Food Safety: Regulations, Science and Biodiversity

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Summary

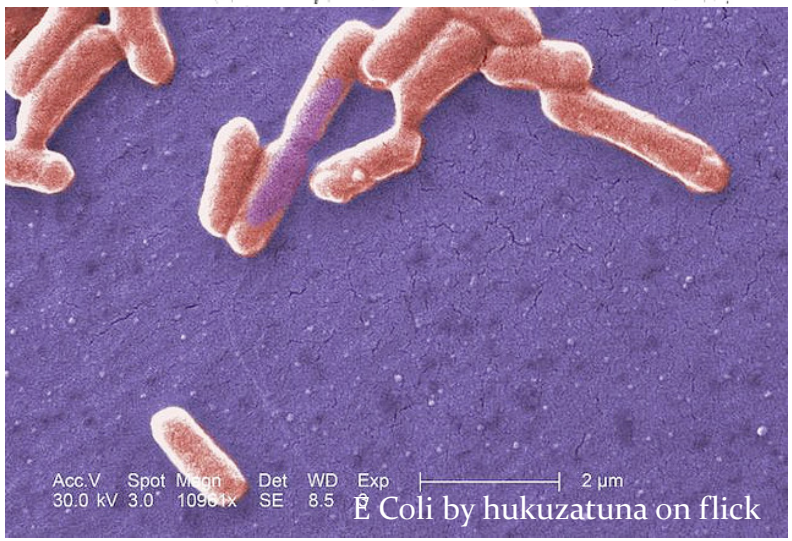
Main Factors that Affect Survival and Movement of Food Borne Pathogens

Understand How Conservation Practices Can Help to Provide Food Safety

What's in FDA's Proposed Produce Rules Related to Wildlife

Factors that Influence Pathogen Survival

- Ultra Violet Radiation
- Moisture/ Dessication
- Temperature
- Predation/Competition/Antagonistic Interactions
- Nutrient Sources
- pH



E Coli by hukuzatuna on flick

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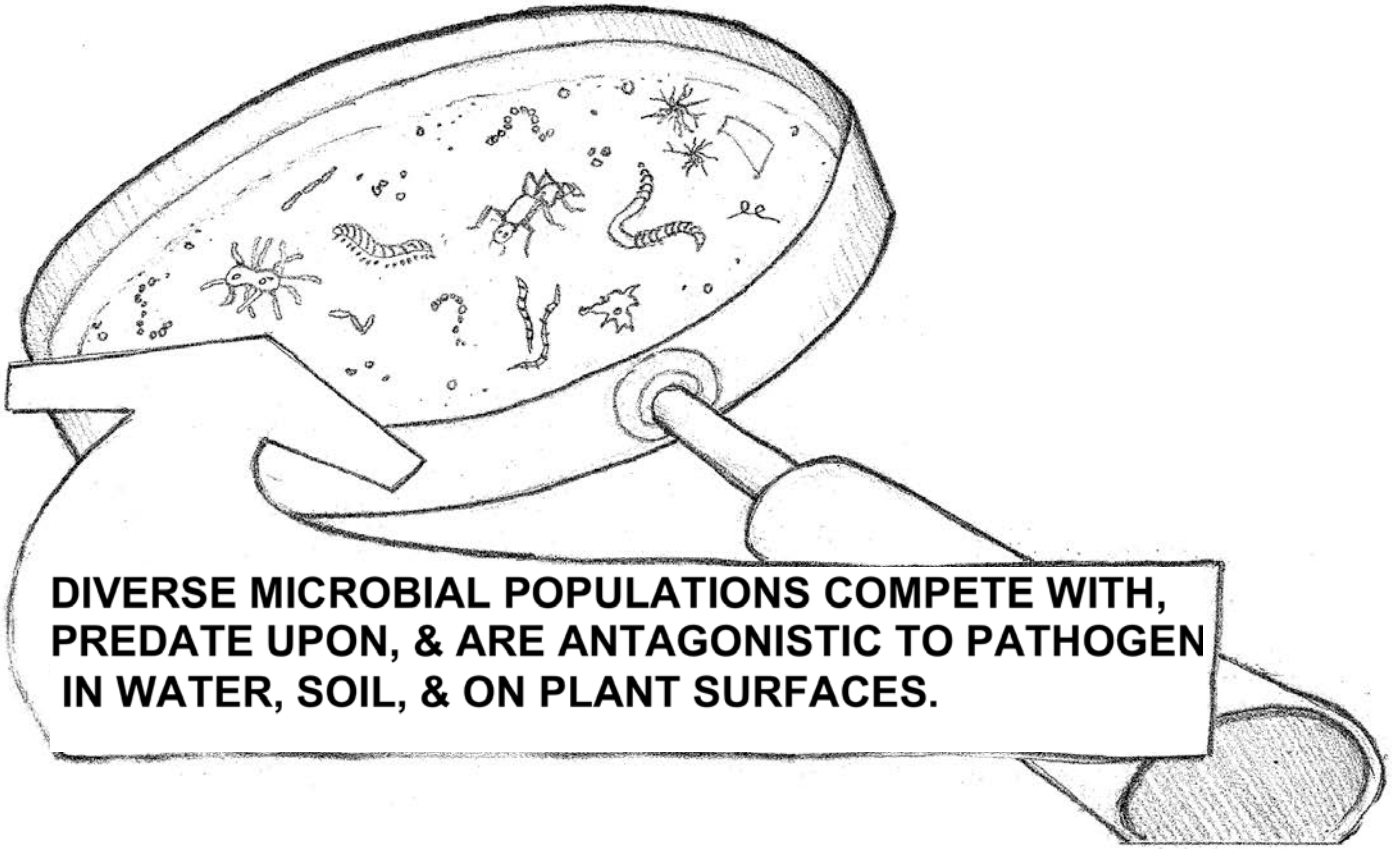

