**UC Davis Agricultural Sustainability Institute's**

**Russell Ranch Sustainable Agriculture Field Day 2011**

**Thursday, June 9th,**

## The impact of current food safety regulations on biodiversity

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### Food Safety Modernization Act 2011…Fresh Produce Safety (Section 105)

http://www.fda.gov/Food/FoodSafety/fsma/default.htm

• **In 1yr** - publish a proposed rule to establish minimum standards for the safe production and harvesting of fruits and vegetables

• **May not** include any requirements that would cause certified organic produce to run afoul of USDA's National Organic Program

• **Must consider** impacts on environment in rule-making

• **FDA is authorized to exempt** or modify the requirements for small and very small businesses that produce and harvest fruits and vegetables that FDA has determined are low risk

• **FDA must exempt local farms** with average annual monetary value of all food sold by such farm during the 3-year period was less than $500,000 AND local marketing within 275 miles of production

• **FDA is directed** to hold at least 3 public hearings in diverse geographical areas

**PRIMARY CONCERN** – efforts to comply with known and anticipated rulemaking will promote the further erosion of on-farm and regional practices and efforts to promote microbial, plant, and animal biodiversity for societal benefits in sustainability.

- Direct impact of regulations
- Indirect impact from actions taken by produce handlers and buyers

**SUGGESTED SOLUTION: CO-MANAGEMENT** - A landscape-scale approach to conserving soil, water, air, wildlife and other natural resources while simultaneously minimizing microbiological hazards associated with food production.

**Resources for more Information and Perspectives**

Food Safety Considerations for Conservation Planners downloadable from http://www.rcdmonterey.org

'Safe and Sustainable' report http://www.producesafetyproject.org/reports?id=0007

Biodiversity and Food Safety

Though we enjoy overwhelmingly safe fresh produce supply, over the past twenty years there have been over 70 outbreaks of human pathogen diseases associated with the consumption of raw fruits and vegetables sourced domestically and imported, including conventional and organic production, as well as large-centralized and small-scale production. In addition to other factors, the absence of clear and effective steps that consumers can take to prevent such illness if product is contaminated has generated significant concerns among public health regulators, the scientific community, consumer advocates, and the public. In response, new industry, state, and federal voluntary guidelines to minimize the risk of contamination arose and have been the precursors of pending rulemaking embodied in the recently signed "Food Safety Modernization Act (FSMA)". This federal regulation was brought into law in January 2011 and its enforcement will begin within 3 years on the highest risk commodities (according to FDA) which include tomato, cantaloupe, leafy greens, green onion, sprouts and culinary herbs which have been responsible for more than 75% of recognized outbreaks where contamination is implicated to a pre-shipping event, typically at preharvest or harvest phases.

Although FSMA regulations are directed to be based on current scientific data and emerging research; many unknowns exist with regard to pathogen behavior in the environment, impact of current conventional and organic farming practices on pathogen survival and proliferation and the role that on-farm biodiversity could have on pathogen dissemination and survival. Anticipated legislation, likely a legacy from previous guidelines, has generated conflicts between food safety mandates and on-farm conservation practices. Perturbations to natural habitat and resources and removal, or failure to implement, of desired water quality management practices and biodiversity enhancing measures, such as hedgerows, has been a documented impact of efforts to comply with food safety standards adopt by some of the larger produce handlers and buyers.

In response, the concept of ***Co-Management*** of microbiological hazards arose which associated the need for safe food production with other societal benefits of maintaining soil, water, air, and wildlife biodiversity (York et al. 2010). To realize this goal of Co-Management Best Practices, a greater scientific and practical understanding of how water quality management, environmental conservation and biodiversity, and food safety can function in harmony is sorely needed.

Current food safety research on the interactions of human pathogens with leafy greens has mainly focused on pathogen survival and internalization after artificial inoculation, disinfection methods to eliminate risk, pathogen detection and to a lesser extent, understanding the effects of the environment and agronomic practices on human pathogen survival and proliferation. One of the little known or explored interactions is the relationship that may exist between soil and plant biodiversity and human pathogen colonization and survival.

According to the Council on Environmental Quality (CEQ), biodiversity is defined as "the variety and variability of life, and the diversity of genes, species and ecosystems". Such broad definition needs to be put in context of the system under evaluation and normally is divided in several subcategories that include regional, local, within-systems, taxonomic and gene specific biodiversity. When referring to soil biodiversity; all categories significantly impact the level and scope of microorganisms present in a specific location and those resident communities have long been considered barriers against invasion of introduced species, non-adapted plant pathogens, and other pests (Levine and D'Antonio, 1999). Stochastic niche theory predicts that low invasibility of diverse communities results from competition for low levels of available resources due to efficient and expedite processing by those dissimilar communities reducing niche vacancy (Tilman, 2004 and Hodgson et al., 2002). Additionally, disturbance of soil habitats has been suggested to change both composition and function of microbial communities and more recently; "resistance to disturbance" has also been described in well established communities (Bowen et al. 2011). Current agronomic practices of many crops impose significant disturbances to the microbial communities in soil by adding inorganic nutrients, applying pesticides and heavy tilling. These principals and their relationship to human pathogen colonization, survival and persistence within the past 4 years have received special attention by different research groups around the world and some of the most important outcomes from these studies are summarized in the following statements extracted from their respective research articles.

1- Soil community structure parameters like species diversity and evenness can be indicative for the reliability of predictive models describing the fate of pathogens in (agricultural) soil ecosystems (van Overbeek et al. 2010).
2- Indigenous microbial communities present in composts adversely affect the survival of *E. coli* O157:H7; in specific, predation of *E. coli* O157:H7 by protists might be a potential mechanism for reducing *E. coli* O157:H7 (Puri and Dudley 2010).

3- *E. coli* O157:H7 populations decline faster under more oligotrophic soil conditions, which can be achieved by the use of organic fertilizer with a relatively high C/N ratio and consequently a relatively low rate of nutrient release (Franz et al. 2008).
4- Microbial species diversity as determined by DGGE was significantly higher in clay soil than sandy soil and this resulted in higher initial decline in population of *E. coli* O157:H7 in clay soil than in sandy soil (Ibekwe et al. 2011).
5- *E. coli* O157:H7 was able to survive in the soil for up to 90 days and that sandy soils were more permissible for its survival (Ibekwe et al. 2006).

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