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At a glance

A NEWSLETTER FROM THE UNIVERSITY OF GEORGIA CENTER FOR FOOD SAFETY

Message from the Center Director

On July 1, 2017 our founding Director, Professor Mike Doyle, is retiring from the Center for Food Safety. This At-A-Glance Newsletter is devoted to highlighting Mike's leadership since 1993 as Director of the Center for Food Safety and to celebrating his accomplishments and contributions. During his tenure as CFS Director, Mike's contributions have elevated the reputation of The University of Georgia and have made a great impact in the field of food safety microbiology and on the lives of thousands of scientists and consumers. In my opinion, Mike is probably the most influential food microbiologist of our generation. He is one of a few food microbiologists who has been named a fellow in the American Academy of Microbiology, the American Association for the Advancement of Science, and the American Academy of Inventors.

Mike's legacy will endure for many generations and he will be remembered as a true pioneer with an "infectious" passion for making our food supply safer and for advancing science. This newsletter issue will reproduce excerpts from a recent interview granted by Mike that offers a glimpse into his life and career, as well as commentary by Art Liang, one of his closest collaborators from CDC. Mike's scientific accomplishments are also featured in this issue.

Please join me in congratulating him for achieving this milestone in his career.

Double Cheers,

Francisco Diez-Gonzalez

Message from Dr. Art Liang
Senior Advisor for Food Safety
Centers for Disease Control and Prevention

Although the bacterial enteric disease activities are among the oldest programs, as late as 1993 CDC's primary engagement with food safety was through Dr. Frank Bryan's consultation and training with state and local health departments as well as some industry, and universities. CDC foodborne disease publications and presentations were aimed at a medical or at a traditional health department communicable disease audience. Except perhaps for consumers, our foodborne disease groups at CDC had very little contact with groups that actually "touched" food, e.g., growers, processors, manufacturers, retailers or government regulators. Naïvely perhaps, we didn't trust industry; and we didn't appreciate the work of the regulators. **Mike Doyle helped to change all this.** As President of IAMFES, now IAFP, Mike pulled Morrie Potter DVM, Assistant Director for Foodborne Diseases at CDC at the time, inside the IAFP food safety community so that CDC could have better opportunities to inform discussions of food safety policy and practice with data from CDC and state/local health departments' foodborne illness surveillance and investigations. The "CDC-Industry" conversation took a giant leap forward in 2007 when Dr. Doyle began convening the CDC Food Industry Safe Foods Forum bringing together the CDC food safety programs and key food companies who had a reputation for "going the extra mile" for food safety. Over the intervening years, communications have continued to improve, and real opportunities for coordination and collaboration have been developed such as consultation with food industry representatives during multistate foodborne outbreaks and VoluntaryNet. Mike Doyle really has had a very great impact on the foodborne illness community at CDC and the way we view and work with food safety partners in industry and academia.

Interview of Michael P. Doyle

(interview credits: Terry Marie Hastings, Director Research Communications, Office of Research, UGA)

Among the millions of people sickened every year with foodborne disease, 128,000 must be hospitalized and about 3,000 die. Foodborne illnesses also impose a tremendous economic burden of more than $15.5 billion in treatment costs and lost wages every year, according to the most recent data from the U.S. Department of Agriculture.

These numbers are a stark reminder that while we have made great advances in food safety, there is always ample room for improvement. Few people are as aware of this as Michael Doyle. The Regents Professor of Food Microbiology and founding director of UGA's Center for Food Safety, Doyle has spent the better part of 30 years studying the pathogens that make us sick.

"I grew up on a dairy farm in Wisconsin, so I appreciated the importance of safe food from a very young age," Doyle said. "I've carried those lessons with me all the way to UGA, where my colleagues in the Center for Food Safety and I work to develop new ways of detecting and controlling the harmful microbes in food that can make people sick."

Doyle's scientific career began in earnest at the University of Wisconsin-Madison, where he earned a Bachelor of Science in bacteriology, and a Master of Science and Ph.D. in food microbiology. He worked as a faculty member in UW's Food Research Institute from 1980 to 1991, and he gained wide recognition for developing the first test to detect *E. coli* O157, a bacterial food pathogen that can cause diarrhea, abdominal cramps, kidney failure, and even death.

He came to UGA in 1991 to lead the newly developed Center for Food Safety, which is now home to 19 faculty. He also began working with scientists at the CDC, who came to rely on Doyle's counsel and skill in the laboratory when faced with a new outbreak of foodborne illnesses.

Over the course of his career, Doyle has seen dramatic changes in the way food companies and regulatory agencies manage the nation's food supply. He's watched household brands take a beating in the news media when one of their products is connected with an outbreak, and he and his colleagues have helped create a myriad of new scientific tools to help those companies improve their operations.