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Van Elsas, J. D., P. Hill, et al. 2007. "Survival of genetically marked E. coli 0157:H7 in soil as affected by soil microbial community shifts." Isme Journal. Vol 1, No 3

Factors that Influence Pathogen Movement

- Water
- Air
- Animals
- Humans*

Cases of Waterborne Pathogen Contamination (Outbreaks Linked to Irrigated Produce)

Crop	Pathogen	Irrigation Source
•Tomatoes	•*Salmonella*	•Pond in VA
•Lettuce	•*E. coli* O157:H7	•Small stream in Sweden
•Shredded lettuce	•*E. coli* O157:H7	•Well water in CA
•Hot peppers	•*Salmonella*	•Pond in Mexico

From (a) Greene et al. 2008; (b) Soderstrom et al. 2008; (c) US FDA and CA Emergency Response Team 2008; (d) CDC 2008.

Cases of Airborne Pathogen Contamination

Types of Airborne Pathogens	Location
•*E. coli* O157:H7	•CO cattle feedlot
•Newcastle disease virus	•PA poultry farm
•*Larynogtracheitis* virus	•DE poultry farm
•*E. coli* O157:H7	•OH fairgrounds
•*E. coli* strains	•Mexico City
•*E. coli* and *Salmonella*	•TX cattle feed yards
•Bacteria, fungi and dust	•Croatia poultry farm
•Bacteria and fungi	•Egyptian cattle barns
•Bacteria and fungi	•Romanian dairy barns

Type of Animals

Cattle Are a Major Reservoir of *E. coli* 0157: H7

Herds in feedlots and large confined dairy operations have shown a percentage of this pathogen than those outside pastures. Herds in feedlots and dairy may also be infected with this deadly bacteria.

E. coli Pathogens in Dairy Calves

Percent in Dairy Calves	Location
• 0.4	•Many states
• 8.2	•CA
• 8.3	•FL
• 1.8	•MD
• 9.5	•NE
• 3.8	•NY
• 3.7	•OH
• 2.3	•TN
• 9.4	•WI
• 2.0	•CA
•40.0	•MN
• 7.4	•NY
•12.5	•OH

