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October 14, 2009

To: USDA's Agriculture Marketing Service

Re: Testimony of Michele Jay-Russell

My name is Michele Jay-Russell and I am the Program Manager of the Western Center for Food Safety (WCFS) at the Western Institute for Safety and Security (WIFSS), University of California, Davis. As background, my training includes a Doctor of Veterinary Medicine (DVM), a Master's of Veterinary Preventive Medicine (MPVM), and I am a PhD Candidate in Microbiology. In my current position, I work actively in applied food safety research, outreach, and education. My research focus is pre-harvest leafy green food safety with an emphasis on identifying potential risk factors and mitigation strategies to prevent microbial contamination of produce from vertebrate (domestic and wild animal) reservoirs. Our collaborative research group is approximately half-way through an extensive, multi-year longitudinal study of the epidemiology and ecology of *E. coli* O157:H7 in leafy greens in the California Central Coast funded by USDA CSREES (Mandrell and Atwill, project no. 2006-01240); this work is also supported by FDA CSFSAN funds for the WCFS. Both myself and others from this research group have provided input into the development and implementation of the California Leafy Green Marketing Agreement including the GAP metrics.

My involvement in leafy green food safety actually began prior to joining UC Davis in 2008. I worked previously as a Research Scientist with the California Department of Public Health (CDPH) where I served as the State Public Health Veterinarian, followed by a position in the Food and Drug Branch. Over my ten year career at CDPH, I investigated many foodborne disease outbreaks including the 2006 *E. coli* O157:H7 outbreak linked to bagged spinach. During the spinach outbreak, I participated in the farm investigation and served as a Team Leader on the California Food Emergency Response Team (CalFERT). As a result of these experiences, I know first hand the devastation that foodborne disease outbreaks can cause to the patients and their families and the industry, as well as the impacts on consumer confidence and the burden these outbreaks cause on an already stressed public health system.

For these reasons, I see an urgent need to implement science-based strategies to reduce the risk of future leafy green-related outbreaks and recalls. The National Leafy Green Marketing Agreement (NLGMA) represents one such avenue. Based on my experience in public health and as a university scientist, I have several comments on the proposal that are specific to my areas of expertise in zoonotic diseases and food safety.

**Potential Risk Factors for Contamination of Leafy Green Vegetables in the Pre-harvest Environment with Foodborne Pathogens**

The NLGMA GAP audit metrics include "encroachment by animals of significant risk," based, at least in part, on the document, *Commodity Specific Food Safety Guidelines for the Lettuce and Leafy Green Supply Chain*.[1] I was one of the contributors and reviewers of this document, and continue to conduct applied research on the role of domestic animals and wildlife in the microbial contamination of leafy greens or the growing environment (e.g., water, soil, bioaerosols) as mentioned earlier. It is important to note that concern about disease transmission between animals and people in the context of food safety is not new. Cattle and other livestock are considered reservoirs of a number of zoonotic foodborne pathogens such as *Campylobacter*, *E. coli* O157 and other shiga-toxin producing *E. coli*, and *Salmonella*. Likewise, foodborne pathogens have been isolated from a variety of wildlife species worldwide, and public health officials routinely provide safety information for hunters to prevent infections during the handling and processing of game meat. As an example, venison contaminated with *E. coli* O157:H7 has been associated with several outbreaks in the United States, and the strain has been isolated from deer droppings.[2]

In contrast, the risk of domestic animals and wildlife transmitting zoonotic foodborne pathogens to fresh produce prior to harvest is not as well defined. In many produce growing regions across the United States, livestock and wildlife populations co-exist in close proximity to crops, thus raising the possibility of foodborne pathogen transmission. In general, the incidence of foodborne pathogens in wildlife populations appears to be low; however, several notable exceptions exist that I will describe in more detail shortly.

There are two potential mechanisms of foodborne pathogen transmission from domestic animals or wildlife to leafy greens, and both of these routes are addressed by the NLGMA GAP metrics.

1. Direct transmission: fecal defecation or runoff (for example from a cattle operation) onto the plant
2. Indirect transmission: fecal contamination of water (surface or well), soil, sediment, and/or bioaerosols that may subsequently contaminate the plant

Much of what we know today about the potential risk factors relating to produce contamination with foodborne pathogens comes from the results of outbreak investigations. Our understanding of these processes remains incomplete, but the available information forms the basis for some of the GAP metrics in the NLGMA. It is important to note that even a low level of contamination at the pre-harvest level may still

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[1] Commodity Specific Food Safety Guidelines for the Lettuce and Leafy Greens Supply Chain, 1st ed. Available from: http://www.fda.gov/downloads/Food/FoodSafety/Product-SpecificInformation/FruitsVegetablesJuices/GuidanceComplianceRegulatoryInformation/UCM169008.pdf

[2] Keene, W. E., E. Sazie, J. Kok, D. H. Rice, D. D. Hancock, et al. 1997. An outbreak of Escherichia coli O157:H7 infections traced to jerky made from deer meat. JAMA. 277:1229-31

represent a serious food safety risk because the infectious dose for many of these pathogens is very low (especially for the young, elderly, and immunocompromised). Furthermore, downstream failures during processing, transport, and handling (such as temperature abuse) could allow pathogens coming from the fields to grow to more significant numbers.