"Many companies in years gone by talked a lot about food safety, but they didn't really spend a lot of money on it," said Doyle. "But the world has changed in the last few years, and people are becoming more serious about food safety culture."

Doyle has forged strong working relationships in the food industry, which has allowed him to mold the Center for Food Safety into a program that develops real solutions for companies that are committed to producing safer foods.

"Today it is largely companies that are paving the way in terms of developing more advanced methods to isolate harmful microbes," he said. "Big brands like Kraft and General Mills can't afford to have food safety hiccups. Also, the Department of Justice prosecutes these cases more aggressively now than they have in the past, so there is a financial incentive to produce safe products."

When dangerous pathogens do slip through the cracks, scientists may call upon a host of new genetic tools to track the outbreak. Researchers at the CDC and other agencies can isolate pathogens from tainted food, analyze their unique genetic makeup and store that information in databases.

"When a patient comes in complaining of food poisoning, they can compare the pathogen taken from that patient with the database to see if there might be links to isolates that have come from food processing facilities," said Doyle, who is also a member of the National Academy of Medicine. "They can even go back in time and look at microbes that caused outbreaks years ago to see if there is any connection to something happening today. It's incredible; the technology is driving the industry in new directions very quickly."

Doyle stepped down from his position as director of the Center for Food Safety last year after 25 years at its helm and he will be fully retiring as Regents Professor after July 1st, 2017.

"Our immediate family has grown from five to 14 with all my grandkids and my children's spouses, and it's continuing to grow," he said. "I'd like to see more of them. I'll try to continue working with companies that really want to raise the bar on food safety, and I'm looking forward to spending more time with family."

(For the entire interview see: https://ugaresearch.uga.edu/one-researchers-mission-to-make-our-food-safer/)

Mike Doyle's Top 30 Highly Cited Peer-Reviewed Articles

(based on Web of Science's Citation Index)