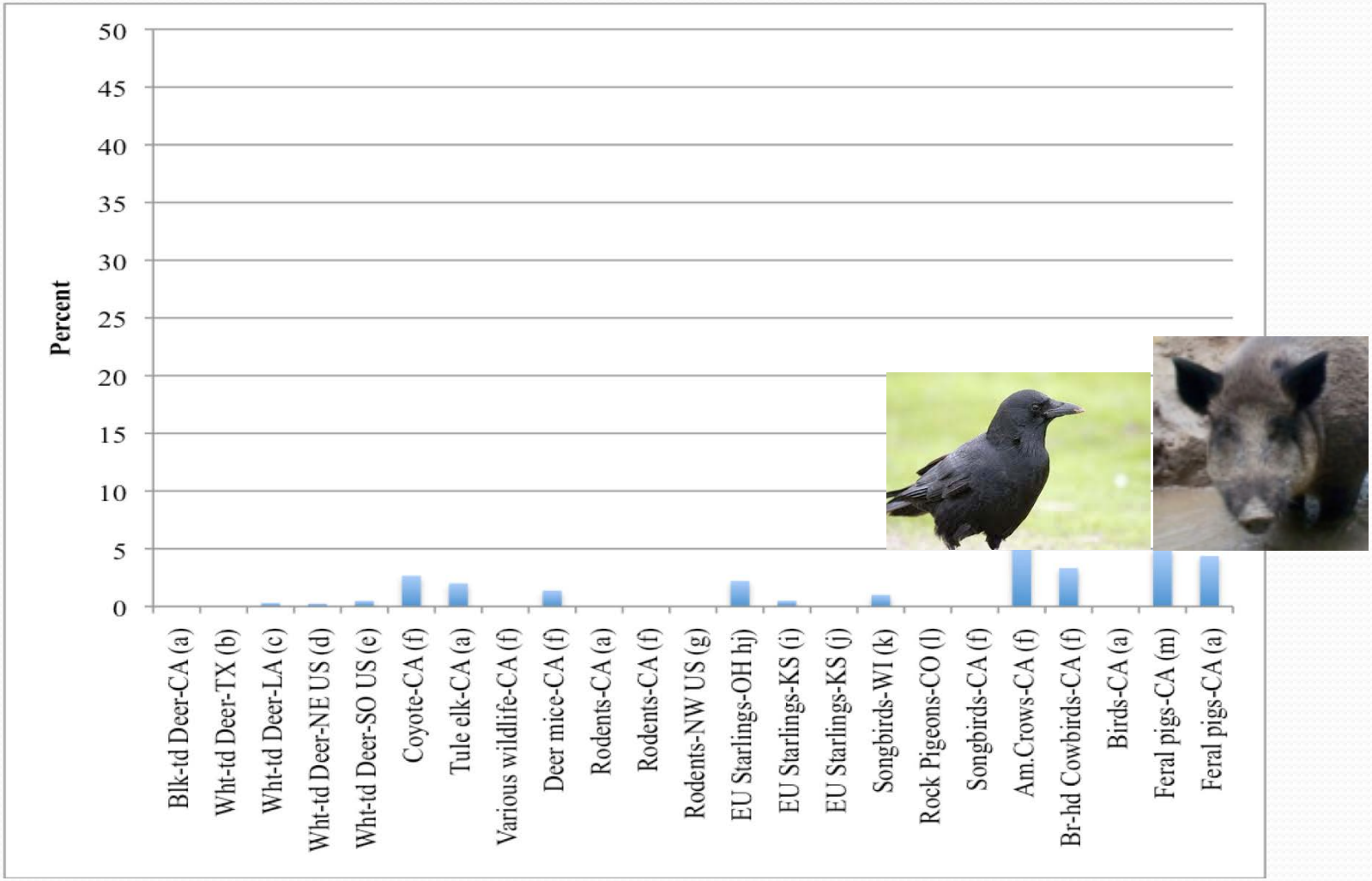
Hussein, H. S., and T. Sakuma. 2005. Invited review: Prevalence of Shiga toxin-producing Escherichia coli in dairy cattle and their products. Journal of Dairy Science. Vol 88, No 2

E. coli 0157:H7 in Lambs

Percent in Lambs	Location
• 0.2	•Italy
• 3.8 -4.1	•Netherlands
• 8.7	•Spain
• 1.7 - 2.2	•England/Wales
• 0.7	•England
• 6.5	•Scotland
•31.0	•United States

