



# Editorial: The Relationship of Animal Health and Management to Food Safety

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## Editorial on the Research Topic

### The Relationship of Animal Health and Management to Food Safety

For many years we have understood that efficient, profitable, and sustainable animal management was linked to optimal animal health. As a result, it has been long assumed that healthy animals grew best, and produced safe food, but in recent years this linkage has not been solidified. In fact, the dots connecting these important on-farm factors are connected, but we do not yet see the whole “picture” of how they are related. The advent of Next Generation Sequencing and other novel techniques have been used in studies that have been focused on elucidating this “common sense” correlation. Thus, this special issue was designed to determine where we currently are in our search to correlate these important on-farm factors with food safety that can impact human consumers globally.

*Salmonella* is one of the biggest foodborne threats facing all of animal agriculture because it can be a pathogen to both humans and to animals, but it is most often an asymptomatic member of the gut microbial population. Efforts have been expended in reducing the burden of *Salmonella* reaching human meat consumers through the implementation of post-harvest interventions, but the application of pre-harvest control strategies have been slow to be developed and implemented. Edrington and Brown discuss (Frontiers | A Commentary on Salmonella from a Pre-Harvest Perspective | Animal Science (frontiersin.org)) the contradiction that *Salmonella* acts as both a commensal and an opportunistic pathogen, and why the cases of Salmonellosis in cattle are relatively rare. Thus, pre-harvest control of *Salmonella* has many challenges that must be accounted for throughout the production continuum.

Some of the challenges of *Salmonella* control are encapsulated in two of the accompanying papers (Wottlin et al.) (Frontiers | Salmonella Carriage in Peripheral Lymph Nodes and Feces of Cattle at Slaughter Is Affected by Cattle Type, Region, and Season | Animal Science (frontiersin.org)), which describes why *Salmonella* is not a constant burden, but rather a moving target that is lurking to expand its ecological niche. Their results show that the ways and locations in which we produce cattle can directly impact the risk for *Salmonella* transmission, which can allow for abattoir operators to evaluate risks effectively. Differences between *Salmonella* prevalence on dairy and beef operations are not yet explained, but examining these differences across operations gives promise for understanding of which on-farm factors drive risk for carriage of *Salmonella* (Hanson et al.) (Frontiers | Salmonella Prevalence Varies Over Time and Space in Three Large, Adjacent Cattle Operations in the Southwestern United States | Animal Science (frontiersin.org)). This study also

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demonstrates how serotypes may move between nearby animal rearing facilities, and how these pathogens may enter surface and ground water supplies.

Consumers across the US are in search of more environmentally conscious approaches to producing protein food sources. While rearing birds in confinement conditions arose initially as a method to improve poultry health by excluding environmental (and foodborne) pathogens, utilization of pastures to raise poultry has increased in recent years. However, Rothrock et al. demonstrated in (Frontiers | Salmonella Diversity Along the Farm-to-Fork Continuum of Pastured Poultry Flocks in the Southeastern United States | Animal Science (frontiersin.org)), that *Salmonella* was isolated from nearly 20% of all pasture isolates. Furthermore, in spite of the antibiotic-free status of these flocks, nearly 2/3 of the *Salmonella* isolates were antibiotic resistant, and specific serotypes can fill the ecological niche of *Salmonella* across the farm-to-fork production continuum and the serotype was fairly farm-specific, indicating a need for tailored pathogen intervention strategies.

The use of micronized ceramic particles as a potential intervention strategy in swine is discussed in (Davis et al.) (Frontiers | A dose response investigation of a micronized porous ceramic particle to improve the health and performance of post-weaned pigs infected with *Salmonella enterica* serotype Typhimurium | Animal Science (frontiersin.org)). Treatment with this product reduced fever during the post infection period, and improved health and animal performance following *Salmonella* Typhimurium infection. A dose-dependent response demonstrated a potential role in protecting pigs from Salmonellosis. Studies demonstrate that these types of approaches offer a real-world potential to improve both animal health and food safety on the farm.

Collectively, these articles highlight the difficulty in protecting our food animals from threats to animal health and food safety, all while ensuring production efficiency. However, this special issue underlines the potential of modern techniques to finally draw the lines connecting the dots between animal health, animal productivity, and food safety. By understanding these connections we can at last develop a coherent idea of how we can improve all facets of animal production, health, and food safety, and truly establish a “One Health” approach that can simultaneously improve both human and animal health.

## AUTHOR CONTRIBUTIONS

JL, PB, and TC all wrote and approved this editorial.

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