

Salmonella enteritidis

Your Questions Answered – Part 1

September 2013

Why is Salmonella enteritidis dangerous?

Salmonella causes disease in humans and is usually associated with food borne outbreaks. People who have ingested a contaminated food product will typically become sick within 8 to 72 hours and suffer from diarrhea, abdominal pain, and sometime fever. A healthy adult with salmonellosis usually recovers uneventfully in a few days, but it can be life-threatening in young children, seniors, and those with weak immune systems.

How do humans become infected with Salmonella?

Historically, Salmonella infections in humans have been linked to contaminated table eggs; however, human illness is now being traced to contaminated broiler meat and ungraded eggs. If consumers fail to cook their meat and eggs at appropriate temperatures Salmonella will persist in the product and cause harm.

As a means of controlling salmonella in broiler chickens, the existence of salmonella in hatching eggs has been identified as a critical control point.

How do my hatching eggs become contaminated with Salmonella?

Hatching eggs can become contaminated with SE in two ways, through vertical transmission and through horizontal transmission.

Vertical transmission of SE occurs when an infected hen passes SE onto her unborn chick. Oral inoculation (a hen eats litter contaminated with SE for example) of hens can produce an SE infection in the reproductive tract. When this occurs the hens' egg production rate is usually unaffected.

It has been show in research trials that a hens ovary and oviduct, or the reproductive tract, can become colonized with SE through airborne inoculation; delivery of about 100 cells of SE to the eye of a hen produces an infection. On farm airborne inoculation could occur by the spread of contaminated dust, feathers, or litter movement within the barn.

10% of the yolks from orally inoculated hens will be contaminated with SE and produce an SE positive chick.

Reference

Salmonella Penetration of Egg Shells and Proliferation in Broiler Hatching Eggs – A Review by N.A. Cox, M.E. Berrang and J.A. Cason. Journal of Poultry Science 2000.

Horizontal transmission occurs after the egg has been laid or the chick has hatched. The presence of SE in the nest box, in the litter, in the egg cooler, or on hatchery equipment can contaminate an egg. The probable mode of contamination is during the cooling of a moist freshly laid egg, which creates a vacuum pulling bacteria into the egg shell membranes. Shell quality, temperature, and on farm practices can have a great effect on the bacterial penetration of hatching eggs. It has been demonstrated that SE penetration of the cuticle and shell occurs almost immediately in some eggs; for example in one egg, penetration below both membranes was detected six minutes after the shell was exposed to SE. Once SE gets past the cuticle and the shell of an egg there is no way to prevent the growing embryo from becoming contaminated.

Salmonella Persistence

In a trial completed in 1964 it was found that salmonella organisms have the ability to persist for long periods of time. Hatchery fluff samples that were positive for salmonella kept for four years at room temperature still had 1,000 to 1,000,000 viable salmonella cells per gram.

Unlike other bacteria, SE contaminated eggs still hatch. Upon hatching SE is dispersed throughout the hatcher due to the fan-forced air. It has been shown that 80% of the chicks hatched above or below inoculated eggs will test positive for Salmonella sp. (trial was conducted using *S.typhimurium*). Eggs that are carrying Salmonella on the shell exterior can infect chicks once they begin to pip. In a trial, in which eggs were externally inoculated with Salmonella, 15% of the chicks were also externally contaminated with Salmonella after pipping and 8% of the chicks had contaminated yolk sacs after pipping.

Newly hatched chicks are highly susceptible to colonization by SE, and the organism will rapidly spread throughout the flock after hatch.

Hens can also contract an SE infection by being exposed to another bird carrying the disease (spiking males for example).

How is SE detected?

Less than 10% of the yolks from orally inoculated hens will be contaminated with SE and produce an SE positive chick and at any time less than 2% of hens may be actively colonized with SE. This means that to find SE in a breeder flock, a large number of eggs or individual hens (at least 1,000) must be tested.

Alternatively, the barn environment can be sampled. While it is also difficult to detect SE in this way, it is a reasonable and practical alternative to sacrificing large numbers of eggs. Environmental sampling is the most common method used for flock monitoring.

Reference

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