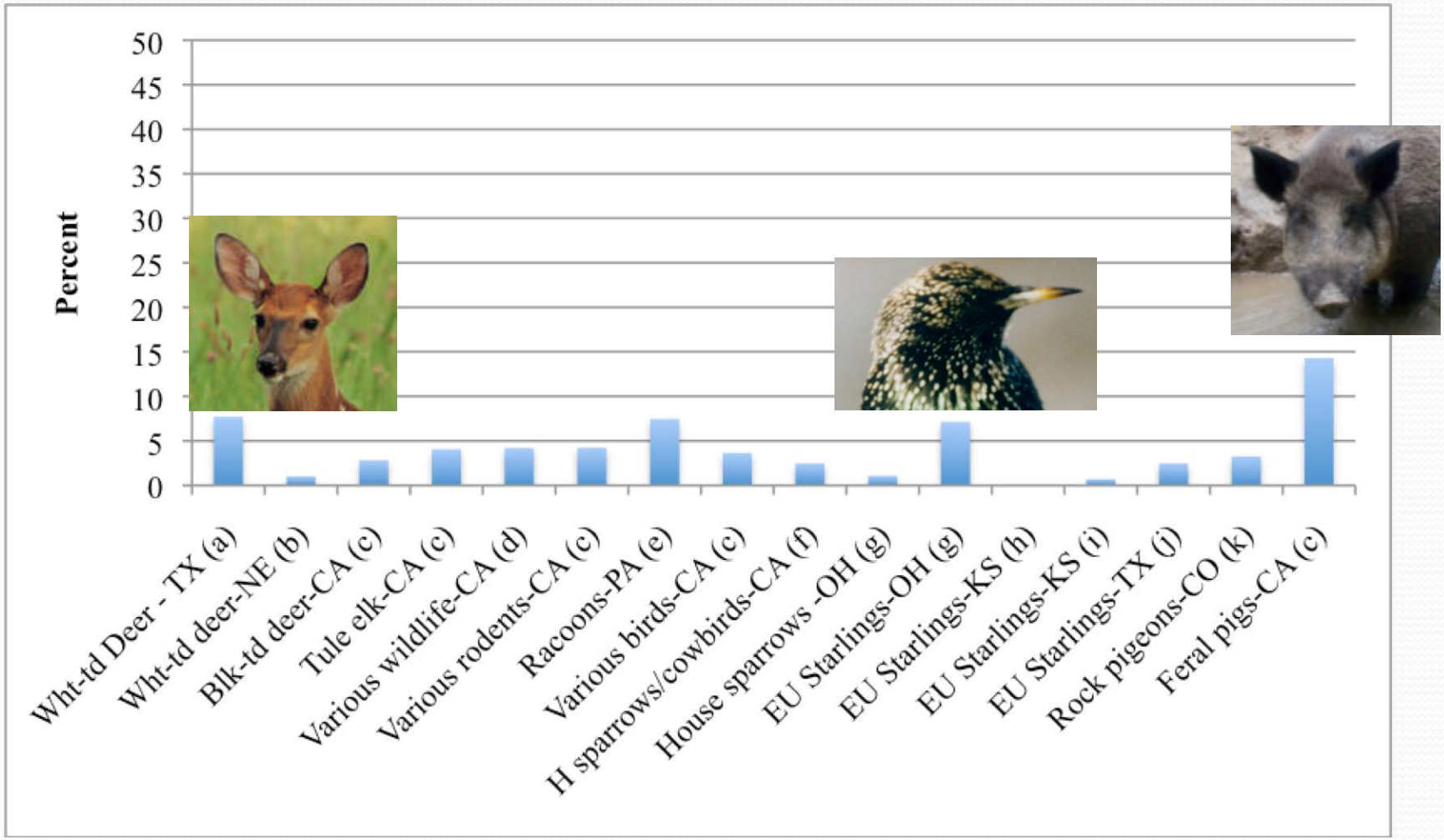
La Ragione, R. M., A. Best, M. J. Woodward, and A. D. Wales. 2009. Escherichia coli 0157:H7 colonization in small domestic ruminants. FEMS Microbiol Rev. Vol 33

Percent US Native and Non-Native Animal Colon/Cloacal/Tissue Samples with *E. coli* 0157:H7 Pathogens



