAD – Gastroenteric Disease Section
- 2005: Most outstanding oral presentation, CRWAD – Gastroenteric Disease Section
- 2014: CSUN Competition for Research, Scholarship and Creative Activity Award “Detection of viable but non-culturable bacterial foodborne pathogens on fresh produce”

- 2015: CSUN Competition for Research, Scholarship and Creative Activity Award “Quantification of foodborne pathogens from raw ready-to-eat mushrooms”

## Research Interests

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- Comparative genomics, transcriptomics, and epigenetics of various pathogenic bacteria, particularly Shiga toxin-producing *Escherichia coli* (STECs), *Campylobacter* and *Salmonella*.
- SNP analysis and developing other tools to improve source tracking of foodborne pathogens during outbreaks.
- Studying the evolution of numerous bacterial foodborne pathogens in various agricultural environments.
- Utilizing various -omics tools to identify host-specific genes, virulence genes, fitness genes and conserved genes.
- Investigating the pathogenesis of *Campylobacter* and other foodborne pathogens.
- Development and improvement of animal models for various bacteriological diseases, and innovation of effective vaccines against various bacteriological diseases.
- Development of rapid and effective detection and surveillance techniques for foodborne pathogens.
- Exploring the microbiomes and metagenomics of different agricultural environments, and the impact foodborne pathogens have on the communities.
- Role antibiotic resistant bacteria in various environments have on human health.

## Grants

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### Previous:

- USDA, AFRI Postdoctoral Fellowship Grant. May 2011. “Identifying a new cytotoxin from *Campylobacter jejuni* and determining its role in pathogenesis”. Awarded not accepted.
- California State University Program for Education and Research in Biotechnology. 3/2015 – 12/2016. “The role of RpoS and methylation of DNA in *Escherichia coli*”.

### Current:

- Improving Food Safety Grant, USDA, NIFA, AFRI. Characterization of tree fruit bacterial communities during harvest.; 3/2017-2/2020.
- Specialty Crop Research Initiative (SCRI) Grant, USDA, AFRI. Table to Farm: A sustainable systems-based approach for a safe, healthier melon supply chain in the U.S.; 9/2017 – 8/2021.
- Start for Success, Research, Discovery and Innovation (RDI). Establishing a rat model to simulate post-infectious IBS.; 7/2018-7/2019.
- Center for Produce Safety (CPS) Grant. Illuminating the role of whole genome sequencing in produce safety.; 1/2019-12/2020.
- Start for Success, Research, Discovery and Innovation (RDI). Assessing public health risk from sewage spills along the Mexico-Arizona border.; 7/2019-7/2020.
- Center for Produce Safety (CPS) Grant. Agriculture water treatment – Southwest region.; 1/2020 – 12/2020.

