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SECURITY THROUGH SCIENCE®

Salmonella: Impact and Mitigation

Could Controlling Salmonella Start with Animal Feed?

At all stages of broiler chicken production, Salmonella is a threat to public health. There are several potential sources of Salmonella contamination in an integrated poultry operation[1], including breeder flocks, hatcheries, feed, the environment, litter, water and pests.

Salmonella enters the food chain through raw materials and can persist and thrive in feed even after it reaches the farm. Bacteria in feed can originate from feed ingredients, ingredient storage or during the feed manufacture process.

100 days

Number of days Salmonella can survive in feed[2]

There are a number of opportunities for the contamination and re-contamination of broiler chickens throughout the farm-to-fork pathway.

Broiler house infected?	Slaughter house infected?	Cross contamination at retail or transport?	Broiler under-cooked/any cross contamination?	Salmonella infection
9.7%	12%	33.5%	16.7%	

1 Hoover et al, 1997.
2 https://www.aasv.org/jshap/issues/v5n5/v5n5p189.pdf

What is Salmonella's Impact on Food Producers?

Salmonella bacteria impacts both human health and chicken welfare and performance. However, it is the risks to food safety, and consequently human health, that makes Salmonella infections a worldwide major public health concern.

CDC estimates that Salmonella bacteria cause about 1.35 million infections, 26,500 hospitalizations, and 420 deaths in the US annually.[1]

The USDA estimates that Salmonella cost the US economy about $3.7 billion annually, not including the industry cost, the cost of sales lost because of loss of consumer confidence, recalls, lawsuits, testing for pathogens and the cost of government agencies investing these outbreaks.[2]

USDA cost/benefit analysis of performance standards for clean feed[3]

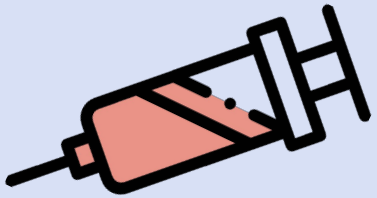
Level of Establishments Not Meeting the Standard	Cost/Benefit Component	Primary Estimate ($mil)	Low Estimate ($mil)	High Estimate ($mil)
30%	Industry Costs	18.0	12.9	23.0
	Public Health Benefits	50.9	31.8	79.9
	Net Benefits	32.9	18.9	56.9
40%	Industry Costs	21.4	15.5	27.2
	Public Health Benefits	79.7	50.4	125.9
	Net Benefits	58.3	34.9	98.7
50%	Industry Costs	24.9	18.2	31.5
	Public Health Benefits	109.1	68.8	171.2
	Net Benefits	84.2	50.6	139.7

[1]All costs (savings) annualized at a discount rate of 7% over 10 years.

1. https://www.cdc.gov/salmonella/index.html
2. https://www.foodsafetynews.com/2015/01/salmonella-costs-the-us-3-7-billion-per-year-among-other-costly-pathogens/
3. https://www.fsis.usda.gov/wps/wcm/connect/2f98f0a2-6a89-4316-aa95-86e5b103610f/CBA-Salmonella-Campy-2014-0023F-022016.pdf?MOD=AJPERES

How Can Salmonella be Mitigated?

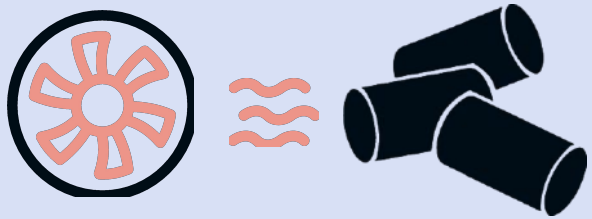
Effective Salmonella prevention and control measures require a comprehensive approach.



Vaccination

Several studies demonstrate the effectiveness of vaccination on Salmonella.

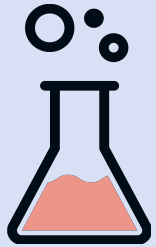
However, vaccines are specific for certain serotypes of Salmonella and do not tend to confer cross immunity to other Salmonella serotypes that are not represented in the vaccine. Currently, there are over 150 serotypes of Salmonella that colonize poultry and no vaccine can protect against all strains.



Heat treatment of feed

Salmonella can be eliminated by heat treatment dependent upon conditioning time, temperature, and moisture, water activity of the feed, feed formulation, initial level of contamination, stress status of isolate and the thermotolerance of Salmonella strain.

Recommended treatment is **86° C** for **6 min** to eliminate Salmonella below 10^5 CFU/g (but without providing residual protection).



Chemical preservatives

Organic Acids: used for more than 30 years to reduce bacterial growth and mold in feedstuffs. Efficacy is dependent on temperature, exposure time and feed type. They may mask the presences of Salmonella in feed.[1]

Termin-8: found to be 99% more effective than organic acids in reducing Salmonella in feed.[2]

Termin-8 at 2kg/MT prevented recontamination of fishmeal by Salmonella while 20kg/MT of organic acids were required to prevent recontamination.

1 Carrique-Mas et al, 2006
2 Wales et al 2013.