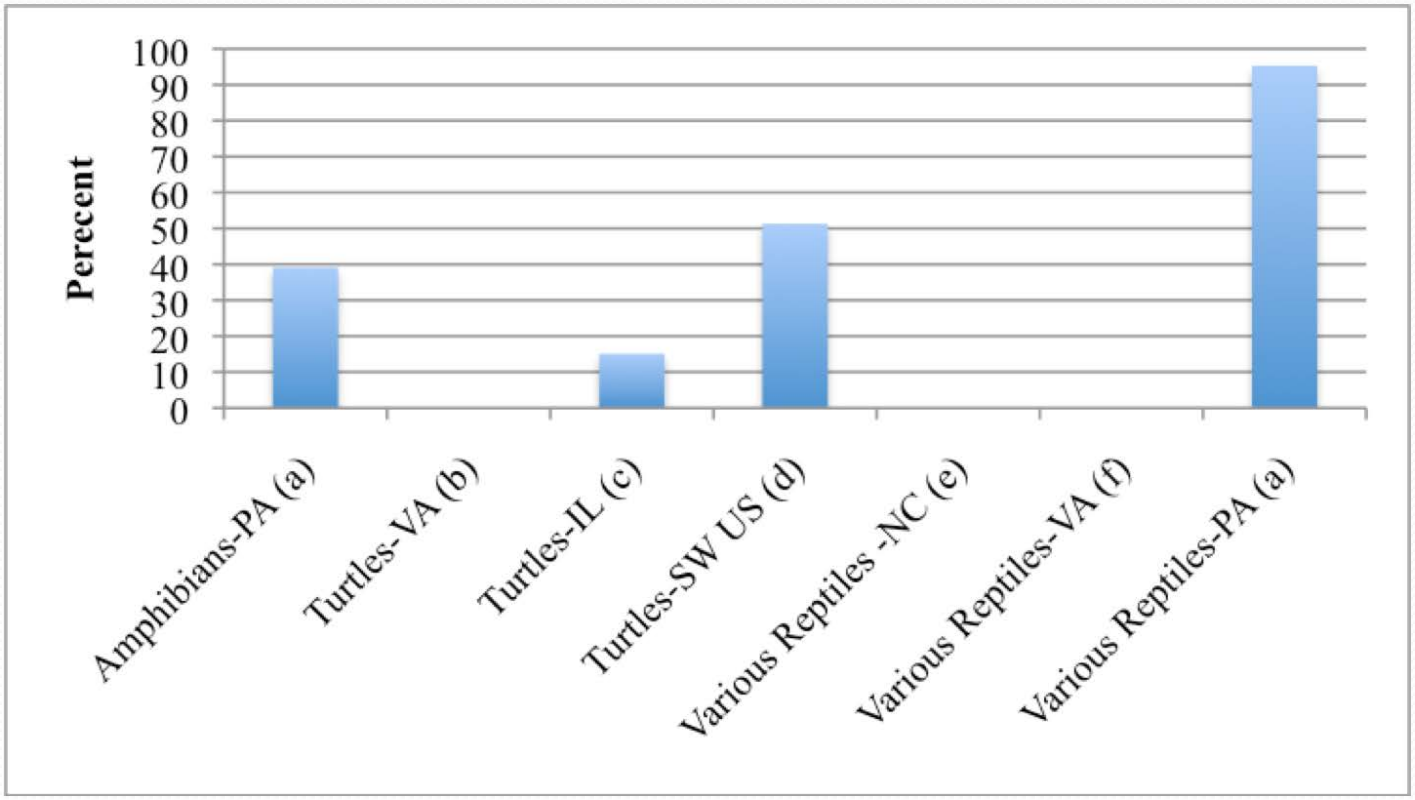
From (a) Gordus et al. 2011; (b) Branham et al. 2005; (c) Dunn et al. 2004; (d) Renter et al. 2001; (e) Fischer et al. 2001; (f) Jay-Russell et al. 2010; (g) Hancock et al. 1998; (h) LeJeune et al. 2008; (i) Gaukler et al. 2008; (j) Gaukler et al. 2009; (k) Shere et al. 1998; (l) Pedersen et al. 2006; (m) Jay et al. 2007.

Percent US Native and Non-Native Animal Colon/Cloacal/Tissue Samples with *Salmonella* Pathogens



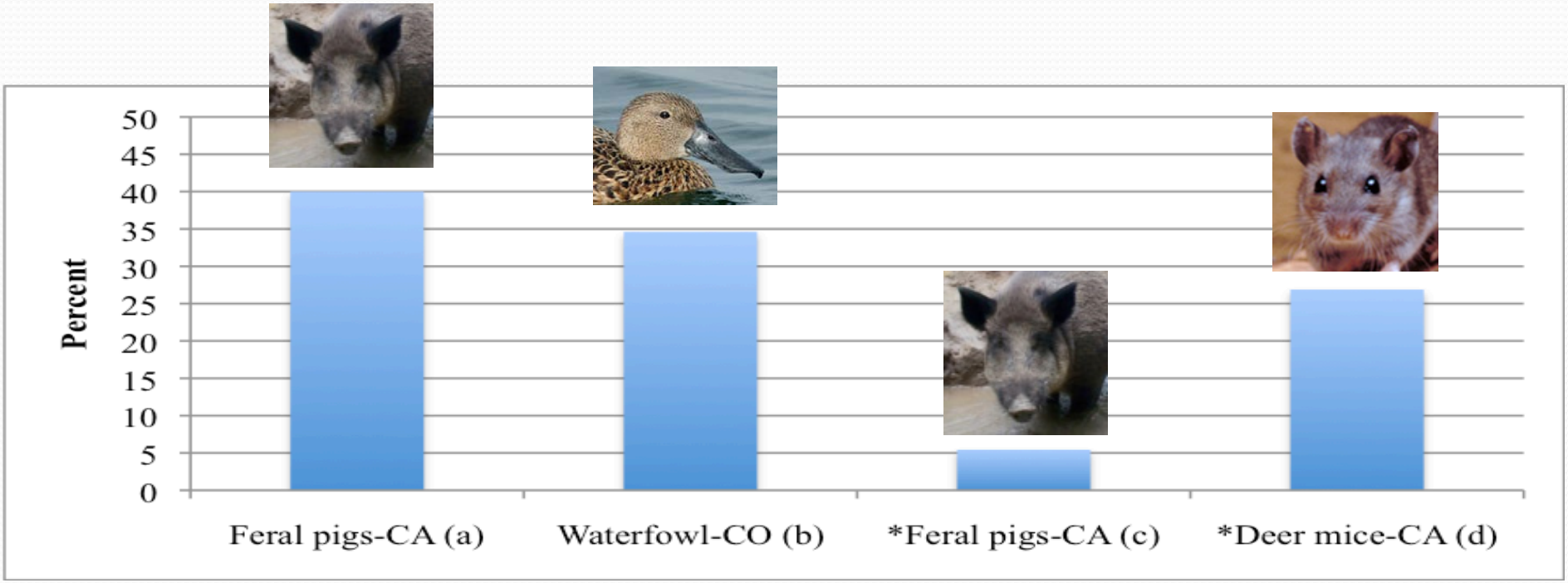
(a) Branham et al. 2005; (b) Renter et al. 2006; (c) Gordus et al. 2011; (d) Gorski et al. 2011; (e) Compton et al. 2008; (f) Kirk et al. 2002; (g) Morishita et al. 1999; (h) Gaukler et al. 2008; (i) Gaukler et al. 2009; (j) Carlson et al. 2011; (k) Pedersen et al. 2006.