**Case Studies**

During the environmental investigation of the spinach outbreak in 2006, the outbreak strain was isolated from cattle, feral swine, soil, sediment, and surface water samples at a single ranch in San Benito County where the implicated product was harvested[3]. As shown in Attachment 1, prior to this outbreak, *E coli* O157:H7 had been isolated from surface water (creeks, streams) and cattle feces in the Salinas Valley region[4]. Attachment 2 (Table 1) shows the percent positive samples from the spinach investigation. Notably, *E. coli* O157:H7 was cultured from 26 (33.8%) of 77 cattle feces, 2 (5%) of 40 feral swine colonic feces, 11 (23.4%) of 47 feral swine feces, 3 (3.8%) of 79 surface water, and 3 (8.1%) of 37 soil/sediment samples. A large feral swine population was documented at the ranch, and evidence of intrusion into surrounding row crops was documented (Attachment 2, Figure 1). The exact mechanism of transfer of the pathogen to the plants was not determined, but the fact that the molecular data suggested that the spinach outbreak strain was circulating between cattle, feral swine, and the environment (water, soil) near the fields and agriculture wells indicates that multiple potential sources of contamination existed on the farm. Following this outbreak, I published a paper with Jerry Wiscomb, a wildlife biologist from USDA Wildlife Services, that addressed more specifically the potential food safety concerns and mitigation strategies for feral swine near produce fields (Attachment 3).[5]

A more direct link between wildlife fecal contamination and a produce outbreak was recently documented in Alaska in 2008 (Attachment 4).[6] This outbreak of campylobacteriosis involved 63 illnesses linked to consumption of contaminated fresh peas. The investigators identified the outbreak strain in 14 Sandhill crane feces and 2 pea samples. Similar to the spinach outbreak investigation, a very large population of cranes was observed near the pea fields. Additionally, deficiencies in the pea-processing water (residual chlorine) were found.

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[3] Jay MT, Cooley M, Carychao D, Wiscomb GW, Sweitzer RA, et al. 2007. *Escherichia coli* O157:H7 in feral swine near spinach fields and cattle, central California coast. Emerg Infect Dis. Available from http://www.cdc.gov/EID/content/13/12/1908.htm

[4] Cooley M, Carychao D, Crawford-Miksza L, Jay MT, Myers C, et al. 2007. Incidence and tracking of Escherichia coli O157:H7 in a major produce production region in California PLoS ONE 2(11): e1159. doi:10.1371/journal.pone.0001159

[5] Jay M.T. and G.W. Wiscomb. 2008. Food Safety Risks and Mitigation Strategies for Feral Swine (Sus scrofa) near Agriculture Fields. Proc. 23rd Vertebr. Pest Conf. R. M. Timm and M. B. Madon, eds. Pp. 21-25

[6] Alaska Department of Health. 2008. Campylobacteriosis Outbreak due to Consumption of Raw Peas — Alaska, 2008. Available from: http://www.epi.alaska.gov/bulletins/docs/b2008_20.pdf

These outbreaks illustrate the potential for domestic animals and wildlife near produce fields to carry foodborne pathogens, which strongly supports the inclusion of GAP metrics that address these risks as defined in the NLGMA. The outbreaks also show that although the prevalence of foodborne pathogens in livestock or wildlife may be low overall in a region, there may also be "hot spots," or situations where the population density reaches a critical mass that could theoretically promote a contamination event. The relationships between pathogen carriage, wildlife population density, and co-mingling with domestic livestock such as cattle are areas of active research in California and other states. For example, researchers at Ohio State University recently reported that European starlings can serve as a vehicle to disseminate *E. coli* O157:H7 from dairy farm to dairy farm[7].

**Communication of Research Findings with Industry: Recommendations for Risk Reduction to Protect Leafy Green Vegetables from Food Safety Hazards**

A major goal of the applied research on leafy greens at WIFSS in collaboration with the USDA ARS Western Regional Research Center and others is to use the information obtained from our studies and past outbreak investigations to: 1) inform produce growers about specific strategies to prevent pre-harvest microbial contamination of produce, 2) educate the livestock community about potential impacts of rangeland runoff on watersheds and downstream stakeholders, and 3) develop effective management practices for improving water quality.

In California, the LGMA is an important avenue by which to communicate our research findings. Similarly, the NLGMA will create a bridge with researchers and it provides the needed flexibility to implement changes as new scientific findings emerge. For example, some growers and conservationists have raised concerns about conflicts between food safety approaches and environmental quality.[8] The key to addressing and resolving these conflicts is continued research and communication of findings to all stakeholders. Although the specific issues will vary by region, a national approach is needed.

The Technical Advisory Board of the NLGMA represents an important mechanism in the proposal for university scientists to communicate with scientists from the conservation communities (e.g., NRCS, EPA, etc.) in order to promote both food safety goals and environmental stewardship. It is my belief that we can achieve these goals and the NLGMA is a step forward in the process.

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[7] LeJeune J., J. Homan, G. Linz, D. L. Pearl. 2008. Role of European starling in the transmission of E. coli O157 on dairy farms. Proc. 23rd Vertebr. Pest Conf. R. M. Timm and M. B. Madon, eds. Pp. 31-4

[8] Berretti, M. and D. Stuart. 2008. Food safety and environmental quality impose conflicting demands on Central Coast growers. Calif Agric. 62:68-73

Respectfully submitted,

Michele Jay-Russell, DVM, MPVM
Program Manager

**ATTACHMENTS**

1. Incidence and tracking of *Escherichia coli* O157:H7 in a major produce production region in California (abstract)

2. *Escherichia coli* O157:H7 in feral swine near spinach fields and cattle, central California Coast (manuscript)

3. Food Safety Risks and Mitigation Strategies for Feral Swine (*Sus scrofa*) near Agriculture Fields (manuscript)

4. Campylobacteriosis outbreak due to consumption of raw peas – Alaska, 2008 (newsletter)