## Publications, Posters and Conferences

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- Bian X, Garber JM, **Cooper KK**, Huynh S, Jones J, Mills MK, Rafala D, Nasrin D, Kotloff KL, Parker CT, Tennant SM, Miller WG, Szymanski CM. 2019. *Campylobacter* abundance in breastfed infants and identification of a new species in the Global Enterics Multicenter Study. mSphere (Accepted).
- Ruiz C, McCarley A, Espejo ML, **Cooper KK**, Harmon DE. 2019. Comparative genomics reveals a well-conserved intrinsic resistome in the emerging multidrug-resistant pathogen *Cupriavidus gilardii*. mSphere. 4(5):e00631-19. DOI: 10.1128/mSphere.00631-19.
- Parker CT, **Cooper KK**, Huynh S, Smith TP, Bono JL, Cooley M. 2018. Genome sequences of eight Shiga toxin-producing *Escherichia coli* strains isolated from a produce-growing region in California. Microbiol Resour Announc. 7(1):e00807-18. DOI: 10.1128/MRA.00807-18.
- Pinoargote G, Flores, G, **Cooper K**, Ravishankar S. 2018. Effects on survival and bacterial community composition of the aquaculture water and gastrointestinal tract of shrimp (*Litopenaeus vannamei*) exposed to probiotic treatments after an induced infection of acute hepatopancreatic necrosis disease. Aquacult Res. 49:3270-3288. DOI: 10.1111/are.13791.
- Oliver A, Kay M, **Cooper KK**. 2018. Comparative genomics of cocci-shaped *Sporosarcina* strains with diverse spatial isolation. BMC Genomics. 19(1):310. DOI: 10.1186/s12864-018-4635-8.
- Seuylemezian A, Vaishampayan P, **Cooper K**, Venkateswaran K. 2018. Draft genome sequences of *Acinetobacter* and *Bacillus* strains isolated from spacecraft-associated surfaces. Genome Announc. 6(6):e01554-17. DOI: 10.1128/genomeA.01554-17.
- Seuylemezian A, **Cooper K**, Schubert W, Vaishampayan P. 2018. Draft genome sequences of 12 dry-heat-resistant *Bacillus* strains isolated from the cleanrooms where the Viking Spacecraft were assembled. Genome Announc. 6(12):e00094-18. DOI: 10.1128/genomeA.00094-18.
- Pascoe B, Meric G, Yahara K, Wimalarathna H, Murray S, Hitchings MD, Sproston EL, Carrillo CD, Taboada EN, **Cooper KK**, Huynh S, Cody AJ, Jolley KA, Maiden MCJ, McCarthy ND, Didelot X, Parker CT, Sheppard SK. 2017. Local genes for local bacteria: Evidence of allopatry in the genomes of transatlantic *Campylobacter* populations. Mol Ecol. 26(17):4497-4508. DOI: 10.1111/mec.14176.
- Chaires M, Gupta D, Joshee N, **Cooper KK**, Basu C. 2017. RNA-seq analysis of the salt stress-induced transcripts in fast-growing bioenergy tree, *Paulownia elongate*. J Plant Inter 12(1):128-136. DOI: 10.1080/17429145.2017.1298851.
- Gorski L, Huynh S, **Cooper KK**, Parker CT. 2017. Complete genomic sequences of two *Salmonella enterica* subsp. *enterica* Serogroup C2 (O:6,8) strains from Central California. Genome Announc. 5(46):e01234-17. DOI: 10.1128/genomeA.01234-17.
- Parker CT, Huynh S, Gorski L, **Cooper KK**, Miller WG. 2015. Complete genome sequences of two outbreak strains of *Salmonella enterica* subsp. *enterica* serovar Thompson associated with cilantro. Genome Announc. 3(6):e01365-15. DOI: 10.1128/genomeA.01365-15.
- Parker CT, Huynh S, Heikema AP, **Cooper KK**, Miller WG. 2015. Complete genome sequences of *Campylobacter jejuni* strains RM3196 (233.94) and RM3197 (308.95) isolated from patients with Guillain-Barre Syndrome. Genome Announc. 3(6):e01312-15. DOI: 10.1128/genomeA.01312-15.

**Cooper KK**, Mandrell RE, Louie JW, Korlach J, Clark TA, Parker CT, Huynh S, Chain PS, Ahmed S, Carter MQ. 2014. Complete genome sequences of two *Escherichia coli* O145:H28 outbreak strains of food origin. *Genome Announc.* **2**(3):e00483-14. DOI: 10.1128/genomeA.00482-14.

**Cooper KK**, Mandrell RE, Louie JW, Korlach J, Clark TA, Parker CT, Huynh S, Chain PS, Ahmed S, Carter MQ. 2014. Comparative genomics of enterohemorrhagic *Escherichia coli* O145:H28 demonstrates a common evolutionary lineage with *Escherichia coli* O157:H7. *BMC Genomics.* **15**:17. DOI: 10.1186/1471-2164-15-17.

**Cooper KK**, Bueschel DM, Songer JG. 2013. Presence of *Clostridium perfringens* in retail chicken livers. *Anaerobe.* **21**:67-8. DOI: 10.1016/j.anaerobe.2013.03.013.

**Cooper KK**, Songer JG, Uzal F. 2013. Diagnosing clostridial enteric disease in poultry. *J Vet Diagn Invest.* **25**(3):314-27. DOI: 10.1177/1040638713483468.

**Cooper KK**, Cooper MA, Zuccolo A, Joens LA. 2013. Re-sequencing of virulent strain of *Campylobacter jejuni* NCTC11168 reveals potential virulence factors. *Res Microbiol.* **164**:6-11. DOI: 10.1016/j.resmic.2012.10.002.

Theoret JR, **Cooper KK**, Zekarias B, Roland K, Law BF, Curtiss III R, Joens LA. 2012. The *Campylobacter jejuni* Dps homologue is important for *in vitro* biofilm formation and cecal colonization of poultry, and may serve as a protective antigen for vaccination. *Clin Vaccine Immunol.* **19**(9):1426-31. DOI: 10.1128/CVI.00151-12.