Total	Avg./ Year	Title and Source	Major Finding
668	26.7	**An outbreak of diarrhea and hemolytic uremic syndrome from *Escherichia coli* O157:H7 in fresh-pressed apple cider.** JAMA 269:2217 **(1993)**	The first outbreak linked to unpasteurized apple cider occurred in MA in 1991 involving 18 patients. Benzoate reduced survival of *E. coli* O157:H7.
418	13.5	**Isolation of *Escherichia coli* O157:H7 from retail fresh meats and poultry.** AEM 53:2394 **(1987)**	First large-scale survey of 896 retail meat samples that reported the presence of serotype O157 in 3.7% of beef, 1.5% pork, 1.5% poultry and 2.0% lamb samples.
287	13.0	**Fate of enterohemorrhagic *Escherichia coli* O157:H7 in bovine feces.** AEM 62:2567 **(1996)**	Using inoculated cattle feces, *E. coli* O157:H7 survived at room temperature from 49 and 56 days and at 5°C for 63 to 70 days, at 3 and 5 Log CFU/g inoculum level, respectively.
283	12.3	**Prevalence of enterohemorrhagic *Escherichia coli* O157:H7 in a survey of dairy herds.** AEM 61:1290 **(1995)**	In one of the first surveys that assessed the presence of *E. coli* O157:H7 in dairy cattle, from 1.5% to 5.3% of calves and as many as 50% of herds tested positive.
282	10.4	***Escherichia coli* O157:H7 and its significance in foods.** IJFM 12:289 **(1991)**	First comprehensive review of the epidemiology, ecology, detection methods, and characteristics of *E. coli* O157:H7.
274	11.0	**Fate of enterohemorrhagic *Escherichia coli* O157:H7 in apple cider with and without preservatives.** AEM 59:2526 **(1993)**	Challenge experiments demonstrated that *E. coli* O157:H7 survived up to 31 days at 8˚C. Benzoate was more effective to reduce survival to 10 days.
269	10.4	**Fate of *Escherichia coli* O157:H7 as affected by pH or sodium chloride and in fermented, dry sausage.** AEM 58:2513 **(1992)**	*E. coli* O157:H7 survived fermentation, drying, and storage of fermented sausage.
258	11.2	**Health risks and consequences of *Salmonella* and *Campylobacter jejuni* in raw poultry.** JFP 58:326 **(1995)**	Review paper of the epidemiological, incidence and economic magnitude of poultry contamination.
234	8.1	**Fate of *Listeria monocytogenes* in processed meat-products during refrigerated storage.** AEM 55:1565 **(1989)**	*Listeria* growth on a variety of processed and fermented meats was favored when pH was 6 or above and in poultry products.
219	21.9	**Summer meeting 2007 - the problems with fresh produce: an overview.** JAM 105:317 **(2008)**	Landmark review paper that provided an overview of the complexity of controlling foodborne pathogens.
219	15.6	**Persistence of enterohemorrhagic *Escherichia coli* O157:H7 in soil and on leaf lettuce and parsley grown in fields treated with contaminated manure composts or irrigation water.** JFP 67:1365 **(2004)**	*E. coli* O157:H7 survived in soils amended with contaminated compost and it was detected in parsley for more than 5 months.
217	7.2	**Colonization of gastrointestinal tracts of chicks by *Campylobacter jejuni*.** AEM 54:2365 **(1988)**	*C. jejuni*'s principal sites of localization were the ceca, large intestine, and cloaca.
206	9.8	**Foodborne disease significance of *Escherichia coli* O157:H7 and other enterohemorrhagic *E. coli*.** FT 51:69 **(1997)**	Extensive review of the epidemiology, ecology, detection methods, characteristics and control of *E. coli* O157:H7.
190	9.5	**Survival of enterohemorrhagic *Escherichia coli* O157:H7 in water.** JFP 61:662 **(1998)**	*E. coli* O157:H7 survived up to 91 days at 8˚C in water. Survival was reduced to 84 days at 25˚C. *E. coli* O157:H7 became viable but nonculturable.
188	9.0	**An outbreak of *Escherichia coli* O157:H7 infections traced to jerky made from deer meat.** JAMA 277:1229 **(1997)**	Processed deer meat was a vehicle for transmission. *E. coli* O157:H7 was found in deer feces and it survived in venison jerky.
187	6.7	***Listeria monocytogenes* and other *Listeria* spp. in meat and meat products - A review.** JFP 53:81 **(1990)**	Overview of the prevalence, survival, isolation and control of *Listeria* in meats.
182	9.6	**Lessons from a large outbreak of *Escherichia coli* O157:H7 infections: insights into the infectious dose and method of widespread contamination of hamburger patties.** EI 122:185 **(1999)**	*E. coli* O157:H7 infectious dose was estimated to be less than 700 CFU based on quantification of beef patties implicated in a 1993 large outbreak.
180	9.5	**Efficacy of electrolyzed oxidizing water for inactivating *Escherichia coli* O157:H7, *Salmonella* Enteritidis, and *Listeria monocytogenes*.** AEM 65:4276 **(1999)**	Suspensions of each pathogen were inactivated by 7 Log CFU/ml after 1 min at 45˚C and 2 min at 35˚C.
177	11.1	**Fate of *Escherichia coli* O157:H7 in manure-amended soil.** AEM 68:2605 **(2002)**	Survival in non-sterile soil amended with manure was >30 days shorter than in sterile. Survival was reduced to less than 50% at 5˚C, compared to 15˚C and 20˚C.
172	6.6	***Escherichia coli* O157:H7 - Epidemiology, pathogenesis, and methods for detection in food.** JFP 55:555 **(1992)**	Review on the transmission routes, virulence, and methods of detection of *E. coli* O157:H7.
164	5.3	**Survival of *Listeria monocytogenes* in milk during high-temperature, short-time pasteurization.** AEM 53:1433 **(1987)**	*L. monocytogenes* was detected after short-time pasteurization at temperatures below 73.9˚C.
161	8.1	**Reduction of carriage of enterohemorrhagic *Escherichia coli* O157:H7 in cattle by inoculation with probiotic bacteria.** JCM 36:641 **(1998)**	Calves pre-inoculated with a mixture of probiotic *E. coli* shed serotype O157:H7 ten days shorter in their feces at lower counts than controls.
161	6.0	**Rapid procedure for detecting enterohemorrhagic *Escherichia coli* O157:H7 in food.** AEM 57:2693 **(1991)**	A novel ELISA-based method detected at least 0.4 cell/g in less than 20 hours from ground beef.
158	7.5	**Experimental *Escherichia coli* O157:H7 carriage in calves.** AEM 63:27 **(1997)**	The population of fecal *E. coli* O157:H7 inoculated orally into calves declined rapidly during the first two weeks. Colonization was restricted to the GI tract.
128	5.6	**Risk factors for fecal shedding of *Escherichia coli* O157:H7 in dairy calves.** JAVMA 207:46 **(1995)**	The prevalence of *E. coli* O157:H7 in dairy calves increased from 1.4% to 4.8% after weaning.
118	6.9	**Pathogen reduction and quality of lettuce treated with electrolyzed oxidizing and acidified chlorinated water.** JFS 66:1368 **(2001)**	*E. coli* O157:H7 and *L. monocytogenes* inoculated on lettuce leaf surfaces were reduced by 2.4 and 2.6 Log CFU/g after 3 min of EOW or ACW treatments.
112	9.3	**Reducing the carriage of foodborne pathogens in livestock and poultry.** PS 85:960 **(2006)**	Review on the factors that affect colonization of livestock and analysis of the potential pre-harvest critical points and interventions.
111	4.6	**Inactivation of *Escherichia coli* O157:H7, salmonellae, and *Campylobacter jejuni* in raw ground beef by gamma irradiation.** AEM 60:2069 **(1994)**	D10 values of 0.235, 0.307 and 0.8 kGy were determined for *E. coli* O157:H7, *Salmonella* and *C. jejuni*, respectively, in frozen ground beef.
101	4.2	**Ineffectiveness of hot acid sprays to decontaminate *Escherichia coli* O157:H7 on beef.** JFP 57:198 **(1994)**	Reductions of less than 0.5 Log CFU/g *E. coli* O157:H7 were determined after treating beef slices with acetic, citric and lactic acid sprays.
99	9.0	**Food as a vehicle for transmission of Shiga toxin-producing *Escherichia coli*.** JFP 70:2426 **(2007)**	Review of the food outbreak attribution of STEC, the food prevalence, virulence factors, and strategies for control.