Percent US Native and Non-Native Amphibian and Reptile Cloacal/Tissue Samples with *Salmonella* Pathogens That May Have the Potential to Infect Humans



(a) Chambers and Hulse 2006; (b) Brenner et al. 2002; (c) Readel et al. 2010; (d) Gaetner et al. 2008; (e) Saelinger et al. 2006; (f) Richards et al. 2004.

Percent US Native and Non-Native Animal Colon/Cloacal/Tissue Samples with *Campylobacter and Cryptosporidium** Pathogens



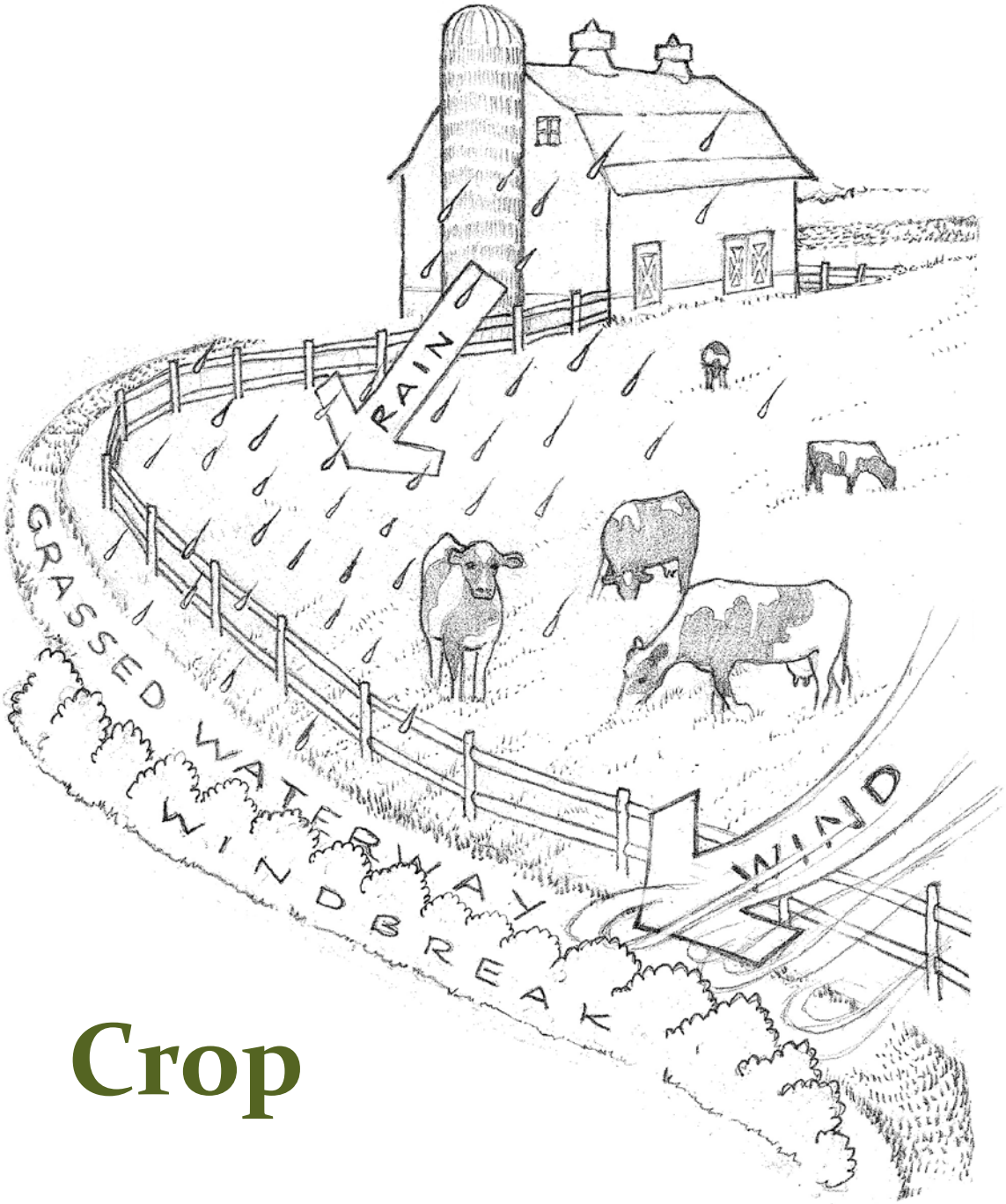
(a) Jay-Russel et al. 2012; (b) Luechtefeld et al. 1980; (c) Atwill et al. 1997; (d) Li et al. 2012;