Coursodon CF, Glock RD, Moore KL, **Cooper KK**, Songer JG. 2012. TpeL-producing strains of *Clostridium perfringens* type A are highly virulent for broiler chicks. *Anaerobe.* **18**(1):117-21. DOI: 10.1016/j.anaerobe.2011.10.001.

Theoret JR, **Cooper KK**, Glock RD, Joens LA. 2011. A *Campylobacter jejuni* Dps homologue has a role in intracellular survival and in the development of campylobacteriosis in neonate piglets. *Foodborne Pathog Dis.* **8**(12):1263-8. DOI: 10.1089/fpd.2011.0892.

**Cooper KK**, Cooper MA, Zuccolo A, Law B, Joens LA. 2011. The complete genome sequence of *Campylobacter jejuni* strain S3", *J Bacteriol.* **193**(6):1491-2. DOI: 10.1128/JB.01475-10.

**Cooper KK**, Theoret JR, Stewart BA, Trinh HT, Glock RD, Songer JG. 2010. Virulence for chickens of *Clostridium perfringens* isolated from poultry and other sources. *Anaerobe.* **16**(3):289-92. DOI: 10.1016/j.anaerobe.2010.02.006.

**Cooper KK**, Songer JG. 2010. Virulence of *Clostridium perfringens* in an experimental model of poultry necrotic enteritis. *Vet Microbiol.* **142**(3-4): 323-8. DOI: 10.1016/j.vetmic.2009.09.065.

**Cooper KK**, Songer JG. 2009. Necrotic enteritis in poultry: A paradigm of enteric infection by *Clostridium perfringens* type A. *Anaerobe.* **15**(1-2):55-60. DOI: 10.1016/j.anaerobe.2009.01.006.

**Cooper KK**, Trinh HT, Songer JG. 2009. Immunization with recombinant alpha toxin partially protects broiler chicks against experimental challenge with *Clostridium perfringens*. *Vet Microbiol.* **133**(1-2) 92-7. DOI: 10.1016/j.vetmic.2008.06.001.

### **Oral Presentations:**

**K.K. Cooper.** “Comparative genomics of *Campylobacter jejuni* strains producing different diarrheal pathotypes”, *Campylobacter, Helicobacter* and Related Organisms (CHRO) Meeting, Belfast, Northern Ireland, September 2019.

**K.K. Cooper.** “Role of Whole Genome Sequencing in Foodborne Outbreaks”, YUM! Produce Industry Meeting, Monterey, CA, July 2018.

**K.K. Cooper.** “Role of Whole Genome Sequencing in Food Safety”, Taco Bell Annual Supplier Meeting, Irvine, CA, April 2018.

**K.K. Cooper.** “An Update on Whole Genome Sequencing”, YUM! Produce Industry Meeting, Monterey, CA, July 2017.

**K.K. Cooper.** “Fundamentals of foodborne pathogens”, YUM! Produce Industry Meeting, Monterey, CA, July 2016.

**K.K. Cooper,** J. Theoret, B. Law, M.E. Konkel, B.A. White, Q. Zhang, and L.A. Joens, "Genes up-regulated in *Campylobacter jejuni* after colonization of the host", CRWAD, Chicago, IL, December 2007.

**K.K. Cooper,** M.K. Keel, B. Stewart, H. Trinh, B.H. Jost, and J.G. Songer, "Virulence for chickens of *Clostridium perfringens* isolated from poultry and other sources", ASM AZ-NV Branch Meeting, Las Vegas, NV, Feb 2006.

**K.K. Cooper,** H. Trinh, and J.G. Songer, "The ability of crude toxins from *Clostridium perfringens* type A to produce necrotic enteritis in broiler chickens", CRWAD, St. Louis, MO December 2005.

**K.K. Cooper,** M.K. Keel, B. Stewart, H. Trinh, B.H. Jost, and J.G. Songer, "Virulence for chickens of *Clostridium perfringens* isolated from poultry and other sources", CRWAD, Chicago, IL December 2004.

**K.K. Cooper,** M.K. Keel, D.M. Bueschel, B.H. Jost, and J.G. Songer, "Reproduction of necrotic enteritis in broiler chickens", ASM AZ-NV Branch Meeting, Flagstaff, AZ, April 2002.

### **Posters:**

**K.K. Cooper,** J. Pinzon, M.A. Cooper, M. Skots, G.E. Flores, R. Mackelprang, and T.V. Suslow, “Characterization of tree fruit bacterial communities during harvest”, International Food Protection Association Annual Meeting, Louisville, KY, July 2019.