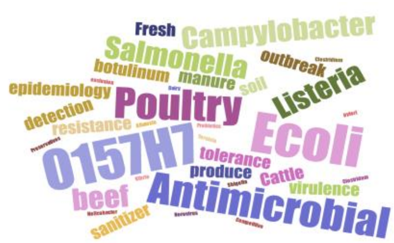
Research Highlights and Accomplishments of Mike Doyle

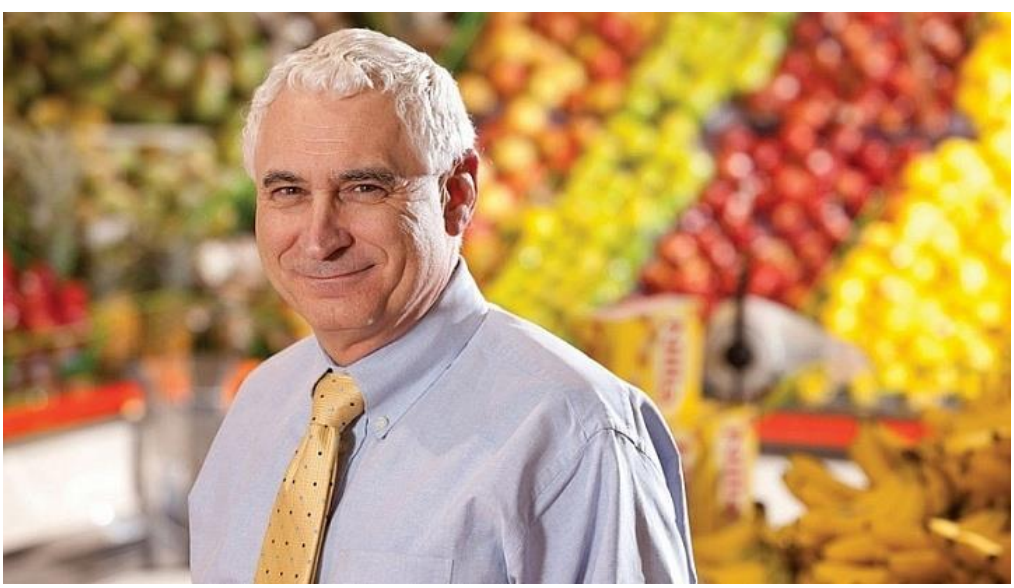
Mike Doyle has 324 refereed journal articles, 23 books, 67 book chapters, 87 invited papers /conference proceedings, 30 patents, and more than 900 invited presentations at national and international professional meetings. He is an active researcher in the area of foodborne bacterial pathogens and works closely with the food industry on issues related to the microbiological safety of foods. His research has focused on the study of microbial pathogenicity, the development of methods for pathogen detection, and the identification of means to control or eliminate pathogens in foods.

By the Numbers

(based on Web of Science and PubMed searches)

Microbial agent	No. of peer-reviewed publications	Commodity	No. of peer-reviewed publications	Other Topics	No. of peer-reviewed publications
E. coli O157:H7	132	Poultry	58	Antimicrobial	51
Listeria monocytogenes	90	Cattle	58	Resistance/tolerance	38
Salmonella	61	Beef	30	Manure	33
Campylobacter	50	Fresh produce	30	Virulence	31
Clostridium botulinum	20	Dairy	21	Soil	28
Aflatoxin	12			Outbreak	28
Yersinia	9			Epidemiology	26
Shigella	8			Detection	17
Helicobacter pylori	4			Sanitizer	14
Vibrio	4			Antimicrobial resistance	13
Norovirus	2			Preservatives	8
				Competitive exclusion	7
				Probiotics	4





At a glance

At A Glance is published by the Center for Food Safety of the University of Georgia College of Agricultural and Environmental Sciences. For further information on our research, please contact Dr. Francisco Diez-Gonzalez, Center for Food Safety, University of Georgia, Melton Building, Griffin, GA 30223-1797. Phone (770) 228-7284, Fax (770) 229-3216, Email: fdiez@uga.edu.