FDA Proposed Produce Rule

Wild Animals

FSMA required FDA to consult with conservation agencies and they mentioned doing so with NRCS, NOP, EPA and FWS.

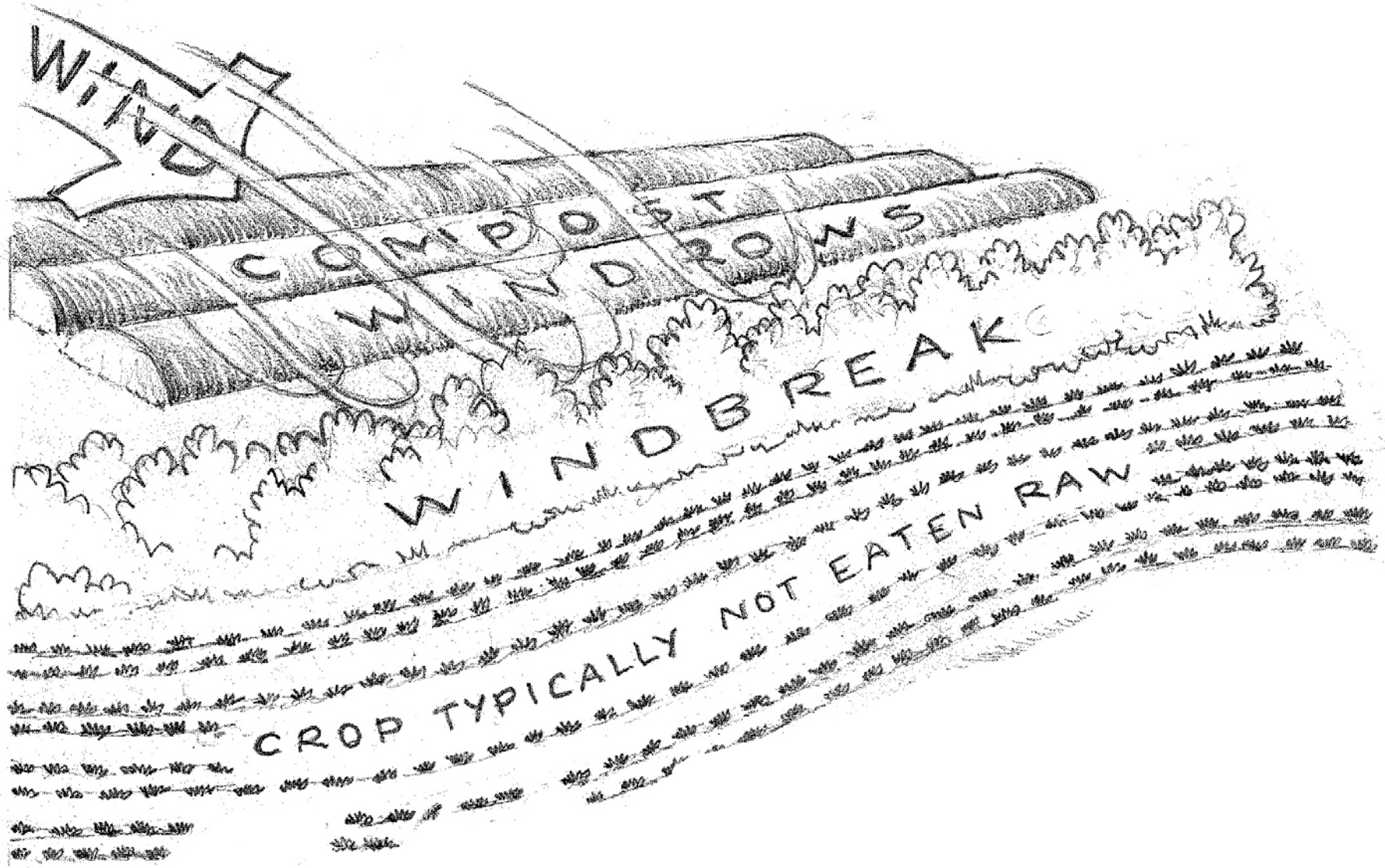
FDA "encourages the application of practices that can enhance food safety, including sustainable conservation practices."