**K.K. Cooper,** J. Pinzon, M.A. Cooper, M. Skots, G.E. Flores, R. Mackelprang, and T.V. Suslow, “Characterization of tree fruit bacterial communities during harvest”, Lake Arrowhead Microbial Genomics Meeting, Lake Arrowhead, CA, September 2018.

C.T. Parker, M. Chapman, S. Huynh, and **K.K. Cooper,** “WGS of sympatric *Campylobacter jejuni* reveals little evidence that strains are exchanged between livestock animals and passerine birds in the Salinas Valley”, ASM General Meeting, New Orleans, LA, June 2017.



T. Bayangos, K. Rocha, A. Noguera, E. Luna, S. Tholberg, G. Flores, and **K.K. Cooper**, "Identification and quantification of antibiotic resistant bacteria from meats and poultry", ASM General Meeting, New Orleans, LA, June 2017.

N. Lopez, T. Bayangos, A. Rodriguez, C. Santoso, T. Nguyen, I. Sirota, A. Kedgulpiyapanich, S. Asgharzadeh, M. Chapman, C.T. Parker, and **K.K. Cooper**, "Prevalence of foodborne pathogens on fresh produce in the San Fernando Valley, CA", ASM General Meeting, New Orleans, LA, June 2017.

K. Galindo, C.T. Parker, S. Huynh, C. Sams, T.P. Smith, J.L. Bono, R.E. Mandrell, and **K.K. Cooper**, "The genomics of Shiga toxin-producing *Escherichia coli* (STEC) O91:H21", ASM General Meeting, New Orleans, LA, June 2017.

B. Sanchez, T. Bayangos, K. Rocha, A. Noguera, E. Luna, S. Tholberg, C. Alcaez, G. Flores, and **K.K. Cooper**, "Quantification of antibiotic resistant bacteria from ready-to-eat foods", ASM General Meeting, New Orleans, LA, June 2017.

O. Guerbidjian, **K.K. Cooper**, S. Huynh, L. Gorski, A.S. Liang, A.H. Bates, R.E. Mandrell, and C.T. Parker, "Whole-genome sequencing analysis reveals diversity among indetically subtyped *Salmonella* Typhimurium strains from different spatial and temporal sources", ASM General Meeting, New Orleans, LA, June 2017.

A. Oliver, M. Kay, T. Kurbessoian, and **K.K. Cooper**, "Comparative genomics and epigenomics of *Sporosarcina ureae*", ASM General Meeting, Boston, MA, June 2016.

T. Bayangos, K. Rocha, A. Noguera, E. Luna, and **K.K. Cooper**, "Role of foods in transmission of antibiotic resistance", CSUPERB Symposium, Anaheim, CA, January 2016.

C.T. Parker, M. Chapman, S. Huynh, and **K.K. Cooper**, "Little evidence that *Campylobacter jejuni* strains are exchanged between livestock animals and passerine birds inhabiting the same Salinas Valley agricultural lands", *Campylobacter, Helicobacter, and Related Organisms (CHRO)* Conference, Rotorua, New Zealand, November 2015.

C. Basu, **K.K. Cooper**, D. Gupta, and N. Joshee, "Genome wide analysis of heat stress inducible genes in *Paulownia elongate*", 3<sup>rd</sup> Plant Genomics Congress, St. Louis, MO, September 2015.

C.T. Parker, **K.K. Cooper**, A. Oliver, and S. Huynh, "Whole-genome sequence comparison of *Salmonella* Enteritidis strains isolated from samples associated with almond outbreaks", ASM General Meeting, Boston, MA, May 2014.

**K.K. Cooper**, J. Korlach, T.A. Clark, K. Luong, J.W. Louie, S. Huynh, C.T. Parker, R.E. Mandrell, and M.Q. Carter, "Comparative epigenetics of enterohemorrhagic *Escherichia coli*", ASM General Meeting, Denver, CO, May 2013.

**K.K. Cooper**, P.S. Chain, S. Ahmed, S. Huynh, C.T. Parker, J. Korlach, R.E. Mandrell and M.Q. Carter, "Comparative genomics of Shiga toxin-producing *Escherichia coli* O145:H28 strains associated with the 2007 Belgium and 2010 US outbreaks", ASM General Meeting, San Francisco, CA, June 2012.

**K.K. Cooper**, H. Trinh, and J.G. Songer, "Experimental necrotic enteritis in poultry", ClostPath, Nottingham, England, June 2006.