Crop

Vymazal, J. 2005. "Removal of enteric bacteria in constructed treatment wetlands with emergent macrophytes: A review." Journal of Environmental Science and Health Part a-Toxic/Hazardous Substances & Environmental Engineering 40(6-7): 1355-1367.

Knox, A. K., K. W. Tate, et al. 2007. Management reduces E. coli in irrigated pasture runoff. California Agriculture. Vol 6, No. 4



Malone, B. (2004). "Using trees to reduce dust and odour emissions from poultry farms." Proceedings 2004 Poultry Information Exchange., Surfers Paradise, Qld, AU. : 33-38.

Burley, H. K., A. Adrizal, et al. (2011). "The potential of vegetative buffers to reduce dust and respiratory virus transmission from commercial poultry farms." Journal of Applied Poultry Research **20**(2): 210-222.

FDA Proposed Produce Rule

Wild Animals

FDA acknowledged that "when produce is grown in an outdoor environment, wild animals are likely to have access to production fields."

"The presence of animals in a production field of covered produce, in and of itself, is not a significant food safety risk."

FDA Proposed Produce Rule

Wild Animals

FDA notes that there is not science to justify pointing out dangerous wildlife; ie. it does not declare that deer are more of a risk than any other wild animals.

In contrast, the LGMA still uses the term "animals of significant risk," which includes cattle, sheep, goats, domestic and wild pigs, and deer.

FDA Proposed Produce Rule

Wild Animals

States that due to domesticated animals close proximity and interactions with humans, they are generally more likely to harbor zoonotic pathogens than wild animals.

FDA Proposed Produce Rule

Wild Animals

FDA recognizes that it is impossible to keep all wild animals away from produce fields.

Monitor for Animal Damage and Feces

- During Growth of Crop
- Immediately Prior to Harvest

FDA Proposed Produce Rule

Wild Animals

Monitoring is "intended to provide you with information about animals movements on your farm, allows you to recognize significant intrusion, and facilitate your taking appropriate measures following significant animal intrusion."

In contrast, the USDA GAPs makes farmers lose points if they don't take steps to deter any animals, whether there is significant intrusion or not.

FDA Proposed Produce Rule

Wild Animals

If animal intrusion occurs, as evidenced by seeing many animals, feces, or crop destruction via grazing, the farmer must determine how much of the crop can be harvested.

Determination depends on what can be seen and if part of a field has to be excluded so that harvesting equipment isn’t contaminated.

FDA Proposed Produce Rule

Wild Animals

FDA does not require the “taking” of endangered species.

Nor does it require farms to take measures to exclude animals from outdoor growing areas (ie. fence) or destroy animal habitat or otherwise clear farm borders around outdoor growing areas or drainages.

FDA Proposed Produce Rule

Wild Animals

FDA asks reviewers to provide any details on current wildlife management practices and their potential impacts.

FDA proposes that an Environmental Impact Statement is not required, but asks for comments about that.

FDA Proposed Produce Rule

Wild Animals

We are still hearing from farmers seven years after the spinach contamination that habitat is being removed.

FDA needs to set up a hotline where farmers can call in anonymously to report buyers who cause the destruction of habitat. Those buyers should be required to submit their food safety metrics for inspection and revision. FDA should put an upper limit on what is allowed, just as the NOP does, and not permit habitat destruction to occur in the name of food safety.

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